



NATIONAL BOARD FOR TECHNICAL EDUCATION, KADUNA

HIGHER NATIONAL DIPLOMA (HND)

IN

NAUTICAL SCIENCE

CURRICULUM AND COURSE SPECIFICATIONS

MAY 2017

Produced by the National Board for Technical Education (NBTE)

Plot B, Bida Road, P.M.B 2239, Kaduna Nigeria

GENERAL INFORMATION

1.0 GOAL AND OBJECTIVES

HIGHER NATIONAL DIPLOMA (HND) IN NAUTICAL SCIENCE

PROGRAMME GOAL:

The Higher National Diploma (HND) in Nautical Science is aimed at producing diplomats with sound knowledge in seafaring activities with technological and professional skills necessary for employment as Navigation Officer and job creation in various areas of maritime industry.

PROGRAMME OBJECTIVES:

On completion of this Programme, the HND diplomats should be able to:

- Keep a navigation watch.
- Do cargo works on board ship
- Plan and execute voyage plan
- Carry out safety and fire prevention techniques on board ships
- Develop an ability to accept position of leadership and higher responsibility in the Maritime Industry

2.0 MINIMUM ENTRY REQUIREMENTS

The general entry requirements for admission into the HND Nautical Science programme are:

- i. Five (5) G.C.E. (0 level), WASC, NECO or NABTEB subjects passed at not more than two sittings. The subjects must be passed at Credit level and should include English Language, Mathematics, Physics Geography and any one (1) other subject from the list contained in the most current Directory of Accredited programmes of Polytechnics and similar tertiary technical institutions in Nigeria.
- ii. Passing the Unified Tertiary Matriculation Examination (UTME).

- iii. A minimum of lower credit pass (CGPA 2.0-2.50) in the cognate ND Nautical Science examination and
- iv. A minimum of one year cognate work experience (IT)
In exceptional cases, ND diplomates with pass (CGPA 2.00-2.45) in the ND examination that had two or more years of cognate work experience in the specific field may be considered for admission into the HND Nautical Science programme.

3.0 PROJECT

Every HND student is required to complete successfully in original practical project in any area of specialization during his/her final year on the programme in order to qualify for the award of the diploma.

4.0 CURRICULUM

The curriculum consists of three main components. These are:

- i. General Studies
- ii. Foundation Courses
- iii. Professional Courses

The General Studies component shall include courses in:-Science and Technology related programmes, English Language, Computer/ICT, Entrepreneurship Education and Educational Psychology; Citizenship (the Nigerian constitution),Sociology, and Entrepreneurship, are compulsory. The general Studies component shall account for not more than 10-15% of total contact hours for the programme.

Foundation courses include courses in English, Languages, and Basic Computer Applications. The number of hours will account for about 10-15% of the total contact hours.

Professional Courses are the core Nautical Science courses which give the student the theoretical and practical skills needed to practice as a seafarer. These may account for between 70-80% of the contact hours.

5.0 CURRICULUM STRUCTURE OF HND PROGRAMME IN NAUTICAL SCIENCE

The structure of the HND programme consists of four semesters of classroom, laboratory, workshop and Studio activities in the institution. Each semester shall be of 17 weeks duration made up as follows: 15 contact weeks of teaching, (Lecture and Practical Exercises). Tests, quizzes, examinations and registration take the remaining two weeks.

6.0 ACCREDITATION

The Higher National Diploma (HND) in Nautical Science shall be accredited by NBTE before the diplomats can be awarded the diploma certificate. Details about the process of accrediting a programme for the award of the HND are available from the Executive Secretary, National Board for Technical Education (NBTE) Plot 'B', Bida Road, P.M.B. 2239, Kaduna, Nigeria.

7.0 CONDITIONS FOR THE AWARD OF THE DIPLOMA

Institutions offering accredited programmes should award the Higher National Diploma (HND) to candidates who have successfully completed the programme after passing prescribed course work, examinations and diploma project. Such candidates should have completed a minimum of 72 semester credit units.

The Diploma shall be classified as follows:

(a) **Grading System**

Marked Range%	Letter Grade	Weighting
75– 100	A	4.00
70 – 74	AB	3.50
65 -69	B	3.25
60 – 64	BC	2.50
55 – 59	C	2.75
50 – 54	CD	2.50
45 – 49	D	2.25
40 – 44	E	2.00
Below 40	F	0.00

Classification of Grade

(b) The HND shall be classified as follows on a 4- point grading system: (CGPA)

3.50 and above	Distinction
3.00 – 3.49	Upper Credit
2.50 – 2.99	Lower Credit
2.00 – 2.49	Pass

8.0 GUIDANCE NOTES FOR TEACHERS TEACHING THE PROGRAMME

- 8.1** The new curriculum is drawn in course units. This is in keeping with the provisions of the National Policy on Education which stresses the introduction of the semester credit units, which will enable a student who so wishes to transfer the units already completed in an institution to another of similar standard.
- 8.2** In designing the unit, the principle of the modular system by product has been adopted thus making each of the professional modules, when completed, provide the student with technical operative skills, which can be used for job creation and employment purposes.
- 8.3** As the success of the credit unit system depends on the articulation of programmes between the institutions and industry, the curriculum's content has been written in behavioral objectives, so that the expected performance of the student who successfully completed the courses of the programme is clear to it. There is a slight departure in the presentation of the performance based curriculum which requires the conditions under which the performances are expected to be carried out and the criteria for the acceptable levels of performance to be stated. It is a deliberate attempt to get the staff of the department teaching the programme to write their own curriculum stating the conditions existing in their institution under which the performance can take place and to follow that with the criteria for determining an acceptable level of performance. The Academic Board of the institution may vet departmental submission on the final curriculum. The aim is to continue to see to it that a solid internal evaluation system exists in each institution for ensuring minimum standards and quality of education in the programmes offered throughout the polytechnic and other specialized institutions such as the Maritime sector system.
- 8.4** The teaching of the theory and practical work should, as much as possible, be integrated. Practical exercises, especially those in professional courses and studio work should not be taught in isolation from the theory. For each course, there should be a balance of theory to practice.

9.0 GUIDELINES ON SIWES

9.1 For the smooth operation of the SIWES the following guidelines shall apply.

- a. Institution offering the HND programme shall arrange to place the students in industry. By second semester/second year of the programme, six copies of the master list showing where each student has been placed shall be submitted to the Executive Secretary, NBTE, who shall, in turn authenticate the list and forward it to the Industrial Training Fund, Jos.
- b. The Placement Officer should discuss and agree with industry on the following
 - i. A task inventory of what the student is expected to experience during the period of attachment. It may be wise to adopt the one already approved for each field by the industry based supervisor.
 - ii. The evaluation of the student by the industry based supervisor and the institution-based supervisor. The final grading of the student during the period of attachment should be weighted more on the evaluation by industry-based supervisor.

9.2 Evaluation of Students during the SIWES

In the evaluation of the student, cognizance should be taken of the following items:

- i. Punctuality
- ii. Attendance
- iii. General Attitude to Work
- iv. Respect for authority
- v. Interest in the field/technical area
- vi. Technical competence as a potential technician in his field.
- vii. Team work

9.3 Grading of SIWES

To ensure uniformity of grading scales, the institution should ensure that the uniform grading of students work which has been agreed to by all polytechnics is adopted.

9.4 The Institution Based Supervisor

The institution-based supervisor should initial the log book during each visit. This will enable him to check and determine to what extent the objectives of the scheme are being met and to assist students having any problems regarding the specific assignments given to them by their industry-based supervisor.

9.5 Frequency of Visit

Institution should ensure that students placed on attachment are visited within one month of their placement. Other visits shall be arranged so that:

1. there is another visit six weeks after the first visits; and
2. final visit in the last month of the attachment

9.6 Stipend for Students in SIWES

The rate of stipend payable shall be determined from time to time by the Federal Government after due consultation with the Federal Ministry of Education, the Industrial Training Fund and the National Board for Technical Education (NBTE).

9.7 SIWES as a Component of the Curriculum

The completion of SIWES is important in the final determination of whether the student is successful in the programme or not. Failure in the SIWES is an indication that the student has not shown sufficient interest in the field or has no potential to become a skilled technician in field. The SIWES should be graded on a fail or pass basis. Where a student has satisfied all other requirements but failed SIWES he may only be allowed to repeat another four months SIWES at his/her own expense.

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1ST SEMESTER: HND I

Course Code	Course Title	L	T	P	CU	CH
GNS 301	Communication in English III	2	-	-	2	2
NSC 311	Chart Work III	-	-	3	3	3
NSC 313	Marine Meteorology	2	-	2	4	4
MAR 319	Shipp Power Plant I	2	-	2	4	4
NSC 315	Seamanship III	2	-	2	4	4
EED 413	Entrepreneurship Development	2	-	2	4	4
MST 311	Human Resource Management	2	-	-	2	2
	Total	12	-	13	23	23

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2ND SEMESTER: HND I

Course Code	Course Title	L	T	P	CU	CH
MAR 328	Ship Power Plant II	2	-	2	4	4
NSC 323	Compass Work	2	-	2	4	4
NSC 325	Ship Stability and Structure I	2	-	2	4	4
NSC 326	Seamanship IV	2	-	2	4	5
NSC 327	Cargo Handling & Stowage I	2	-	2	4	4
NSC 329	Ship Construction	3	-	-	3	3
GNS 328	Computer Application	2	-	2	4	4
		15		12	27	27

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3RD SEMESTER: HND II

Course Code	Course Title	L	T	P	CU	CH
NSC 431	Electronic Navigation Aids	2	-	2	4	4
NSC 432	Maritime Law I	4	-	-	4	4
NSC 433	Cargo Handling & Stowage II	2	-	2	4	4
NSC 434	Ship Stability and Structure II	2	-	-	2	2
NSC 435	Celestial Navigation III	4	-	-	4	4
NSC 436	Research Methodology	2	-	-	2	2
NSC 437	Watch Keeping	2	-	-	2	2
NSC 414	Industrial Relations	2	-	-	2	2
	Total	20	-	4	24	24

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4TH SEMESTER: HND II

Course Code	Course Title	L	T	P	CU	CH
NSC 441	Maritime Law II	2	-	-	2	4
NSC 442	Emergency Procedure	2	1	-	3	3
NSC 443	Meteorology & Oceanography	2	1	-	3	3
NSC 444	Voyage Planning	2	-	2	4	4
NSC 445	Search & Rescue	2	1	-	3	3
NSC 448	Project	2	-	2	4	4
NSC 446	Final Year Project	-	1	2	3	3
	Total	14	4	4	18	18

^ HND I FIRST SEMESTER

Programme: HND Nautical Science	Course Code: NSC 311	Contact Hours 45/Credit unit: 3
Course: Chart work III	Semester: 1	Theoretical: hours/week -
Year:	Pre-requisite:	Practical: 3 hours /week
GOAL: To enable the students acquire basic knowledge of chart work.		
GENERAL OBJECTIVES: On completion of this course the students will be able to:		
1.0 Understand the basic principles of chart work. 2.0 Know the various information and symbols use on charts. 3.0 Know how to interpret information on charts. 4.0 Know the purpose of keeping a log.		

General Objective 1.0: Understand the basic Principles of Chart work.

General Objective 1.0: Understand the basic Principles of Chart work.						
	THEORETICAL CONTENTS			PRACTICAL CONTENTS		
Week	Specific Learning Outcomes	Teacher's Activities	Resources Theoretical/practical	Specific Learning Outcomes	Teacher's Activities	Evaluation
1-5	1.1 Define "Course" and "Distance". 1.2 Lay off true course between two points. 1.3 Find the distance between the two points. 1.4 Calculate the speed. 1.5 Define "Set", "rate" drift and "leeway" due to wind. 1.6 Define "Ship's speed", effective speed course and distance made good. 1.7 Apply leeway. 1.8 Find the course to steer allowing for tidal stream. 1.9 Find the set and rate of tidal stream or current from chart and tables. 1.10 Explain the term running fix. 1.11 Use the method to plot a position. 1.12 Find position by running	Explain the various navigational terms. Demonstrate the various plotting exercises.	Charts. Text books	Students to understand basic use of charts, be able to fix position applying set, drift and leeway.	Use charts to illustrate various methods of position fixing.	Assignment Test Examination.

	<p>fix in a tidal stream or current.</p> <p>1.13 Calculate set and rate of tidal stream or current from D.R. and fixed position.</p>					
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General Objective 2.0: Know the various information and symbols use on charts

6-8	<p>2.1 Recognize the use of symbols and abbreviations on a chart- like, lighthouse, buoys, beacons, etc.</p> <p>2.2 Identify the characteristics and range of lights.</p> <p>2.3 Calculate sighting and dipping distance.</p> <p>2.4 Explain the principles and rules of the International Associations of light house Authority (IALA) maritime buoyage system “A&B”.</p> <p>2.5 Identify the symbols for chart depths and nature of the bottom.</p> <p>2.6 Explain the use of sounding.</p>	<p>Use chart 5011 to provide undepth understanding in identification of various symbols and information on charts.</p> <p>Explain how the information obtained will be used.</p> <p>Use sighting and dipping distance to obtain position.</p> <p>Demonstrate how the information got can be used to</p>	<p>Reference Textbooks</p> <p>Charts</p>	<p>Students to know the various symbols with their uses on the charts.</p>	<p>Use chart 5011 to provide indepth knowledge in identification of various symbols and information on charts.</p>	<p>Assignment</p> <p>Test</p> <p>Examination.</p>
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		verify your position and set your course.				
General Objective 3.0: Know how to interpret information on charts.						
9-12	<p>3.1 Recognize Coastlines Contours and radar responsive target.</p> <p>3.2 Interpret Coastline contours, bottom depths and nature of bottom.</p> <p>3.3 Use tidal information given on chart.</p> <p>3.4 Recognize traffic lanes and separation Zones.</p> <p>3.5 Recognize the different types of charts overlaid with lattice charts.</p> <p>3.6 Recognize the danger of placing reliance on floating Navigational aids, and approaching too close to them.</p> <p>3.7 Explain the use of the notices to mariners.</p> <p>3.8 Use the information on them to correct charts.</p>	<p>Explain the use of traffic lanes and separation Zones.</p> <p>Explain the use of Lattice charts.</p> <p>Explain the reason for not placing reliance on floating Navigational Aids.</p> <p>Explain the use of notices.</p> <p>Use the information to correct charts.</p>	<p>Reference Textbooks</p> <p>Charts</p> <p>Copies of Notices to mariner's</p>	Students to know how interpret various navigational information on charts.	Use various types of charts to demonstrate the identification and interpretation of chart symbols.	Assignment Test Examination.

General Objective 4.0: Know the purpose of keeping a Log.

13-15	<p>4.1 List the rules and common practices regarded keeping a navigational log books.</p> <p>4.2 Describe the proper keeping of different kinds of log books during sea (passage and in port).</p>	<p>Explain the use of keeping the log book and the proper way of keeping it.</p> <p>State the different kinds of log books kept on board.</p>	<p>Log Books</p> <p>Extract from ship's log book.</p>	<p>Students to know how the purpose and importance of log book keeping.</p>	<p>Explain the technical fundamentals of log book keeping on board.</p>	<p>Assignment</p> <p>Test</p> <p>Examination.</p>
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Programme: HND NAUTICAL SCIENCE	Course Code: NSC 313	Contact Hours:60/Credit unit: 4
Course: MARINE METEOROLOGY	Semester: 1	Theoretical: 2 hours/week
Year:	Pre-requisite:	Practical: 2 hours /week
GOAL: At the end of the course the student will be able to use weather forecast in Navigation.		
GENERAL OBJECTIVES: On completion of this course the student will be able to:		
1.0 Know the ship borne meteorological instrument(s). 2.0 Know the composition and properties of the atmosphere. 3.0 Know atmospheric Pressure. 4.0 Appreciate the phenomenon of wind. 5.0 Apprehend the formation of clouds and precipitation. 6.0 Comprehend visibility. 7.0 Know the wind and pressure system over the ocean. 8.0 Apprehend the structure of depression. 9.0 Know the Anticyclone and other pressure system. 10.0 Know weather services for shipping. 11.0 Apprehend how to record and report weather observation. 12.0 Appreciate weather forecasting.		

General Objective 1.0: Know the ship borne meteorological instrument.

General Objective 1.0: Know the ship borne meteorological instrument.						
	THEORETICAL CONTENTS			PRACTICAL CONTENTS		
Week	Specific Learning Outcomes	Teacher's Activities	Resources Theoretical/ practical	Specific Learning Outcomes	Teacher's Activities	Evaluation
1	1.1 State the basic principles of a mercurial barometer and aneroid barometer 1.2 Read the atmospheric pressure from an ordinary aneroid barometer and mercurial barometer 1.3 Read the temperature from the thermometers (maximum, minimum, wet, dry bulb and thermograph) 1.4 State the function of hygrometer and marine screen. 1.5 State the basic principle of wind sensors	The cadets should be taken to laboratory so that they can identify and read the meteorological measuring instruments that are related to the seafarer.	Meteorological instrument such as: Barometer both aneroid and mercurial type; - Thermometer of different types; maximum, minimum dry bulb & wet bulb. thermometer. - Hygrometric table to determine mean sea level pressure (QNH) and station level pressure (QFE).	The student should be able to understand the basic principle of weather instrument, operate and read the instruments.	Supervise the students while reading/ using the various instrument.	Test Assignment Examination.

General Objective 2.0: Know the composition and properties of the atmosphere

2- 3	<p>2.1 Describe the composition of the earth's atmosphere, mentioning Dry air and its constituents, water vapour, Ozone and aerosol.</p> <p>2.2 Draw a typical vertical temp profile through the lower 100 km of the earth's atmosphere.</p> <p>2.3 State the importance of the sun as the principle energy source for atmospheric processes.</p> <p>2.4 Describe the nature of solar radiation (Scattering, reflection and absorption).</p> <p>2.5 Explain the effect on insulations of a variation in latitude and in the length of Day light</p> <p>2.6 Define Water Vapour</p> <p>2.7 Define evaporation, condensation and latent heat of vaporization</p> <p>2.8 Describe the processes of mixing cooling and the evaporation of water vapour, by which a sample of air may be brought to saturation.</p>	<p>Illustrate the subject matter related to air immediate environment with special interest to CO₂, Ozone and water vapour.</p>	<p>Diagrams, tables and theories will aid in the study.</p>			<p>Test Assignment Examination.</p>
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General Objectives 3.0: Know the atmospheric pressure						
4	<p>3.1 Define pressure and state its basic unit.</p> <p>3.2 Draw/Sketch different pressure systems e.g. low or cyclone, High or Anticyclone, Col, ridges of high pressure and Trough of Low pressure</p> <p>3.3 Define Isobar, Isallobars, Pressure-Gradient and Pressure Tendency.</p> <p>3.4 Explain the cause of atmospheric pressure and why it decreases with height.</p>	<p>To open the understanding of cadet the lecturer relates the subject matter to tropical environment and stating the significance of pressure as it determines stability of atmosphere.</p>	<p>Chart (Synoptic). Diagram. Sketch. Equations.</p>			<p>Test Assignment Examination.</p>
General Objectives 4.0: Appreciate the phenomenon of wind						
5	<p>4.1 Define Wind.</p> <p>4.2 Describe the Beauport scale of wind force</p> <p>4.3 Explain qualitatively the coridhs force</p> <p>4.4 State Buys – Ballot’s law</p> <p>4.5 State the factors other than the wind speed which affect the appearance of the sea surface</p> <p>4.6 Differentiate between apparent and true wind.</p>	<p>Explain Buys – Ballot law Use the law to determine the pattern of synoptic chart i.e. where is likely the high pressure will appear or the low pressure will appear. Explain the use of Beauport</p>	<p>Wind Vane. Anemometer. Anemoclimo- meter. Anemograph. Beaufort. Scale table.</p>	<p>The student should observe the record value obtained from weather instruments.</p>	<p>Supervise the students.</p>	<p>Test Assignment Examination.</p>

		scale as a guide to wind pattern or description of sea.				
General Objectives 5.0: Apprehend the formation of clouds and precipitations						
6 - 7	5.1 Define cloud 5.2 Explain how clouds are formed 5.3 State the need for and define condensation nuclei 5.4 Name and describe the ten basic cloud types in relevance to their height 5.5 Define precipitation 5.6 Define rain, drizzle, hail snow and sleet.	Explain Cloud formation base on theories and conditions. Explain precipitation bases on hydrological cycle.	Table, diagrams were used but the key interest is in visual observation Rain gauge.	Identify various cloud types.		Test Assignment Examination.
General Objectives 6.0: Comprehend visibility						
8	6.1 Define Visibility 6.2 Define Fog, mist and haze 6.3 Explain qualitatively the formation radiation fog and a direction fog, mentioning area, seasons and reason for their dispersal 6.4 Explain qualitatively the conditions leading to the formation of sea smoke and typical areas where sea smoke may be encountered. 6.5 Describe the difficulties	Discuss the Conditions that hindered visibility, fog, mist and haze as they affect seafarer. Demonstrates/s hows different condition of visibility using the simulator.	Tables, (Visibility efficient) Simulation.		Ensure the student understand different types of visibility.	Assignment Test Examination.

		involved in estimating visibility day & night at sea.				
General Objectives 7.0: Know the wind and pressure system over the ocean						
9 - 10	7.1	Explain qualitatively, with the aid of sketches the circulation cells which would exist on a rotating earth.	Illustrate in class; using theories to explain the rotation of earth working into Hailey cell circulation; and the weather associated with subject matter.	Chart (Synoptic or prognostic chart). Diagrams for adequate illustration. Sketch (circulation cell which would exist on a rotation earth).	Student reads the chart.	Ensure the student understand weather routing. Assignment Test Examination.
	7.2	Draw the mean surface pressure and wind distribution over the earth's surface in January and July.				
	7.3	Describe the characteristics and location of the doldrums, inter-tropical convergence zone, trade wind, sub-tropical oceanic highs, westerlies and polar easterlies				
	7.4	Describe a monsoon regime and state the areas which experience a true monsoon regime	The lecturer should use weather routing maps/charts to explain the topics.	Weather routing charts Ocean passages of the world.		
	7.5	Explain the weather associated with the January and July monsoon of Indian Ocean, China sea, North coast of Australian and West coast of Africa and Brazil.				
	7.6	Explain the formation of land and sea breeze				
	7.7	Explain the formation of anabatic & katasic wind				
	7.8	State examples of Local				

	wind.					
General Objectives 8:0 Apprehend the structure of depression						
11 - 12	<p>8.1 Define air mass, its formation and source region</p> <p>8.2 Define warm front, cold front and identify them on the weather map.</p> <p>8.3 Define depression and identify it on a surface synoptic chart</p> <p>8.4 Describe the stages in the life cycle of a polar front depression and describe the usual movement of a polar front depression</p> <p>8.5 Describe a family of depression</p> <p>8.6 Draw a diagram of a polar front depression for both northern and southern hemisphere</p> <p>8.7 Describe the process that leads to the occlusion of a polar front depression.</p> <p>8.8 Use hygrometer table to calculate for mean sea level pressure, station level pressure, vapor pressure, RH and dew point temp.</p>	<p>To enhance adequate understanding of the subject matter, the lecturer need to identify in the weather map the cold and warm front and discuss depression vividly.</p>	<p>Diagram showing different families of depression was used.</p> <p>Meteorological symbols code related to cold and warm front were used.</p> <p>- Synoptic Chart</p>	<p>The student should identify on weather map the cold and warm front and other symbols.</p>	<p>To enhance adequate understanding of the subject matter, the lecturer need to identify in the weather map the cold and warm front and discuss depression vividly.</p> <p>Supervise the student.</p>	<p>Test Assignment Examination.</p>

General Objectives 9.0: Know anticyclone and other pressure systems						
13	<p>9.1 Define Anticyclone and describe the weather associated with it</p> <p>9.2 Define a ridge of high pressure, and co hand describe weather that are associated with them</p> <p>9.3 Identify Anticyclone, col and ridge of high pressure on a surface synoptic chart.</p>	<p>The Lecturer should be able to inform cadet that Anticyclone is opposite of cyclone and also explain their effects on Navigation.</p>	<p>Synoptic chart Diagrams Sketch of Pressure Systems</p>	<p>Student read the synoptic charts.</p>	<p>Ensures the student understand the synoptic chart.</p>	<p>Assignment Test Examination.</p>
General Objectives 10.0: Apprehend weather services for shipping						
14	<p>10.1 Describe the organization function and objective of world meteorological organization</p> <p>10.2 Describe the source of weather information available for shipping</p> <p>10.3 Describe the service provided for shipping by meteorological office</p> <p>10.4 Describe the appropriate weather bulletin and the contents of each of its section.</p> <p>10.5 Describe the type of information received by facsimile machine and</p>	<p>The lecturer is expected to define the relationship between meteorologist and mariners and the significance of this to Navigation.</p>	<p>Samples weather bulletin facsimile chart meteorological organization</p>			<p>Assignment Test Examination.</p>

	describe the services provided for storm warning.					
General Objectives 11.0: Appreciate weather forecasting						
15	<p>12.1 Apply previous concepts to the interpretation of symbols and isobaric patterns on weather charts and facsimile chart</p> <p>12.2 Apply previous concepts to the interpretation of symbols weather and prognostic chart to ascertain and directions, areas of strong wind, cloud and precipitation area, fog, area, the area of fire weather.</p> <p>12.3 Explain how weather observations on a ship can be used to improve the forecast derived from synoptic and prognostic charts.</p>	The lecturer is expected demonstrate the interpretation of message.	<p>Mainly synoptic chart and prognostic chart.</p> <p>Weather computer program for illustration.</p>	Student interprets a weather message uses various computer program to enable him forecast the weather.	Supervises the student.	Test Assignment Examination.

Programme: HND Nautical Science	Course Code: NSC 315	Contact Hours: 60/Credit unit:4
Course: Seamanship III	Semester: I	Theoretical: 2 hours/week
Year: I	Pre-requisite: NSC	Practical:2 hours /week
GOAL: To enable student have a clear understanding of various aspects of ship handling, aids to navigation, shipboard equipments, shipboard operations with applicable codes and practices.		
GENERAL OBJECTIVES: On completion of this course the student will be able to:		
<p>1.0 Comprehend principles of ship handling.</p> <p>2.0 Know the effect of wind and current on ship motion.</p> <p>3.0 Comprehend the procedure of anchoring and mooring.</p> <p>4.0 Know the use of auxiliary steering gear and rigging of jury rudder.</p> <p>5.0 Know the arrangement for towing and being towed.</p> <p>6.0 Know the IALA maritime buoyage system.</p> <p>7.0 Know carriage requirements for Life Saving Appliance on board ship.</p>		

General Objective 1.0: Comprehend principles of ship handling.

General Objective 1.0: Comprehend principles of ship handling.						
	THEORETICAL CONTENTS			PRACTICAL CONTENTS		
Week	Specific Learning Outcomes	Teacher's Activities	Resources Theoretical/practical	Specific Learning Outcomes	Teacher's Activities	Evaluation
1 - 3	<p>1.1 Explain the concepts of – Turning circles and stopping distances</p> <p>1.2 Define the following terms Advance, Transfer, Tactical diameter, track reach, head reach side reach, under keel clearance</p> <p>1.3 Explain the factors that determine turning circle.</p> <p>1.4 State the effect of turning circle & stopping distances in ballast and loaded conditions.</p> <p>1.5 Understand squat & shallow water effect</p> <p>1.6 Know shallow water effect on ship's speed, stability and trim</p> <p>1.7 State method to control or reduce the effect of squat such as reduction of speed at narrow channels and shallow waters.</p>	<p>Define stopping distance using maneuvering characteristic of a vessel.</p> <p>Illustrate ships manoeuvring characteristics with diagrams</p> <p>State that factors such as loaded conditions, ballast conditions, type of propeller; position of accommodation as they affect vessels maneuvering ability.</p> <p>Sketch ships</p>	<p>Reference textbooks.</p> <p>Audio Visual facility and demonstration CD.</p> <p>Theory and practice of Seamanship – Danton.</p> <p>Admiralty Manual of Seamanship.</p> <p>Training boat or bridge Simulator.</p> <p>Nicholas Seamanship and Nautical</p>	<p>Students to be able to have a clear understanding of principles of ship handling and its practical application.</p>	<p>Use Audio Visual displays to demonstrate the practical application of ship handling.</p>	<p>Assignment</p> <p>Test</p> <p>Examination</p>

	1.8	Explain bank suction effect and cushion with respect to narrow channel.	behaviour in shallow waters. Illustrate interaction between ships and fixed structures in port approaches. Explain that timely reduction of speed will reduce effect of squat on ship.	Knowledge. Mariner handbook seamanship techniques by D.J. House.			
General Objective 2.0: Know the effect of wind and current on ship motion.							
4 – 5	2.1	Explain how the following affect motion of a ship-wind strength, current strength, relative direction of wind.	Illustrate the effect of wind on ship motion and the precautions to take to avoid dangers	O.H.Ps. and Transparencies. Audio Visual Aids.	Students to be able to demonstrate a clear understanding of the effects of wind and current on ship motion.	Use audio visual displays to demonstrate the learning on effects of wind and current on ship motion.	Assignment Test Examination
	2.2	State that draught, trim, and direction of current are factors to consider.	Illustrate ships motion and handling in narrow channels.	Training boat or Bridge Simulator.			
	2.3	Explain the effect of current in narrow channel on ship-Handling.					
General Objective 3.0: Comprehend the procedure of anchoring and mooring.							
6 – 7	3.1	Understand how anchors should be cleared and made ready for use.	Sketch various methods of marking anchor cables	Reference Text Books. Nicholl's	Students to be able to demonstrate a clear understanding of procedure and safety requirement for anchoring and mooring of	Use pictorial sketches to illustrate anchoring and mooring	Assignment Test Examination
	3.2	Describe approaches to anchorage preparation	Produce a check				

	<p>3.3 List the preparation for anchoring in all conditions of weather</p> <p>3.4 Understand anchoring terms.</p> <p>3.5 Describe the marking of the anchor cable.</p> <p>3.6 Enumerate the general precautions to take to ensure that anchor is not fouled during heaving up.</p> <p>3.7 Explain general preparation and securing of anchor for sea passage</p> <p>3.8 Describe, berthing and unberthing operation and all precautions to take to ensure safety of personnel.</p> <p>3.9 Describe the precautions required to ensure that moorings are safe and tended.</p> <p>3.10 Describe how to secure to Mooring buoys with ship wire.</p>	<p>list for preparation of anchoring vessels.</p> <p>List the factors that determine the number of cables to be use for anchoring.</p> <p>Draw different arrangements of Mooring Plan. of a ship.</p> <p>Emphasize the importance of safe Mooring.</p> <p>Sketch Mooring buoys arrangements of vessels.</p> <p>List requirements of pilot ladder-recommendation from Life Saving Appliances (LSA.)</p>	<p>Seamanship.</p> <p>International chamber of Shipping Manual.</p> <p>Concise Guide. International Chamber of Shipping.</p> <p>Theory and practice of Seamanship by Danton.</p> <p>Training boat or Bridge Simulator.</p>	<p>ships.</p>	<p>operations with their associated equipment.</p>	
General Objective 4.0: Know the use of auxiliary steering gear and rigging of jury rudder.						
8 - 9	<p>4.1 Describe typical arrangements of auxiliary steering gear.</p> <p>4.2 Explain how to change from</p>	<p>Sketch an auxiliary steering</p>	<p>Field trips to ship,</p>			<p>Assignment</p> <p>Test</p>

	<p>bridge control to local control in the steering gear compartment.</p> <p>4.3 Describe how to secure rudder in the event of broken rudder stock.</p> <p>4.4 Describe the rigging of jury rudder in emergency steering arrangement when the main rudder is lost.</p> <p>4.5 Describe the rigging of and construction of jury rudder.</p>	<p>arrangement</p> <p>State that auxiliary steering arrangement is used when main steering is defective.</p> <p>State that auxiliary steering arrangement should be in readiness in the event of main steering breaking down.</p>	<p>Audio Visual aids,</p> <p>O.H.Ps and Transparencies.</p>			Examination
General Objective 5.0: Know the arrangement for towing and being towed.						
10 - 12	<p>5.1 State that both vessels should have all prepared and be ready before towing and agree on communication procedure</p> <p>5.2 Describe in detail how to tow including approaches to disabled vessel</p> <p>5.3 State all precautions to take to ensure that towing lines do not chafe</p> <p>5.4 Describe how to let-go the towing line.</p> <p>5.5 Describe the arrangement for emergency towing to tankers greater than 50,000 DWT.</p>	<p>State that several safety preparation should be made before taking a tow including preparing lines and chains.</p> <p>Produce a check list for a towing operation.</p> <p>Sketch a typical towing arrangement.</p> <p>Illustrate the</p>	<p>Reference text books.</p> <p>Merchant Shipping Notices.</p> <p>Audio Visual facility and demonstration CD.</p>	<p>Students to have clear understanding of towing operations and its applicable safety requirements.</p>	<p>Use audio aids to illustrate towing operations, applicable codes and standards safe working practices.</p>	<p>Assignment</p> <p>Test</p> <p>Examination</p>

		dangers of ignoring the controlling factors during towing operation.				
General Objective 6.0: Know the IALA maritime buoyage system.						
13	<p>6.1 Explain the need for a Uniform Buoyage system.</p> <p>6.2 Explain the development of Buoyage system.</p> <p>6.3 Describe International Association of Light-House Authorities (IALA) Buoyage system.</p> <p>6.4 Explain the difference between Buoyage system in region A and region B.</p> <p>6.5 Describe the dangers of using Buoyage to fix position.</p>	<p>Describe the IALA System.</p> <p>Illustrate with models the Buoyage system</p> <p>Illustrate the Buoyage systems for regions A and B.</p> <p>State the direction of Buoyage system -Conventional system.</p> <p>Describe the colour, shape, top mark, lights, of all buoys in Regions A and B.</p> <p>Describe the special mark buoys and its significance.</p>	<p>Models of Buoys.</p> <p>Reference text books.</p> <p>Audio Visual aids.</p> <p>O.H.Ps. and Transparencies.</p>	<p>Students to have clear understanding of IALA A & B buoyage systems.</p>	<p>Use audio visual or pictorial cards to illustrate the practical application of IALA buoyage system.</p>	<p>Assignment</p> <p>Test</p> <p>Examination</p>

General Objective 7.0: Know carriage requirements for Life Saving Appliance on board ship.

14-15	<p>7.1 State that number of Lifebuoys to be carried on board will depend upon size and length of ship and availability for immediate use.</p> <p>7.2 State the number of Life Jackets is dependent upon the number of persons on board.</p> <p>7.3 State that immersion suits should be provided for every person assigned to crew the rescue boat.</p> <p>7.4 State the carriage requirements for survival crafts on board ships .</p> <p>7.5 State the carriage requirements for pyrotechnics for different ships in accordance with SOLAS'74, as amended.</p> <p>7.6 Explain the storage and protection of pyrotechnics on board.</p> <p>7.7 State the precautions to take when using the equipment.</p> <p>7.8 State the need for pyrotechnics to be well disposed-off when it expires.</p>	<p>State that cargo vessel should carry minimum number of Pyrotechnics according to IMO requirements.</p> <p>Define an efficient life buoy.</p> <p>Illustrate the different features of a life buoy</p> <p>State the requirements for Immersion Suits to provide warmth to survivors.</p>	<p>SOLAS,74.</p> <p>Samples of Pyrotechnics.</p> <p>Life Raft.</p> <p>Life Boat.</p> <p>Life Buoys.</p> <p>Life Jackets.</p> <p>Immersion Suits.</p>	<p>Students to have clear understanding of legislative requirements for the carriage of Life Saving Appliances aboard ships.</p>	<p>Provide physical presentation of basic Life Saving appliances to enhance student understanding.</p> <p>Pictorial display is acceptable for advance LSA.</p>	<p>Assignment</p> <p>Test</p> <p>Examination</p>
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HND I SECOND SEMESTER

	Programme: HND Nautical Science	Course Code: NSC 323	Contact Hours 60 Credit unit: 4
	Course: Compass Work	Semester: 2	Theoretical: 2hours/week
	Year: 1	Pre-requisite:	Practical: 2hours /week

GOAL: To enable students acquire good knowledge of various compasses and use the skill for safe Navigation

GENERAL OBJECTIVES: 1.0

- 1.0 Comprehend the Earth as a Magnet
- 2.0 Know ships magnetism
- 3.0 Know induced magnetism
- 4.0 Know sub permanent magnetism and directive force
- 5.0 Know the coefficients
- 6.0 Know the heeling error
- 7.0 Know the marine compass and equipment
- 8.0 Know compass and equipment
- 9.0. Know the principle of gyro compass
- 10.0 Know the description of gyro compass
- 11.0 Know the description of gyro compass
- 12.0 Know the basic principle and operation of the Fluxgate compass

General Objective: 1.0: Comprehend the Earth as a Magnet

General Objective: 1.0: Comprehend the Earth as a Magnet						
	THEORETICAL CONTENTS			PRACTICAL CONTENTS NOT REQUIRED		
Week	Specific Learning Outcomes	Teacher's Activities	Resources Theoretical/practical	Specific Learning Outcomes	Teacher's Activities	Evaluation
1	1.1 Explain the Nature of Earth's Magnetism. 1.2 Define Variation, Deviation and Earth Total Force. 1.3 Explain the use of Variation Chart. 1.4 Explain the other types of charts available for earth magnetism.	Explain the Earth Magnet field. Define the Earth total force. Explain the Magnetic Elements, Variation, deviation, and total field strength. Provide variation charts. Mention the existence of other types of magnetic charts.	O.H.Ps. Charts & Deviation Cards. Magnetic Bars/Rods. Wire String. Ferrous Crust. Reference Textbooks. CDs & DVD's	Use the variation chart and Deviation cards to find the error of the magnetic compass uses Magnetic bars and ferrous crust to demonstrate the effect of magnetic fields	Supervise & Ensures the student can do the exercise practically	Assignment, Test and Examinations
General Objective: 2.0 Know ships magnetism						
2	2.1 Explain what is meant by hard iron.	Explain what	Reference	Identifies hard and soft irons	Ensure student can	Assignment, Test

	<p>2.2 Explain what is meant by soft iron.</p> <p>2.3 Explain Intermediate iron.</p> <p>2.4 Explain what is meant by Permanent Magnetism.</p>	<p>deviation means.</p> <p>Explain directive forces.</p> <p>Explain the nature of hard and soft irons.</p> <p>Define Force P, Q and Resultant R.</p> <p>Show the effect of change in Ship's head and change in Magnetism Latitude.</p>	<p>Textbooks.</p> <p>Magnetic Board/ Rods</p> <p>Magnetic material</p>		<p>identify soft and hard irons</p>	<p>and Examinations</p>
General Objective: 3.0 Know induced magnetism						
3	<p>3.1 Describe the nine rods: a,b,c,d,e,f,g,h,k.</p> <p>3.2 Group them into to vertical and horizontal rods.</p> <p>3.3 Describe Vertical Rods.</p> <p>3.4 Describe Horizontal Rods.</p> <p>3.5 Define a well placed compass.</p> <p>3.6 Define a badly placed magnet.</p> <p>3.7 Show induced magnetism in rods b, d, and f.</p>	<p>Show the physical stimuli.</p> <p>Show their imaginary effect.</p> <p>Show the effect of change of ship's head on them</p> <p>Show the effect of change of magnetic</p>	<p>Reference Textbooks.</p>			<p>Assignment, Test and Examinations</p>

		<p>latitude.</p> <p>Show how they are corrected.</p> <p>Show the effects of a, d, and f, at position of a badly placed compass with change in ship's head and magnetic latitude.</p> <p>Show their correction.</p>				
General Objective 4.0 Know sub permanent magnetism and directive force						
4	<p>4.1 Define Retentive Error.</p> <p>4.2 Define Gaussing Error.</p> <p>4.1 Define the directive forces at an uncorrected well placed compass.</p> <p>4.2 Establish that these effects are due to P, Q, and rods a, e and c.</p>	<p>State how the errors can be detected.</p> <p>State how the errors can be eliminated.</p> <p>Establish the directive forces on each cardinal point i.e. North South, East, and West to get total force.</p>	Reference Textbooks.			Assignment, Test and Examinations

General Objective 5.0 Know the coefficients						
5	5.1 Explain how to find the values of each coefficient A, B, C, D, E. 5.2 Explain how to calculate total deviation. 5.3 Explain the methods of separating coefficient B.	From the value of a deviation table or curve calculate deviation on a particular heading. State the equator method. Explain the building direction method.	Reference Textbooks.			Assignment, Test and Examinations
General Objective 6.0 Know the heeling error						
6	6.1 Explain Principal causes of Heeling Error. 6.2 Explain the effect of Heeling error with change in ship head and magnetic location. 6.3 Explain the effect of Heeling Error with change in magnetic location. 6.4 Show change in heeling error with angle of heel. 6.5 Explain the correction method.	State the role of force R. State the role of Rod k. State the role of Rod e. Show the Binnacle Arrangement of the Heeling error bucket.	A Compass with Binnacle complements.			Assignment, Test and Examinations
General Objective 7.0 Know the marine compass and equipment						
7	7.1 Describe the dry card and bowl. 7.2 Describe the Liquid card and	State the deficiency	Dry Card and	Identifies dry card bowl and liquid card bowl	Supervises the students	Assignment, Test

	<p>bowl.</p> <p>7.3 Describe the magnetic compass and binnacle.</p>	<p>of the dry card.</p> <p>State how liquid and overcame this deficiency.</p> <p>Provide a sketch of the compass with binnacle.</p> <p>Explain the correctors.</p>	<p>Bowl.</p> <p>Liquid Card and Bowl.</p> <p>Compass and Binnacle.</p>	compasses		and Examinations
General Objective 8.0 Know compass and equipment						
8	<p>8.1 Explain sitting of the compass.</p> <p>8.2 Describe the projector compass.</p> <p>8.3 Describe the Azimuth Mirror.</p> <p>8.4 Describe the Pelorus.</p>	<p>State the rule that governs the sitting of compass.</p> <p>Explain the principles of the Prismatic application.</p>	<p>Reference Textbooks.</p> <p>Azimuth mirror</p> <p>Pelorus</p>			Assignment, Test and Examinations
General Objective 9.0 Know the principle of gyro compass						
9	<p>9.1 Explain Swinging of a ship by a compass adjuster.</p> <p>9.2 Describe the methods of swinging the ship.</p> <p>9.3 Explain Order of placing the correctors.</p>	<p>State when it is necessary to swing the ship.</p> <p>State the precautions to be taken when swing</p>	Reference Textbooks.	Uses the permanent magnets to show the order of placing the corrector	Supervises the student	Assignment, Test and Examinations

		<p>the ship.</p> <p>Explain the reciprocal method .</p> <p>Explain the bearing of a distant object method.</p> <p>Explain the Azimuth of a heavenly body method.</p> <p>Explain the Gyro Compass method.</p> <p>Explain the four methods above starting with the soft iron correctors followed by heeling error bucket, then close the procedure with horizontal magnets.</p>				
General Objective: 10.0 Know the description of gyro compass						
	<p>10.1 State the Principle of Gyroscope.</p> <p>10.2 State property of Gyroscope.</p> <p>10.3 Explain the application of</p>	<p>Illustrate with diagrams 10.1 –</p>	<p>Reference Textbooks.</p>	<p>Uses the gyroscope to illustrate the principle of gyro uses the</p>		<p>Assignment, Test and</p>

	<p>Gyroscope to Gyro Compass control.</p> <p>10.4 Explain the following types of Control:</p> <ul style="list-style-type: none"> - Top heavy; - Bottom heavy. <p>10.5 Explain how a free gyroscope can be made north –seeking by the use of gravity control.</p> <p>10.6 Describe the use of damping in azimuth and damping in tilt to cause settling of the axis and thus produce a gyrocompass.</p>	10.6.	Gyroscope	gyroscope to illustrate the properties of the gyro		Examinations
General Objective: 11.0 Know the description of gyro compass						
	<p>11.1 Describe the Amal Brown or any other type of Gyro compass.</p> <p>11.2 Explain the errors of Gyro compass.</p> <p>11.3 Describe how it can be measured.</p> <p>11.4 Explain how it can be accommodated.</p>	Illustrate with diagram 11.1 – 11.4.	Reference Textbooks.	Identifies various types of gyro compasses	Supervises the students	Assignment, Test and Examinations
General Objective:12.0 Know the basic principle and operation of the Fluxgate compass						
	<p>12.1 Define single axis and dual axis</p> <p>12.2 Explain basic operation</p>	<p>Explain single axis and double axis with CD</p> <p>Show basic operation of a fluxgate compass</p>	<p>CDs and OHP</p> <p>Fluxgate compass</p>	The student steers with a fluxgate compass	Ensures the students can steer with a fluxgate compass	Assignment, Test and Examinations.

	12.2 Explain TMC 12.4 Describe solid state type	and show solid state type compass fluxgate compass with magnetic compass. Show fluxgate compass is a combination of electricity and magnets.				
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Programme: HND Nautical Science	Course Code: NSC 325	Contact Hours 60	Credit unit: 4
Course: Ship Stability and Structure I	Semester: 2	Theoretical: 4hours/week	
Year: 1	Pre-requisite: SEAMANSHIP III	Practical: hours /week	
GOAL: To enable the student have clear understanding of Principles of ship stability and structural layoutof ships.			
GENERAL OBJECTIVES:- On completion of this course the students will be able to:			
<ul style="list-style-type: none"> 1.0 Know the stresses to which ships are subjected to. 2.0 Know the sections and arrangement of Bow and Stern 3.0 Know load lines and Draught marks 4.0 Comprehend the principles of ship stability. 5.0 Comprehend moment of statistical stability 6.0 Comprehend Hydrostatic curves 7.0 Comprehend the movement of center of Gravity of a ship 8.0 Comprehend the effect of slack tanks on stability of a ship 9.0 Comprehend Trim and its applications 10.0 Comprehend partial loss of intact buoyancy 11.0 Know how to calculate change in drafts, trim and stability using hydrostatic data supplied on board ship 			

General Objective: 1.0: Know the stresses to which ships are subjected to.

General Objective: 1.0: Know the stresses to which ships are subjected to.						
	THEORETICAL CONTENTS			PRACTICAL CONTENTS NOT REQUIRED		
Week	Specific Learning Outcomes	Teacher's Activities	Resources Theoretical/ practical	Specific Learning Outcomes	Teacher's Activities	Evaluation
1-2	1.1 Describe in quantitative terms Shear Forces & Bending Moments. 1.2 Explain the effects of Hogging and Sagging Stresses. 1.3 Explain their effects on loading conditions. 1.4 Explain stress caused by sea state. 1.5 Explain the effect of Hogging and Sagging Stresses as tensile and compressive forces in deck and bottom structure. 1.6 Describe causes of racking stresses.	Sketch diagram of Shear Forces & Bending Moments in still water and in seaway. Solve calculations of pressure at any depth below the liquid surface when given the density. Demonstrate the effect of pressure on plating with various sketches.	Reference textbooks. Derrett O.H.Ps and Transparencies. Audio Visual CD's			Assignment, Test and Examinations
General Objective: 2.0 Know the sections and arrangement of Bow and Stern						
3	2.1 Explain the additional structural strength required to withstand	Provide diagrams	Reference			Assignment, Test and

	<p>pounding and panting.</p> <p>2.2 Describe the function of a stern frame.</p> <p>2.3 Sketch a stern frame for a single-screw ship.</p> <p>2.4 Explain panting and pounding stresses.</p> <p>2.5 State what part of the ship is mostly affected.</p>	<p>of various panting arrangements on board.</p> <p>Sketch the fore part of a vessel showing measures to resist pounding stresses.</p>	<p>Textbooks.</p> <p>Ship models.</p> <p>O.H.Ps and</p> <p>Transparencies.</p> <p>Audio Visual CD's</p>			Examinations
General Objective: 3.0 Know load lines and Draught marks						
4	<p>3.1 Explain the deck line positions.</p> <p>3.2 Define freeboard.</p> <p>3.3 Explain assigned freeboard.</p> <p>3.4 Draw to scale, the load line for a given summer draft, displacement and tones per centimeter inversion in salt water</p> <p>3.5 Explain how chart of zones is used to find the applicable load line.</p> <p>3.6 Explain the changes in draught from water of one density to another.</p> <p>3.7 Define freshwater allowance</p> <p>3.8 Explain the use of hydrometer.</p> <p>3.9 Explain the effect of density on Draft and Displacement.</p>	<p>Illustrate with sketches the load line zones.</p> <p>Illustrate the load line and draft marking.</p> <p>Illustrate how use a hydrometer.</p>	<p>Reference text books</p> <p>Ship models</p>			Assignment, Test and Examinations

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General Objective 4.0 Comprehend the principles of ship stability.						
5-6	<p>4.3 Explain centres of buoyancy and gravity.</p> <p>4.4 Explain the terms –KB, GM and BM.</p> <p>4.3 Describe the metacentre and relate it to ship stability condition.</p> <p>4.4 Explain stiff and tender conditions.</p> <p>4.5 Explain Negative GM, Angle of Loll and its danger.</p>	<p>Explain the position of metacentre (M).</p> <p>Provide meta-centric diagrams.</p> <p>Explain statistical stability curve.</p> <p>Explain stiff and tender conditions</p> <p>State that a vessel may capsize due to insufficient or negative GM.</p>	<p>Reference text books</p> <p>Ship stability by Derrett</p> <p>O.H.Ps. and Transparencies</p>			Assignment, Test and Examinations
General Objective 5.0 Comprehend moment of statistical stability						
7-8	<p>5.1 Describe moment of statically stability at a small angle of heel.</p> <p>5.2 Explain the use moment of statically stability to obtain GM values.</p> <p>5.3 Show how to obtain from a given curve of statically stability the maximum: (a) Righting lever, (b) the range of stability,</p>	<p>State that at a small angle of heel, M can be considered to act as fixed point.</p> <p>Draw curves of statical stability.</p> <p>Show from the</p>	DITTO			Assignment, Test and Examinations

	<p>(c) the angle of vanishing stability, (d) the approximate initial meta-centric height.</p>	<p>curve how to obtain GM, max GZ and range of positive stability.</p> <p>Explain the curves of statical stability at small angle of heel.</p>				
General Objective 6.0 Comprehend Hydrostatic curves						
9	<p>6.1 Explain KN Curves (Cross curves).</p> <p>6.2 Explain that hydrostatic curves show graph of drafts against displacement, TPC, MCTC, LCF, and LCB.</p>	<p>Draw cross curves of statical stability & obtain GZ for several displacements.</p> <p>Illustrate diagrams of KN curves.</p> <p>State that KN curves may be used in place of GZ curves by applying correction.</p> <p>Demonstrate the effect of movement of G on GZ curves.</p> <p>Provide Hydrostatic curves and obtain</p>	DITTO			Assignment, Test and Examinations

		values for TPC, MCTC, LCF, and LCB.				
General Objective 7. Comprehend the movement of center of Gravity of a ship						
10-11	<p>7.1 Describe the effect of loading or adding weights on Centre of Gravity.</p> <p>7.2 Explain the effect of removing weights.</p> <p>7.3 Explain the effect of shifting weights.</p> <p>7.4 Explain the effect of suspending weights on centre of gravity.</p> <p>7.5 Calculate the final KG from effect of consumption of stores during passage, absorption of water by a deck cargo and ice accretion on decks.</p>	<p>Illustrate the movement of G when weights are removed or added.</p> <p>Sketch several diagrams of vessel's list when weights are suspended.</p> <p>Take moments about keel when vessel is loading in port.</p> <p>State that vessel must depart with adequate GM to arrive with the minimum GM.</p>	DITTO			Assignment, Test and Examinations

General Objective 8.0 Comprehend the effect of slack tanks on stability of a ship

12	<p>8.1 State that a tank when half full of liquid will cause a virtual rise in ships center of gravity.</p> <p>8.2 State that the effect in 8.1 is dependent upon the breadth of the tank and not the mass of the liquid.</p> <p>8.3 State that there is a virtual rise of centre of gravity of the ship caused by free surface effect.</p>	<p>Show sketches of vessel with Slack tanks.</p> <p>Explain their effect on stability.</p> <p>Show that subdivision of tanks will reduce free surface effect on a vessel.</p> <p>Illustrate how several slack tanks will result in angle of Loll which may capsize a vessel if not checked.</p>	DITTO.			
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General Objective: 9.0 Comprehend Trim and its applications.

13	<p>9.1 Define Trim.</p> <p>9.2 Explain moment to change Trim. 1cm is $MCTC = \frac{W \times GML}{100L}$</p>	<p>Sketch a profile of vessel showing longitudinal GML,BML.</p>	DITTO			
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	<p>9.3 Define center of Flootation.</p> <p>9.4 Find the change of draft due to change of Trim.</p> <p>9.5 Explain the effect of shifting weights already on Board or Trim</p> <p>9.6 Explain the effect of loading and/or discharging weights.</p> <p>9.7 Explain the use of trim to:</p> <ul style="list-style-type: none"> a) find the position of centre of Flotation; b) Load trim to weight to keep the aft draft constant; c) Load trim to weight to produce a required draft. 	<p>Proof the MCTC formula.</p> <p>Show that centre of Flootation is intersection of Old & New Waterlines when a vessel trimmed.</p> <p>Sketch diagrams showing several Positions of Loading, Forward and Aft of centre of Flootation</p> <p>Show how to use Trim Table on Board ship.</p> <p>Show that this Calculation is necessary in Shallow Waters for safe passage.</p>				
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General Objective: 10.0 Comprehend partial loss of intact buoyancy						
14	<p>10.1 State that flooding can be controlled by closing of watertight doors & other openings.</p> <p>10.2 Explain Cross-Flooding arrangements.</p> <p>10.3 Explain the actions to take to stop or remove the inflow of water.</p>	<p>Define Margin Line and Floodable Compartments,</p> <p>Illustrate Load line rules with respect to the provision for containment of flooding</p> <p>Explain the term permeability.</p>	DITTO			
General Objective: 11.0. Know how to calculate change in drafts, trim and stability using hydrostatic data supplied on board ship						
15	<p>11.1 Using Hydrostatic particulars and mean draft, determine the weights loaded or discharged.</p> <p>11.2 Use Trimming Table to determine final drafts for a ship.</p>	<p>Use Trimming Table to determine final drafts for a ship</p>	DITTO			

Programme: HND Nautical Science	Course Code: NSC 326	Contact Hours 60 Credit unit: 4
Course: SEAMANSHIP IV	Semester: 2	Theoretical: 2hours/week
Year: 2	Pre-requisite: SEAMANSHIP III NSC 315	Practical: 2hours /week
GOAL: At the end of the course the student will be able to use the skill acquired on a ship		
GENERAL OBJECTIVES: On completion of this course the students will be able to:		
<ul style="list-style-type: none"> 1.0 Know Anchoring. 2.0 Understand the effect of propellers on steering of a ship. 3.0 Understand the duties of the officer of the watch. 4.0 Know the use and maintenance of LSA & FFA. 5.0 Understand distress and life saving at sea. 6.0 Know the various tests and examinations required to be carried out on lifting gears. 7.0 Know the various derrick rigs. 		

General Objective: 1.0: Know Anchoring

General Objective: 1.0: Know Anchoring						
THEORETICAL CONTENTS			PRACTICAL CONTENTS:-			
Week	Specific Learning Outcomes	Teacher's Activities	Resources Theoretical/ practical	Specific Learning Outcomes	Teacher's Activities	Evaluation
	<p>1.1 Explain how to choose an anchorage.</p> <p>1.2 List the factors which influence the choice.</p> <p>1.3 Describe the preparation of anchors, including Walking the anchor back for anchoring in deep water.</p> <p>1.4 Explain how to judge that the ship is stopped ready for letting go.</p> <p>1.5 Explain that positions should be obtained on letting go and again when brought up.</p> <p>1.6 List the factors to consider in determining the length of cable to be used as :</p> <ul style="list-style-type: none"> - the nature of the bottom - the strength of the wind and current - the exposure of the anchorage to bad weather - the amount of room to swing 	<p>Explain the factors involved in choosing anchorage and the preparation for anchoring.</p> <p>List the factors mentioned.</p> <p>Describe the action to take when the anchor start to drag.</p> <p>Explain the foul hawse.</p>	<p>Reference Textbook</p> <p>CD's</p> <p>Projectors (OHPs)</p>	NO PRACTICALS		Assignment, Test and Examinations

	<p>- the expected length of stay at anchor</p> <p>1.7 Define dragging.</p> <p>1.8 Explain how to detect dragging.</p> <p>1.9 Describe the action to take when the anchor start to drag.</p> <p>1.10 Explain how excessive yawing may break the anchor out of its holding.</p> <p>1.11 Describe measures to control a yaw.</p> <p>1.12 Explain what is meant by a “foul hawse” and how it occurs.</p> <p>1.13 Describe how to clear a foul hawse.</p>				
General Objective:2.0 Understand the effect of propellers on the steering of a ship					
	<p>2.1 Describe the effects of right-and – left-handed propellers on maneuvering.</p> <p>2.2 Describe the use twin screws.</p> <p>2.3 Explain the advantages and disadvantages of controlled pitch propeller.</p> <p>2.4 Describe the use of lateral thrusters.</p> <p>2.5 State that lateral thrusters cease to be effective above certain speed which has to be determined by trial.</p> <p>2.6 Describe with reference to ship type and trim, the likely effect of wind</p>	<p>Describe the effect of right- handed propellers on steering.</p> <p>Describe the use of lateral thrusters and when to use them.</p> <p>Describe the effect of wind on maneuvering.</p>	<p>Reference Textbook</p> <p>O.H.Ps. &Transparencie s.</p> <p>CD’s</p>	NO PRACTICALS	<p>Assignme nt, Test and Examinati ons</p>

	<p>on a ship when moving ahead or astern and when stopped.</p> <p>2.7 Explain how an anchor or anchors may be used to assist in maneuvering.</p> <p>2.8 Describe the use of anchors to stop in an emergency.</p>	Describe the use of anchors in ship maneuvering.				
General Objective: 3.0 Understand the duties of the officer of the watch						
	<p>3.1 Describe time keeping at sea.</p> <p>3.2 Explain the duties of the officer of the watch:</p> <ul style="list-style-type: none"> - At Sea - In Port, Berthed - In Port, At Anchor - Prior to Leaving Ports (Berthed) - Prior to arrival in Port. 	<p>Show how the day is divided at sea.</p> <p>Explain the duties of the O.O.W.</p>	<p>Reference Textbooks.</p> <p>Fire extinguishers, Pyrotechnics life boat inflatable life raft etc</p>	NO PRACTICALS		Assignment, Test and Examinations

General Objective 4.0 Know the use and maintenance of LSA & FFA						
	<p>4.1 List Life Saving Appliances carried on board ship.</p> <p>4.2 Describe the use and maintenance of each appliances mentioned in 4.1.</p> <p>4.3 Describe the provisions made on board for fighting fire.</p> <p>4.4 Describe the maintenance of fire-fighting appliances mentioned in 4.3.</p>	<p>List LSA'S.</p> <p>Describe the uses and maintenance of LSA'S.</p> <p>Describe fire appliances used on board.</p>	<p>Reference Textbook</p>	<p>Identifies various types of LSA and FFA carried on board ships.</p> <p>Uses the various types of FFA to show how to fight fire on board ships</p> <p>Demonstrates how to use LSA for safety on board ships</p>	<p>Ensures students can identify and use each equipment well</p>	<p>Assignments, Test and Examinations</p>
General Objective 5.0 Understand distress and Life-Saving at Sea						
	<p>5.1 State the information contained in Admiralty Notices to Mariners and Merchant Shipping notices.</p> <p>5.2 State that most maritime countries provide life-saving service for persons in distress in their coastal area.</p> <p>5.3 Explain how a radio watch may be kept.</p> <p>5.4 State actions to take on receiving a distress call.</p> <p>5.5 State the duties of the Master towards a ship or persons in distress.</p> <p>5.6 Describe the signals to be used by a ship on distress.</p> <p>5.7 State the use of distress signals.</p>	<p>Show the uses of the 'M' Notices and Notices to Mariner.</p> <p>Explain how to maintain a radio watch.</p> <p>Describe the masters duties in the event of collision.</p>	<p>Reference Textbook</p> <p>M' Notices and Notices to Mariners</p>	<p>NO PRACTICALS</p>		<p>Assignments, Test and Examinations</p>

General Objective 6.0 Know the various tests and examinations required to be carried on lifting gears

	<p>6.1 Define safe working load; factors of safety.</p> <p>6.2 State that gear should be annealed to prevent brittleness and fracture.</p> <p>6.3 Define a purchase.</p> <p>6.4 Contrast between a purchases used to advantage.</p> <p>6.5 Define mechanical advantage; velocity ratio (V.R).</p> <p>6.6 Sketch different types of purchase such as single whip; double whip; gun tackle; luff tackle; double or two fold; Gyn tackle and three fold.</p> <p>6.7 State the V.R of each of the purchases illustrated above.</p> <p>6.8 Describe the annealing of cargo gears.</p> <p>6.9 Describe the tests and examinations required on wire ropes, blocks and chains.</p> <p>6.10 Describe the tests and examinations required on derricks and permanent attachment.</p> <p>6.11 Outline the content of the chain register and state its use.</p> <p>6.12 Express the formula for finding the Breaking Stress (B.S) of ropes, chains and wires.</p>	<p>Explain the importance of annealing cargo gears.</p> <p>Use sketches to show different types of purchases.</p> <p>Describe the process of annealing cargo gears.</p> <p>List the contents of the chain register.</p>	<p>O.H.Ps.</p> <p>Blocks and Tackles</p> <p>Purchases</p>	<p>Identifies various types of Blocks and Tackles and purchases Rigs various types of purchase,</p> <p>i. single whip</p> <p>ii. double whip</p> <p>iii. gun tackle</p> <p>iv. double or two fold</p> <p>v. gyn tackle</p> <p>vi. three fold</p>	<p>Provide Blocks, tackles and chain register for students to work on with</p>	<p>Assignment, Test and Examinations</p>
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General Objective 7.0 Know the various derrick rigs

	<p>7.1 Describe a Union purchase derrick.</p> <p>7.2 Describe the swinging derrick.</p> <p>7.3 Describe heavy lift derricks as</p> <ul style="list-style-type: none">- Hallen derrick- Velle derrick- Stuelcken derrick <p>7.4 State the precautions to be taken when handling Heavy lifts.</p>	Describe different types of derrick rigs.	Reference Textbooks. CD's OHPs	NO PRACTICALS	Use CDs to show various types of Derrick and rigs.	Assignment, Test and Examinations
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Programme: HND Nautical Science	Course Code: NSC 327	Contact Hours/Credit unit: 4
Course: Cargo Handling and Stowage I	Semester: 2	Theoretical: 3 hours/week
Year: 1	Pre-requisite: Cargo Handling and Stowage I	Practical: 1 hours /week
GOAL: Students understand the basic concept of dry cargo operations and applicable codes and regulations.		
GENERAL OBJECTIVES: On completion of this course the student will be able to:		
1.0 Know timber deck cargoes. 2.0 Comprehend loading stowage and discharge of heavy weight. 3.0 Know about tallying, receiving and delivering dry cargo. 4.0 Understand statutory requirements for cargo gear. 5.0 Know how to maintain hatch covers. 6.0 Know about dangerous goods. 7.0 Know how to handle solid bulk cargoes. 8.0 Comprehend the IMO Grain rules.		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN NAUTICAL SCIENCE						
COURSE: Cargo Handling and Stowage I		Course Code: NSC 327		Contact Hours: 3-0-1		
THEORETICAL CONTENTS				PRACTICAL CONTENTS –		
WEEK	General Objective 1.0: Know timber deck cargoes.					
	Specific Learning Outcomes	Teacher’s Activities	Resources Theoretical/Practical	Specific Learning Outcomes	Teacher’s Activities	Evaluation
1 - 2	<p>1.1 Outline the contents of Code of safe working practice for ships carrying timber deck cargoes with respect to: stowage of sawn timber, logs, wood pulp. Fittings of uprights, lashing/height of cargo/fencing etc.</p> <p>1.2 Describe the requirements for provision of walkways for access to top of cargo.</p> <p>1.3 List the stability information that should be available to master.</p> <p>1.4 Explain what actions to take in the event of the ship developing an angle of loll.</p>	<p>Make available Code of safe working practice. Make reference to other relevant publications. Draw attention to inadequate stability when cargo of deck timber is carried.</p>	<p>Reference Textbooks. IMO Publications.</p>	No Practical		<p>Assignment Test</p> <p>Examination</p>

	General Objectives 2.0: Comprehend loading stowage & discharge of heavy weights.					
3 - 4	<p>2.1 Explain how the load should be spread over an area of deck or tank top by the use of dunnage to avoid heavy point loading between beams and floors.</p> <p>2.2 State that special supports or cradles will need to be built for awkwardly shaped lifts.</p> <p>2.3 Explain the use of shoring in a “tween-deck” to spread the load over a larger part of the ship’s structure.</p> <p>2.4 State that the ship’s stability should be checked to ensure that the resulting list will be acceptable.</p> <p>2.5 State that the weight of the lifting gear should be included in the weight to lift, both for stability, calculations & during consideration of safe working loads.</p>	<p>Describe the use of spreader and shores to distribute load evenly on tank top.</p> <p>Explain the need for provision of cradles awkwardly shaped cargo.</p> <p>Describe the precaution to take during rigging and operation of heavy lift derrick.</p> <p>Explain that the winches gearing most be doubled up.</p>	<p>Reference Textbooks</p>	<p>Students should have a clear understanding of loading, stowage and off loading of heavy weight.</p>	<p>Use audio visual demonstration to illustrate the handling and management of heavy weight and awkward shaped cargo.</p>	<p>Assignment Test Examination</p>
	General Objectives 3.0 : Know about tallying, receiving and delivering dry cargo					
5 - 6	<p>3.1 Describe ships responsibilities for goods carried.</p> <p>3.2 Describe the principle of stowage.</p> <p>3.3 Explain preparation to receive cargo</p>	<p>State at what point the goods become ships responsibility.</p>	<p>Reference Textbooks Visit to ship</p>	<p>No Practical</p>		<p>Assignment Test</p>

	<p>in cargo compartments.</p> <p>3.4 State precautions to take to ensure cargo is not contaminated.</p> <p>3.5 Describe recommended methods for the safe stowage and securing of various roll on roll- off vehicles.</p> <p>3.6 Describe precautions to avoid cargo shift.</p> <p>3.7 State action to take once cargo has shifted.</p>	<p>Describe holds, bilges are swept clean and debris removed.</p> <p>State dangers of not cleaning holds properly of previous cargo loaded.</p> <p>Illustrate how cargos of vehicles are handled.</p> <p>List precaution to take when vehicles are handled.</p>				Examination
General Objectives 4.0: Understand statutory requirements for cargo gear.						
7 - 8	<p>4.1 Outline the requirements of ILO convention 152 and the occupational safety and health (Dock work) convention 1979.</p> <p>4.2 State that every ship must have a rigging plan and relevant information necessary for the safe rigging of derricks and accessory gear.</p> <p>4.3 Describe maintenance of cargo gear, wire ropes and lifting appliances.</p> <p>4.4 State precautions required when working aloft.</p>	<p>State the content of Form 99.</p> <p>Sketch various types of derricks in use i.e. Stulken mast, Hellen outrigger etc.</p> <p>State Code of safe working practices for seafarers.</p> <p>State contents of codes of safe working practices with respect to</p>	<p>Reference Text books</p> <p>IMO books</p> <p>Reference SOLAS book on cargo Operation</p> <p>Reference IMO publications on occupational hazards in cargo handling.</p>	No Practical		<p>Assignment</p> <p>Test</p> <p>Examination</p>

		cargo gear.				
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General Objectives 5.0: Know how to maintain hatch covers						
9	<p>5.1 Describe the maintenance of McGregor Type Hatch covers.</p> <p>5.2 State details of wheels, gears moving parts.</p> <p>5.3 State that hydraulic system should be checked for leakage in between deck to avoid damage to cargo.</p>	<p>Sketch McGregor type hatch cover , hydraulic hatch covers.</p> <p>Show details of hatch cover section, gears/cross wedges/ wheels chains etc.</p>	<p>Ship Construction ByEyes. Notes and examples on ship construction By Kemp & Young. O.H.Ps. & Transparencies</p>	No Practical		<p>Assignment Test</p> <p>Examination</p>
General Objectives 6.0: Know about dangerous goods						
10	<p>6.1 Outline the requirements of SOLAS Ch. YII on the carriage of dangerous goods.</p> <p>6.2 State the contents of the IMDG code with regard to general information on application, classification marking & labeling, etc.</p>	<p>Explain dangers of not complying with recommendations. Itemize contents using blue and IMDG code.</p>	<p>Blue book IMDG Code</p>	No Practical		<p>Assignment Test</p> <p>Examination</p>

General Objectives 7.0: Know how to handle solid bulk cargoes					
11 - 13	<p>7.1 Outline the contents of the IMO code of safe practice for solid bulk cargoes. (BC Code).</p> <p>7.2 Explain the hazards, composition, movement, of concentrates.</p> <p>7.3 State precautions required when angles of repose is greater than 35°, when angle of repose is equal or less than 35°.</p> <p>7.4 State precautions to prevent cargo from shifting.</p> <p>7.5 State those documents on transportable moisture limits should be made available on board.</p> <p>7.6 State the type of cargo, which may liquidity during carriage.</p> <p>7.7 State materials hazardous only in bulk.</p>	<p>Refer to the code and show that certain bulk cargoes have chemical which are liable to spontaneous combustion. Define bulk concentrates cargo as distinct from general bulk cargo. Illustrate angle of repose. Sketch shifting board arrangement in ships. Explain the dangers of carrying bulk cargoes without authorized certificates and documentations. Show cargo that may liquefy.</p>	<p>IMO book: Guidelines on solid bulk cargoes. SOLAS convection. Cargo Stowage- by Thomas. Code of safe working practice . IMO(BC Code).</p>	No Practical	<p>Assignment Test</p> <p>Examination</p>

General Objectives 8.0: Understand the IMO Grain Rules						
14 - 15	<p>8.1 Outline the contents of IMO grain rules.</p> <p>8.2 Define terms such as grain, filed compartment, angle of flooding.</p> <p>8.3 State the importance of adequate trimming.</p> <p>8.4 State the use of document of authorization.</p> <p>8.5 State the requirements of issue of certificate of loading of grain cargoes in compliance with regulations.</p> <p>8.6 Prepare a stowage plan for a cargo of bulk grain and perform the calculations to ensure that stability criteria is complied with in accordance with SOLAS 1974.</p>	<p>Define grain cargo.</p> <p>Plan stowage of grain cargo.</p> <p>State advantages of compact stow and adequate trimming.</p> <p>State that certain cargoes require documentation/ authorization.</p> <p>List contents of SOLAS 1974 book on grain cargo.</p> <p>List precautions required before loading grain cargo.</p> <p>Emphasize the dangers of shifting.</p> <p>State that adequate stability will take care of loss of stability due to shifting.</p>	IMO Grain rules.	No Practical		<p>Assignment</p> <p>Test</p> <p>Examination</p>

Programme: HND Nautical Science	Course Code: NSC 329	Contact Hours/Credit unit: 3
Course: Ship Construction	Semester: 2	Theoretical: 3 hours/week
Year: 1	Pre-requisite:	Tutorial: 0 hours /week
GOAL: To enable students to have basic knowledge of ship construction, welding, water tight management and dry docking		
GENERAL OBJECTIVES: On completion of this course the student will be able to:		
1.0 Know the principal structural members of a ship. 2.0 Know basic ship building methods. 3.0 Know how the ships parts are welded together. 4.0 Know about bulkheads. 5.0 Understand watertight doors & Weather tight doors and weather tight doors. 6.0 Know Corrosion and its prevention 7.0 Know Ship Surveying and Dry Dock 8.0 Know the flooding of compartments		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN NAUTICAL SCIENCE						
COURSE: Ship Construction		Course Code: NSC 329		Contact Hours: 3-0-0		
	THEORETICAL CONTENTS			PRACTICAL CONTENTS – No Practical		
WEEK	1.0 General Objective 1.0: Know the principal structural members of a ship.					
	Specific Learning Outcomes	Teacher's Activities	Resources Theoretical/Practical	Specific Learning Outcomes	Teacher's Activities	Evaluation
1 - 2	1.1 List the principal structural members of a ship. 1.2 Sketch a profile of a ship, showing the general arrangement.	Sketch a mid-ship section of a ship. Illustrate all the parts of a ship. Sketch a profile of a ship.	Sample of ship's plans. Reference Textbooks.	No Practical		Test Assessment Examination.

	General Objectives 2.0: Know basic ship building methods					
3 - 4	<p>2.1 Describe the grades & size of steel plate used in ship building.</p> <p>2.2 Explain the characteristics of steel used in ship building as toughness and brittleness.</p> <p>2.3 Explain how steel is subject to brittle due to frequent changes in temperature.</p> <p>2.4 Explain the advantages of using aluminium alloys over steel in construction of superstructures.</p> <p>2.5 State precautions against corrosion in the use of aluminum with steel.</p> <p>2.6 State that classification society should supervise/specify steel used in ship building.</p>	<p>Explain how steel is obtained.</p> <p>State the different grades of steel used in ship building.</p> <p>Describe aluminium, alloys.</p> <p>State its advantages over steel.</p> <p>Explain the chemical properties of metals.</p> <p>Illustrate with diagrams stress on metals.</p> <p>Produce Classification Societies rules on Ship Building Materials.</p>	<p>Reference Textbooks.</p> <p>O.H.Ps. & Transparencies .</p> <p>Classification Society's rules on ship construction materials.</p>			<p>Test Assessment Examination.</p>
	General Objectives 3.0 :Know how the ships parts are welded together.					
5 - 6	<p>3.1 Describe how ship parts are welded together.</p>	<p>Describe various types of welding</p>	<p>A visit to a dry dock or</p>			<p>Test Assessment</p>

	<p>3.2 Describe several methods of plate preparation.</p> <p>3.3 Describe automatic welding processes.</p> <p>3.4 Explain terms such as: Leg length, throat thickness, relationship, full penetration, single pass, multipass, back run.</p> <p>3.5 Describe weld faults.</p> <p>3.6 Describe non-destructive tests for Welding jobs.</p> <p>3.7 State requirement of classification society with respect to electrodes used and tests on weld materials.</p>	<p>methods</p> <p>Sketch electric arc welding.</p> <p>Sketch various plate edge preparation methods</p> <p>List sections used in welding construction</p> <p>State that weld faults are caused by poor surface preparation.</p> <p>Sketch various diagrams illustrating plate preparation</p> <p>State classification's requirements.</p>	<p>floating dock or a repair yard.</p> <p>Reference Textbooks.</p> <p>Documents on classification society's requirement.</p> <p>O.H.Ps. & Transparencies</p> <p>.</p>			Examination.
General Objectives 4.0: Know about bulk heads						
7	<p>4.1 State the purpose of Bulkheads.</p> <p>4.2 Define Margin line & Bulkhead deck.</p> <p>4.3 State bulkhead requirements of a Cargo ship.</p> <p>4.4 Describe the construction of watertight bulkhead attachments to tank top, between decks, deck beams.</p> <p>4.5 Describe how watertight bulkheads are pierced by pipes & how water tightness is preserved.</p>	<p>Illustrate with sketches items 4.1 – 4.6.</p> <p>State that bulkhead will reduce fire spread, flooding containment.</p> <p>Sketch how bulkheads are</p>	<p>Reference Textbooks.</p> <p>O.H.Ps. & Transparencies</p> <p>.</p> <p>Ships' Plan/Drawing.</p>	No Practical		Test Assessment Examination.

	<p>4.6 Describe in details the testing of bulkhead for water tightness.</p> <p>4.7 Describe the purpose of wash bulkhead in cargo tanks.</p> <p>4.8 State the rules for additional bulkheads on cargo ships.</p>	<p>attached to tank top, between decks and deck beams showing how water tight is maintained at perfections. State and read out SOLAS regulations for testing of water tightness of bulkheads. Classification Rules of bulkhead number on Board.</p>				
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General Objectives 5.0: Understand Water tight doors & Weather tight doors					
8 - 9	<p>5.1 Explain why water tight doors are fitted on water tight bulkheads.</p> <p>5.2 State various categories of watertight doors.</p> <p>5.3 State the requirements of weather tight doors.</p> <p>5.4 Describe with sketches a hinged watertight door showing means of securing it.</p> <p>5.5 State the requirement and permission required of watertight doors as per load line Rule.</p> <p>5.6 State why drills are required for operation of watertight doors as per SOLAS1974.</p> <p>5.7 State the requirements for log entry of weekly drills of watertight doors</p>	<p>Illustrate with sketches item 5.1 – 5.7.</p>	<p>Reference Textbooks.</p> <p>O.H.Ps. & Transparencies</p> <p>. SOLAS 1974.</p>	No Practical	<p>Test Assessment Examination.</p>

General Objectives 6.0: Know Corrosion and its prevention						
10 - 11	<p>6.1 Explain what is meant by corrosion.</p> <p>6.2 Explain where corrosion of metals is likely to be occurring on ships.</p> <p>6.3 State in details what constitute anode, cathode and electrolytes.</p> <p>6.4 Explain the term a corrosion cell.</p> <p>6.5 Describe the measures to control corrosion.</p> <p>6.6 Describe various merits of these control methods.</p> <p>6.7 Explain “Mill scale”.</p> <p>6.8 Describe surface preparation of steel prior to painting.</p> <p>6.9 State various painting methods.</p> <p>6.10 List the common paint vehicles.</p> <p>6.11 Describe paint schemes for under water areas, boot topping, topsides, tanks and super structures.</p>	<p>Define corrosion.</p> <p>State the various causes of corrosion.</p> <p>Sketch a ship immersed in water and indicate areas subject to corrosion.</p> <p>Sketch corrosion action in a cell of two dissimilar metals.</p> <p>Sketch method of control as cathode method impressed current system</p> <p>Illustrate with diagram the various methods of painting.</p> <p>Define paint as consisting of pigment and vehicle.</p>	<p>Reference Textbooks. O.H.Ps. & Transparencies</p>	No Practical		<p>Test Assessment Examination.</p>

General Objectives 7.0: Know Ship Surveying and Dry Dock						
12 - 13	7.1	State the frequency of classification society surveys.	Describe classification society surveys required for vessels to remain in class.	Classification Society books on Regulations for hull construction.	No Practical	Test Assessment Examination.
	7.2	Describe in details the requirements of periodic surveys.	State when continuous surveys may be in order	Reference Textbooks.		
	7.3	Explain how continuous surveys may replace special surveys.	Produce class regulations on surveys			
	7.4	List items to be examined in dry dock as shell plating etc.	List surveys requirements in dry dock.			
	7.5	Describe penalties for failure to comply with survey requirements.				

General Objectives: 8.0 : Know the flooding of compartments

14 - 15	<p>8.1 Explain the terms: margin line and permeability of a space.</p> <p>8.2 Explain the term: Floodable length, permissible length in a passenger ship.</p> <p>8.3 State factors of subdivision.</p> <p>8.4 Explain details of Type” A” AND Type” B” ships for free board computation.</p> <p>8.5 State the requirements of conditions of assignment of freeboard.</p> <p>8.6 Explain the purpose of reserve buoyancy.</p> <p>8.7 Explain that a ship may capsize as a result of insufficient reserve buoyancy.</p>	<p>Illustrate with diagram margin line, permeability permissible length. State that type A and type B ships must comply with regulations. Explain permissible length requirements for assignment of load line Permissible length requirements for assignment of load line subdivision for passenger vessels. State that type A and type B ships must comply with minimum requirements for freeboard assignment. State that bigger the reserve buoyancy the safer the vessel.</p>	<p>IMO regulations on construction of bulkheads. Reference Textbooks. SOLAS 1974. Load Line Rules. O.H.Ps. & Transparencies .</p>	<p>No Practical</p>		<p>Test Assessment Examination.</p>
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HND II THIRD SEMESTER

Programme: HND Nautical Science	Course Code: NSC 431	Contact Hours/Credit unit: 5
Course: ELECTRONIC NAVIGATION AIDS	Semester: 3	Theoretical: 2 hours/week
Year: 2	Pre-requisite:	Practical: 2hours /week
GOAL: To enable students understand the operational principles of critical electronic Navigational equipment and their applications to safe and efficient navigation		
GENERAL OBJECTIVES: On completion of this course the student will be able to:		
1.0 Know the satellite navigation system		
2.0 Know the principle of global positioning system (GPS)		
3.0 Know the operation of the Echo sounder		
4.0 Know the principles of speed log		
5.0 Comprehend operation of Loran system and Loran		
6.0 Know the basic principles of critical electronic navigation equipment		
i. Radar/ARPA		
ii. AIs		
iii. ECDIS		
iv. IBS		
v. LRIT		
vi. VDR		

General Objective:- General Objective: 1.0: Know the satellite navigation system

General Objective:- General Objective: 1.0: Know the satellite navigation system						
	THEORETICAL CONTENTS			PRACTICAL CONTENTS (NOT REQUIRED)		
Week	Specific Learning Outcomes	Teacher's Activities	Resources Theoretical/ practical	Specific Learning Outcomes	Teacher's Activities	Evaluation
1-4	1.1 Describe the principles of the satellite navigation system. 1.2 Describe the configuration of NNSS (Navy navigation satellite system) satellite orbits and period of satellite vehicle. 1.3 Describe the principles of dopplar count. 1.4 Describe potential sources of error e.g. emphemics error, uncertainties in height of antenna, receiver clock error, propagation error, error in ship's course and speed etc. 1.5 State that at least four SVs at a useable elevation should be visible to the receiving antenna at any point on the earth's surface. 1.6 State that SV positions are accurately controlled from the ground stations.	Display pictures of the globe showing the position of each satellite. Display pictorial sketches of the transceiver layout of a satellite navigation system	Reference Textbook, Satellite Navigation set, O.H.P. & Transparencies, Trip to the ship for demonstration.	Students to understand the operation principles and structural layout of satellite, navigation system	Use pictures and or audio visual systems for illustration	Assignments Tests, Examination
General Objective 2.0: Know the principles of the global positioning system (GPS)						
5-6	2.1 State the principles and uses of the GPS. 2.2 Describe its accuracy for position	State the principles of the GPS.	Reference Textbook,	Students should have an in-depth knowledge of the principles of GPS and	Use pictures and or	Assignments Tests,

	<p>fixing on a moving ship.</p> <p>2.3 Explain the meaning of Pseudo Random noise code, (PRN) code.</p> <p>2.4 Describe the two codes which are Transmitted.</p> <p>2.5 Explain why two frequencies are used.</p> <p>2.6 Name errors associated with GPS.</p> <p>2.7 Describe each error.</p> <p>2.8 State how to allow for such errors on board a ship.</p> <p>2.9 Mention the main dangers of over-reliance on the GPS.</p>	<p>Describe the accuracy of the GPS for position fixing.</p> <p>Explain why two frequencies are used.</p> <p>Explain why civilian sets use only one frequency.</p> <p>Explain GPS errors.</p> <p>Show how to allow for the errors on board ship.</p>	O.H.P.& Transparencies.	its applications to navigation	audio visual systems for illustration	examination
General Objective: 3.0 Know the operation of the Echo sounder						
7-9	<p>3.1 Describe the principles of the echo sounder.</p> <p>3.2 State its uses on board the ship.</p> <p>3.3 Sketch a block diagram of the components of the echo sounder.</p> <p>3.4 Explain reflection, refraction and absorption of sound vibration in water.</p> <p>3.5 Indicate how the above Phenomena affect the operation and accuracy of the echo sounder.</p>	<p>Describe the principles of the echo sounder.</p> <p>Use pictures of block diagram to show the parts. Explain the terms in 3.4.</p> <p>Read an echo</p>	Reference Textbook, Echo sounder, O.H.Ps. & Transparencies.	Students should know the operational concept of echo sounders	Use audio visual display to illustrate reading and errors.	Assignments Tests, examination

	<p>3.6 Explain the effects of temperature salinity and pressure on the speed of sound.</p> <p>3.7 State echo sounder error.</p> <p>3.8 Apply correction to the readings obtained.</p>	<p>sounder with the students.</p> <p>Apply correction to the readings.</p>				
General Objective 4.0 Know the principles of speed log						
10-12	<p>4.1 State the different logs used on board ship such as: Electromagnetic log, Doppler log, pressure log. PITOT log impeller log Janus etc. configuration</p> <p>4.2 State the principles of operation of each log in 4.1</p> <p>4.3 State the errors associated with each log.</p> <p>4.4 State the advantages and disadvantages of each log.</p> <p>4.5 Explain how to mount each log for best result.</p> <p>4.6 Describe how to read the log.</p> <p>4.7 Apply corrections to the readings.</p>	<p>State different types of logs.</p> <p>State their principles of operations.</p> <p>Name the errors of the log.</p> <p>State the advantages and disadvantages of each log.</p> <p>Describe mounting criteria for various log.</p>	Pictures and or OHP.			<p>Assignments</p> <p>Tests,</p> <p>examination</p>

General Objective 5.0: Understand operations of loran system

13-15	<p>5.1 Describe the principles of the loran.</p> <p>5.2 State the use of the loran.</p> <p>5.3 Differentiate between the two loran systems (A&C).</p> <p>5.4 Describe the operations of loran C.</p> <p>5.5 State that loran C chart is published by the American oceanography office on Mercator charts.</p> <p>5.6 Name the sources of errors on the loran C.</p>	<p>Describe the principles of loran C.</p> <p>State that Loran A & C are phased out.</p> <p>State the sources of loran C charts.</p> <p>List the sources of errors.</p>	<p>Reference Textbook, O.H.P. & or pictures</p>		<p>Assignments Tests, examination</p>
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Programme: HND Nautical Science	Course Code: NSC 432	Contact Hours/Credit unit: 4
Course: Maritime Law I	Semester: 3	Theoretical: 4 hours/week
Year: 2	Pre-requisite:	Practical: 1 hours /week
GOAL: To enable students understand UNCLOS 82 and basic international rules and regulations governing environmental protection, maritime labor and safety at sea.		
GENERAL OBJECTIVES: On completion of this course, the student will be able to:		
<p>1.0 Know the United Nations convention on the law of the Sea (UNCLOS 82).</p> <p>2.0 Know the relevant international conventions dealing with safety of life, cargo and navigation and ship stability.</p> <p>3.0 Know the relevant international conventions dealing with pollution prevention.</p> <p>4.0 Understand the relevant Maritime labor conventions Recommendations and Codes</p>		

General Objective:- Know the United Nations convention on the law of the Sea (UNCLOS 82)

General Objective:- Know the United Nations convention on the law of the Sea (UNCLOS 82)						
	THEORETICAL CONTENTS			PRACTICAL CONTENTS (NO PRACTICAL)		
Week	Specific Learning Outcomes	Teacher's Activities	Resources Theoretical/ practical	Specific Learning Outcomes	Teacher's Activities	Evaluation
1-2	1.1 Define the legal status of UNCLOS '82 1.2 Explain the development of the law of the sea 1.3 List and explain the innovating features of UNCLOS '82. 1.4 Define the territorial sea and the contiguous zone 1.5 State the rights and duties of coastal states in : - the territorial sea - EEZ - Internal waters 1.6 Explain the criminal jurisdiction of coastal states regarding crimes committed on board ships: - within their territorial waters - outside their territorial waters - outside but passing through its territorial waters	State the date of entry into force of UNCLOS '82. State the application of UNCLOS '82. Explain the development of the law of the sea. List innovation feature of UNCLOS'82. Define the territorial sea and contiguous zone. State the rights and duties of a coastal state in: The territorial EEZ Internal waters Explain the criminal	Reference Textbooks. UNCLOS'82			Test Assessment Examination

	<p>1.7 Explain the provisions within the convention on international straits.</p> <p>1.8 Explain the provisions of UNCLOS on High Seas.</p> <p>1.9 Explain the UNCLOS provisions dealing with the protection of the marine environment.</p>	<p>jurisdiction of coastal states regarding crimes committed on board ships:</p> <p>Within their territorial waters</p> <p>Outside their territorial waters</p> <p>Outside but passing through its territorial waters.</p> <p>Explain UNCLOS '82 provisions regarding international straits.</p> <p>Explain UNCLOS'82 provisions on the High seas.</p> <p>Explain UNCLOS'82 provisions regarding the protection of the marine environment.</p>				
General Objective 2.0: Know the relevant international conventions dealing with safety of life, cargo and navigation and ship stability						
3-7	2.1 Explain the International Convention on Load Lines 1966 as amended with particular reference	Explain the international convention on Load	MARPOL'73/78, London			

	<p>to the technical provisions for safety.</p> <p>2.2 Interpret the International Convention for the Safety of Life at Sea (SOLAS) 1974 with particular reference to all the provision dealing with safety e.g.</p> <ul style="list-style-type: none"> - surveys - reporting of accidents and defects - port state jurisdiction - subdivision and stability - Machinery and electrical installations - Fire protection detection and extinction - Life Saving Appliances - Radiotelegraphy and telephony and Radio communications - Safety of navigation - Carriage of the different types of goods. <p>2.3 Explain the provisions of the international conventions on standards of training, certification and watch keeping for seafarers 1978, as amended in 1995 (STCW 95) with particular reference to:</p> <ol style="list-style-type: none"> i) Mandatory minimum requirements for certification of masters, offices, radiotelephone operators and ratings forming 	<p>Lines 1966 as amended.</p> <p>Explain the technical provisions for safety in Load Lines Convention. Explain the International Convention for the safety of Life at Sea (SOLAS '74).</p> <p>Explain the provision of SOLAS '74.</p> <p>Explain the provision of the International Convention on Standard of Training, Certification and Watch keeping for Seafarers, 1978 as amended in 1995. (STCW '95) with particular reference to:-</p> <p>Mandatory minimum requirements for certification of</p>	<p>dumping convention,</p> <p>International convention,</p> <p>Civil Liability convention,</p> <p>STCW '95 convention.</p>			
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	<p>part of a navigational watch or an engineering watch.</p> <p>ii) Mandatory minimum requirements for certification of masters, officers and ratings of oil, chemical and gas tankers</p> <p>iii) Mandatory minimum requirements to ensure the continued efficiency of masters, engineers, deck and radio officers.</p> <p>iv) Basic principles to be observed in keeping navigation and engineering watches.</p> <p>v) Mandatory minimum requirements for the issue of certificates of proficiency in Survival Craft.</p>	<p>masters, officers, radio communication operators and ratings forming part of a navigational watch.</p> <p>Mandatory minimum requirement for Certification of engineer officers, second engineer officers, officer in charge of engineering watch and ratings forming part of an engineering watch.</p> <p>Mandatory minimum requirements for certification of masters, officers, and ratings of oil, chemical and gas tankers.</p> <p>Mandatory minimum requirements to ensure the</p>				
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		<p>continued efficiency of master, engineer, deck and radio communication officers</p> <p>Basic principles to be observed in keeping navigation and engineering watches.</p> <p>Mandatory minimum requirement for the issue of certificates of proficiency in Survival craft.</p>				
General Objective: 3.0 Know the relevant international conventions dealing with pollution prevention.						
8-10	<p>3.1 Interpret the provisions of the International convention for the Prevention of pollution from ships (MARPOL) 73/78 with particular emphasis on:</p> <ul style="list-style-type: none"> i) Annex I – Oil ii) Annex II – Noxious liquid substances in bulk iii) Annex III – Harmful substance carried in packaged form. iv) Annex IV - Sewage 	<p>Explain the provisions of the International convention for the prevention of pollution from ships</p> <p>(MARPOL 73/78) with particular emphasis on: Annex I- Oil, Annex II- Noxious</p>				

	<p>v) Annex V- Garbage</p> <p>3.2 Explain the convention on the Prevention of marine pollution by dumping of Wastes and other matter (London Dumping Convention).</p> <p>3.3 Explain the International convention relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 1969.</p> <p>3.4 Explain the Civil Liability Convention (CLC 1969)</p>	<p>liquid substance in bulk, Annex IV- Sewage, Annex V- Garbage. Explain London dumping convention, 1972. Explain the Intervention convention, 1969. Explain the civil Liability convention, 1969.</p>				
General Objective: 4.0 Understand the relevant Maritime labor conventions Recommendations and Codes.						
11-15	<p>4.1 Explain the Convention concerning Minimum Standards in Merchant ships 1969 (NO. 147).</p> <p>4.2 Interpret the convention Concerning seamen’s Articles of Agreement, 1926 (No. 22).</p> <p>4.3 Discuss the convention fixing the Minimum Age for the Admission of Young Persons to Employment and Trimmers or Stokers, 1921 (No. 15).</p> <p>4.4 Explain the convention concerning Minimum Age for Admission to employment, 1973 (No. 138).</p> <p>4.5 Explain the convention concerning the Minimum Requirements of Professional capacity for Masters and Officers on Board Merchant</p>	<p>Explain the Convention concerning Minimum Standard in Merchant ships 1969 (No. 147).</p> <p>Interpret the convention concerning Seaman’s Articles of Agreement, 1926 (No.22).</p> <p>Discuss the convention fixing Minimum Age for the Admission of</p>	<p>Convention on Minimum Standard in Merchant ships 1969 (No.147).</p> <p>Convention concerning seaman’s Articles of Agreement, 1926 (No.22).</p> <p>Convention fixing the</p>			

	<p>ships, 1926 (No. 53).</p> <p>4.6 Discuss the convention concerning certification of ships' Cooks, 1946 No. 69</p> <p>4.7 Explain the Convention concerning certification Able Seamen, 1946 (No. 74).</p> <p>4.8 Discuss the Recommendations concerning vocational Training of Seafarers (Recommendation No. 137).</p> <p>4.9 Explain the convention concerning Wages, Hours of Work on Board ship and manning (No. 91).</p> <p>4.10 Discuss the Convention concerning Annual Leave with pay for Seafarers, 1976 (No. 146).</p> <p>4.11 Discuss the convention concerning the Repatriation of Seamen 1926 (No. 23) and (No. 166).</p> <p>4.12 Explain the following:</p> <p>ILO Recommendation NO. 174-</p> <ul style="list-style-type: none"> - Convention No. 68 - Convention No. 92 - Convention No. 133 - Recommendation No. 105 - Recommendation No 106 - Convention No. 134 - Recommendation No 142 - Convention No 16 - Convention No 73 	<p>Young persons to Employment and Trimmers or Stokers, 1921 (No. 15).</p> <p>Explain the convention concerning minimum Age of Admission to Employment, 1973(No. 138).</p> <p>Explain the convention concerning the Minimum requirement of Professional capacity for Masters and Officers on Board Merchant Ships, 1926 (No. 53).</p> <p>Discuss the convention concerning Certification of ship's cooks, 1946 (No. 69).</p> <p>Discuss the recommendation</p>	<p>Minimum Age for the Admission of Young Persons to Employment and Trimmers or Stokers, 1921.</p>			
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	<ul style="list-style-type: none"> - Convention No. 164 - Convention No. 55 - Convention No. 56 - Convention No. 165 - Convention No. 163 - Recommendation No. 173 - Convention No. 87 - Convention No. 98. 	<p>concerning Vocational Training of Seafarers (Recommendation No.137).</p> <p>Explain the convention concerning Wages, Hours of work on board ship and Manning (No. 91).</p> <p>Explain the convention concerning Vocational Holidays with pay for seafarers (No. 146).</p> <p>Discuss the convention concerning the Repatriation of seamen 1926 (No. 23) and (No. 166).</p> <p>Explain Recommendations Nos. 174, 105, 106, 142, 173.</p> <p>Explain conventions Nos.</p>				
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		68, 92, 133, 134, 16, 73, 164, 55, 165, 163, 87, 98.				
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Programme: HND II	Course Code: NSC 433	Contact Hours60/Credit unit: 4
Course: CARGO HANDLING AND STOWAGE II	Semester: 3	Theoretical: 3 hours/week
Year: 2	Pre-requisite: NSC 327	Practical: 1 hours /week
GOAL: To enable students understand the general operational concept in liquid cargo handling and application of codes and regulations.		
GENERAL OBJECTIVES: On completion of this course the student will be able to:		
<p>1.0 Know the term and definitions used in tanker operations.</p> <p>2.0 Know the contents and applications of the international safety guide for oil tanker and terminals.</p> <p>3.0 Know oil tanker operation and related pollution prevention regulations.</p> <p>4.0 Know operations of chemical tankers.</p> <p>5.0 Know the procedures for tank cleaning and control of pollution in chemical tankers.</p> <p>6.0 Know the operation of gas tankers.</p> <p>7.0 Know cargo operations on gas tankers.</p>		

General Objective 1.0: Know the term and definitions used in tanker operations.

General Objective 1.0: Know the term and definitions used in tanker operations.						
	THEORETICAL CONTENTS			PRACTICAL CONTENTS NO PRACTICALS.		
Week	Specific Learning Outcomes	Teacher's Activities	Resources Theoretical/ practical	Specific Learning Outcomes	Teacher's Activities	Evaluation
1 - 2	<p>1.1 Define petroleum as crude oil and liquid hydrocarbon product derived from it.</p> <p>1.2 State that petroleum gases, principally methane, are extracted from crude oil before shipment.</p> <p>1.3 Explain that "Spited Crude" has additional petroleum gas, usually butane, dissolved in it before shipment.</p> <p>1.4 State that "Sour crude" contains appreciable amount of hydrogen sulphide or organic sulphur compounds</p> <p>1.5 State that product derived from crude oil include petrol, kerosene, gas oil, diesel oils, lubricating oils, waxes and residual oils such as fuel oil and</p>	<p>Define petroleum.</p> <p>State the components of Petroleum gases.</p> <p>Describe the content of spited crude.</p> <p>Describe the content of sour crude.</p> <p>Explain the component of crude oil</p> <p>Explain why the Reid V.P. may not be the same</p>	<p>Reference Textbook.</p> <p>Tanker handbook OC/MF publications.</p>			<p>Test</p> <p>Assessment</p> <p>Examination</p>

	<p>bitumen .</p> <p>1.6 Explain that vapour pressure of any liquid increases with increasing temperature.</p> <p>1.7 Define Reid vapour pressure (RVP)</p> <p>1.8 Explain why the pressure in a tanker is not necessarily the same as the RVP of the oil it contains, even at the standard temperature</p> <p>1.9 Define cloud point'</p> <p>1.10 Define the flashpoint of a liquid</p> <p>1.11 Explain why flashpoint cannot be used as an absolute measure of safety.</p> <p>1.12 State that "Flammable " means capable of being ignited and of burning'</p> <p>1.13 Define upper flammable limit, lower flammable limit, and flammable range.</p> <p>1.14 States approximate values for petroleum products.</p> <p>1.15 Define the auto-ignition temperature.</p> <p>1.16 Describe the viscosity of a fluid.</p> <p>1.17 State that viscosity increases as the temperature decreases.</p>	<p>as that in a tank.</p> <p>Define flashpoint.</p> <p>Explain why it cannot be used to measure safety of a tank atmosphere.</p> <p>Define terms.</p>				
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	1.18 Define 'pour point'.					
General Objective 2.0: Know the contents and applications of the international safety guide for oil tanker and terminals.						
3 - 4	<p>2.1 Explain that the ISGOTT contains operational guidance for the safe handling of petroleum on tankers and at terminals.</p> <p>2.2 State that Part I deals with operations and Part II contains supporting technical information.</p> <p>2.3 State that terminal, local or national regulations may also be applicable and should be known by those concerned.</p> <p>2.4 Outline the general precautions to be taken on tankers regarding:</p> <ul style="list-style-type: none"> - Smoking - The naked lights - The galley - Electrical equipment - Use of tools - Entry to enclosed spaced and pump-rooms <p>2.5 List the information which should be exchanged between the ship and the terminal before arrival.</p> <p>2.6 State that safety procedures are agreed between the</p>	<p>Describe the content of the international safety guide for oil Tankers and terminals (ISGOTT).</p> <p>Use ISGOTT to outline safety precautions.</p> <p>Use ISGOTT to list safety procedures and information to be exchanged between ship and terminal.</p> <p>Use ISGOTT to explain precautions necessary for emergency evacuation.</p> <p>Explain details as contained in</p>	<p>ISGOTT. Reference text book.</p> <p>Tanker handbook OCIMF publication.</p>			

	<p>tanker and the terminal and include:</p> <ul style="list-style-type: none"> - means of summoning emergency services - availability and use of fire-fighting and other emergency equipment - actions to be taken in case of fire or other emergency - emergency evacuation of the berth <p>2.7 State that fire-fighting equipment should be ready for immediate use.</p> <p>2.8 State that main engine and other equipment essential for manoeuvring should be ready for use at short notices and the written agreement of the terminal and port authority should be obtained for any work or repairs which would immobilize the ship.</p> <p>2.9 State that detailed loading or discharging plans are agreed between the ship and terminal.</p> <p>2.10 Explain the safety measures against pollution and actions to take in case of an accident are agreed before transfer of cargo</p>	<p>ISGOTT.</p> <p>Explain the uses of inert gas onboard.</p> <p>Explain what is to be done in the event of inert gas pressure loss.</p> <p>Describe how the tanks of a combo are arranged.</p>				
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	<p>commences.</p> <p>2.11 State that before starting cargo transfer, the responsible officer and the terminal representative must formally agree that they are ready to do so safely.</p> <p>2.12 State that the terminal should be notified of the intention to use crude oil washing (COW) at least 24 hours in advance.</p> <p>2.13 Explain that tanker should be maintained in an inert condition throughout all operations except when entry to tanker for inspection or repair is necessary.</p> <p>2.14 Explain that the inert gas should have an oxygen content not exceeding 5% by volume.</p> <p>2.15 State that the oxygen content of cargo tanks should not exceed 8% by volume.</p> <p>2.16 Explain that the inert gas plant will be used to:</p> <ul style="list-style-type: none">- Supply inert gas during cargo discharge, de-ballasting, crude oil washing and tank					
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	<p>cleaning</p> <ul style="list-style-type: none"> - Purge tanks prior to gas-freeing - Top-up the pressure when necessary during a voyage <p>2.17 Explain that, in the event of a failure of the inert gas system, discharge of cargo or ballast or tank cleaning should be stopped, to prevent air being drawn into the tanks, and operations should only be resumed when a supply of inert gas has been restored.</p> <p>2.18 Describe the hold and tank arrangement of combination carriers.</p>					
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General Objective 3.0: Know oil tanker operation and related pollution prevention regulations.

5 - 6	<p>3.1 Define 'segregated ballast' 'clean ballast' 'dirty ballast' & 'slope tank'.</p> <p>3.2 Describe an inert gas system (IGS).</p> <p>3.3 Sketches the distribution gas to tanks.</p> <p>3.4 Explain the reasons for ballasting.</p> <p>3.5 State the capacity and arrangement of segregated ballast tanks.</p> <p>3.6 State that on rare voyages</p>	<p>Describe Inert gas plant Operation.</p> <p>Give reasons why the ship needs to ballast.</p> <p>Emphasize that C.O.W. is not a complete substitute for</p>	Reference text book.			
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	<p>whether conditions may be so severe that additional ballast is needed for safety of the ship.</p> <p>3.7 Explain that the crude oil tankers equipped with COW, the additional ballast would be carried in tanks that have been washed with crude oil.</p> <p>3.8 State that the additional ballast must be treated as dirty ballast.</p> <p>3.9 Explain why a ship may have only clean or segregated ballast on board upon arrival at a loading port.</p> <p>3.10 State the criteria for the discharge of oil from cargo-tanks of oil tankers.</p> <p>3.11 Outline the procedures for changing ballast at sea.</p> <p>3.12 State that, before loading clean ballast, cargo pumps and lines to be used are flushed with clean water into a dirty ballast or slop tank.</p> <p>3.13 Describe how to dispose of dirty ballast.</p> <p>3.14 Describe how to decant the water contents of the slip</p>	<p>water washing.</p> <p>Explain the process of washing tanks at sea using L.O.T. system.</p> <p>Describe MARPOL Requirements for discharge of oil into the sea.</p> <p>Describe the process of loading clean ballast.</p> <p>Emphasize MARPOL requirements for discharging oily water mixture at sea.</p> <p>Explain the reasons and process of tank cleaning.</p> <p>Describe C.O.W and its</p>				
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	<p>tank.</p> <p>3.15 State that a final flushing of cargo pumps and lines to be used for discharge of clean ballast is made to the sea through the oil monitoring and control system.</p> <p>3.16 Explain that the operations of discharging dirty ballast, decanting the slop tanks and flushing lines must be done when more than 50 nautical miles from the nearest land and outside a special area.</p> <p>3.17 State that only segregated or clean ballast may be discharge within 50 nautical miles of land or inside a special area.</p> <p>3.18 Explain the reason of tank cleaning.</p> <p>3.19 Describe the use of fixed and portable machines for tank cleaning.</p> <p>3.20 Describe the use of slop tanks during tank cleaning.</p> <p>3.21 State that an inert atmosphere should be maintained in tanks during tank cleaning in ships fitted with IGS.</p> <p>3.22 Briefly describe crude oil</p>	<p>advantages.</p> <p>Describe the various ways of disposing oily water mixtures resulting from tank washing.</p> <p>Explain the L.O.T. process.</p> <p>Describe the different cargo operations.</p> <p>Define gas freeing and purging.</p> <p>List reasons for same.</p> <p>Describe the method and equipment used for gas freeing.</p> <p>Explain the importance of ventilation when working in tanks.</p>				
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	<p>washing and the reasons for requiring it in crude oil tankers.</p> <p>3.23 State that crude oil washing can only be carried out with fixed washing machines in inerter tanks.</p> <p>3.24 State that the oil residues in the slop tank resulting from tank cleaning and disposal of dirty ballast may be:</p> <ul style="list-style-type: none"> - pumped ashore at the loading terminal - retained onboard and segregated from the next cargo. - Retained onboard and the new cargo loaded on top. <p>3.25 State that the process of tank cleaning changing ballast decanting the water from slop tanks and loading the next cargo over the retained oil is known as the load-on –top procedure.</p> <p>3.26 State the details of cargo operations, ballasting and de-ballasting, tank cleaning, and discharge of water from slop tanks and disposal of residues are entered in the ship’s oil Record Book.</p>					
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	<p>3.27 Define gas-freeing as the replacement of hydrocarbon vapours or inert gas by air.</p> <p>3.28 List the reasons for gas-freeing.</p> <p>3.29 Explain why inert gas is used to purge the tank of hydrocarbon vapours before introducing air on suitably equipped ships.</p> <p>3.30 State that the mechanical fixed systems is used or portable fans are used.</p> <p>3.31 State that checks are made during gas freeing with combustible-gas indicators, oxygen meters and toxic-gas detectors.</p> <p>3.32 State that the supply of inert gas to the tank is shut off.</p> <p>3.33 Explain the need to maintain ventilation and to check the atmosphere frequently when persons are working in a tank.</p>					
General Objective 4.0: Know operations of chemical tankers.						
	<p>4.1 State that the rapid growth in the chemical industries in the years after World War II led to the need for</p>	<p>Explain the requirement for the equipments</p>	<p>Reference Textbooks.</p>			

7 - 8	<p>bulk shipment to replace the carriage of liquid chemical in drums in dry cargo ships.</p> <p>4.2 State that the first chemical tankers were converted oil tankers.</p> <p>4.3 State that modern chemical tankers have evolved from oil product tankers to take account of special carriage requirements and associated hazards.</p> <p>4.4 State that chemical tanker may be engaged in “dedicated” or “parcel” trades.</p> <p>4.5 Explain that dedicated service usually means that the tankers are designed for the carriage of a particular type of chemical and transports the same types of cargo on each voyage.</p> <p>4.6 Explain that a chemical tanker engaged in parcel trade moves a variety of relatively small lots of chemicals between a numbers of ports.</p> <p>4.7 State that visual and audible high level alarms</p>	<p>on chemical tankers.</p> <p>Mention the precautions necessary for unloading.</p> <p>Explain sampling and the reasons.</p>				
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	<p>and a tank overflow control system is required for many chemicals.</p> <p>4.8 State that personnel involved in loading should check the information in the relevant data sheets and take all necessary precautions including the wearing of appropriate protective clothing.</p> <p>4.9 State that prior to discharging, samples from tanks and line are analyzed to check if the product has been contaminated on board during the passage.</p>					
General Objective 5.0: Know the procedures for tank cleaning and control of pollution in chemical tankers.						
9 - 10	<p>5.1 State that different cargoes require different tank cleaning procedures.</p> <p>5.2 State that most tanks cleaning can be with hot or cold seawater or fresh water, or by ventilation alone, although a few cargoes require special solvents.</p> <p>5.3 State that fixed or portable tank washing machine is used.</p> <p>5.4 List phases in tank-cleaning operation as:</p>	<p>Describe different ways of cleansing tanks based on the cargoes to be carried.</p> <p>Describe how to clean the tanks.</p> <p>Explain with the aid of a sketch the cycle of a</p>	Reference text book.			

	<ul style="list-style-type: none"> - Pre-wash - main wash - fresh water rinse - gas freeing - drying - inspection and testing <p>5.5 Explain with the aid of a simple drawing, the cycle of a tank washing system from the sea water inlet to the slop tank.</p> <p>5.6 State that personnel on watch should be present at all times during operations.</p> <p>5.7 State that entries should be made in the cargo record book, on a tank to tank basis of:</p> <ul style="list-style-type: none"> - loading - internal transfer of cargo - unloading - Mandatory pre-wash in accordance with P and A manual - Cleaning of cargo tanks - Discharge into the sea to tank washings - Ballasting of cargo tanks - Discharge of ballast from cargo tanks - Accidental or other exceptional discharge - Control by authorized 	<p>tank washing system.</p> <p>State the importance of regular inspection during cargo work.</p> <p>State the requirement for C.R.B. and the entries to be made.</p>				
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	surveyor's.					
General Objective 6.0: Know the operation of gas tankers.						
11-13	<p>6.1 State that the transportation by sea of liquid gases in bulk is internationally regulated with regard to safety, through standards laid down by IMO.</p> <p>6.2 State that chapter VII of the international convention for safety of life at sea (SOLAS 1974) as the amended makes the provisions of the international code for the construction and equipment of ships carrying liquefied gases in Bulk (IGC Code) mandatory.</p> <p>6.3 State that liquefied gas is the liquid from a substance that at normal atmospheric temperature and pressure would be a gas.</p> <p>6.4 State that liquefied gas products transported by gas tankers are listed in chapter 19 of the ICG code.</p> <p>6.5 State that some of those substances are also covered by the IBC code.</p> <p>6.6 State that gas cargoes may</p>	<p>State that the IGS regulates the carriage of liquefied gases by sea.</p> <p>Give example of chemical gases.</p> <p>Divide ships into types according to the IGC.</p> <p>Describe the different types.</p> <p>Use IGC code to sub-divide independent tanks.</p> <p>Illustrate tank types described above.</p> <p>Give example of cargoes carried in fully-pressurized, fully-refrigerated and semi-refrigerated</p>	<p>Reference Textbooks. IGC CODE.</p>	<p>Students to have a clear understanding of the various shipboard operations of gas tankers.</p>	<p>Use audiovisual facilities and/or pictorial/sketches to illustrate types of gas tankers, types of cargo pumps and their associated systems.</p>	<p>Assignment</p> <p>Text</p> <p>Examinations</p>

	<p>be divided into four groups:</p> <ul style="list-style-type: none"> - Liquefied natural gas (LNG); - Liquefied petroleum gas (LPG); - Liquefied ethylene gas (LG); - Chemical gas. <p>6.7 State that LPG is the common name for petroleum gas consisting mainly of butane and propane.</p> <p>6.8 State that LNG is the natural gas from which impurities have been removed and consisting mainly of methane.</p> <p>6.9 State that chlorine ammonia and vinyl chloride monomer as examples of chemical gases.</p> <p>6.10 State that in addition to the surveys required for all stop ships, gas tankers must undergo survey of the cargo containment equipment and cargo handling arrangements for the issue of an international certificate of fitness for the carrying of liquefied gas in bulk.</p> <p>6.11 State that, the certificate of</p>	<p>conditions.</p> <p>Sketch LNG and LPG tanker showing arrangement of tanks.</p> <p>Give the range of boiling points.</p> <p>Describe terms and state that they are all connected through the tank dome.</p> <p>State the requirements for shut-off valves, emergency shut-down valves and pressure relief valves.</p> <p>Describe the types of cargo pumps used.</p> <p>Describe the use of the cargo heater.</p>				
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	<p>fitness list that cargoes which may be carried by the ship and may also stipulate conditions for carriage.</p> <p>6.12 Explain the following terms used in IGC code:</p> <ul style="list-style-type: none"> - boiling point - cargo area - cargo containment system - gas carrier - gases dangerous space or zone - gas safe space - hold space - inter barrier space - MARVS - Primary barrier - Secondary barrier - Tank dome. <p>6.13 Explain that the IGC divides ships into four types 1G, 2G, 2PG and 3G.</p> <p>6.14 State that a type 1G ship is intended for the transportation of products considered to be presenting the greatest overall hazard and types 2G/2PG and type 3G for products of progressively lesser hazard.</p> <p>6.15 State that the division into ship types is based on the</p>	<p>State the requirement for pressure control system.</p> <p>Describe methods for controlling pressure.</p> <p>Describe the single stage direct liquefaction system.</p> <p>State the means of producing I.G.</p> <p>Describe its uses.</p> <p>State that tank is fitted with terms and pressure indicators.</p> <p>Explain that gas detectors are used to detect pressure of gases in spaces</p>				
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	<p>ships capability to survive specified damage by collision or stranding and the location of the cargo tanks in relation to such damage.</p> <p>6.16 Describe in simple terms:</p> <ul style="list-style-type: none"> - Integrate tank - Membrane tank - Semi membrane tank - Independent tank - Internally insulated tank. <p>6.17 Explain in simple terms the division of independent tank into:</p> <ul style="list-style-type: none"> - Type A, generally a self supporting prismatic tank; - Type B, generally a self supporting spherical tank; - Type C, generally a self supporting cylindrical pressure tank. <p>6.18 Illustrate by means of simple sketches, the different types of tanks showing primary and secondary barrier, insulated and how the tank is supported.</p> <p>6.19 State that cargoes are normally carried as boiling liquid at:</p> <ul style="list-style-type: none"> - Ambient temperature (fully 	<p>mentioned.</p> <p>Explain where to find information on cargo data.</p> <p>Describe the type of information needed.</p>				
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	<p>pressurized) or</p> <ul style="list-style-type: none"> - Atmospheric or near the boiling point of liquid; - Designated pressure and at corresponding temperature. <p>6.20 Illustrate by means of simple sketches, typical tank arrangement in LNG and LPG tankers.</p> <p>6.21 State that the boiling point of gas cargoes ranges from about -162 °C for methane to 0°C for butane.</p> <p>6.22 State that all connections and access to a cargo tank are via the tank dome area.</p> <p>6.23 List the following piping arrangement connected to a cargo tank:</p> <ul style="list-style-type: none"> - Sample tubes - Vapour line - Condensate line - Stripping/puddle heat line - Liquefied line - Ventilation line. <p>6.24 Describe the purpose of each piping arrangement in 6.23 above.</p> <p>6.25 State that a cargo tank has shut-off valves located as close to the tank as possible for all liquid and vapour</p>					
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	<p>connections except for safety relief valves.</p> <p>6.26 State that regulation requires remotely operated emergency shutdown valves (ESV) in the cargo piping system.</p> <p>6.27 State that the operation of the ESV system also stops pumps and compressors.</p> <p>6.28 State that all cargo tanks must be provided with a pressure relief system.</p> <p>6.29 State that all equipment and piping which can be isolated when full of liquid must be provided with a pressure relief system.</p> <p>6.30 State that cargo pumps are usually centrifugal either dip-well pumps or submerged electric pumps in the tanks with deck-mounted booster pumps, if required.</p> <p>6.31 Describe the use of cargo heaters and vaporisers.</p> <p>6.32 Explain the effect of transfer of heat to the cargo on cargo temperature and tank pressure.</p> <p>6.33 State that means for controlling the pressure</p>					
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	<p>must be provided.</p> <p>6.34 State that pressure in cargo tank may be controlled by:</p> <ul style="list-style-type: none"> - Insulation of tank to reduce heat transfer; - Leading cargo boil-off to the ships boilers or main engines as fuel (only with LNG); - Leading cargo boil-off to the ships refrigeration plant, where vapour is liquefied and returned to the tank; - Cooling the liquid in a heat exchanger (indirect system). <p>6.35 Describe the single-stage direct liquefaction.</p> <p>6.36 State that the indirect system is only used for those products which cannot be compressed for safety reasons.</p> <p>6.37 State that most gas tankers are fitted with an inert gas generator.</p> <p>6.38 State that inert gas is used to hold spaces and inter barrier spaces and to purge tanks.</p> <p>6.39 State that the liquid level in cargo tanks is commonly measured by means of float gauges.</p> <p>6.40 State that each cargo tank is</p>					
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	<p>fitted with a high level alarm and automatic system to prevent over flow.</p> <p>6.41 State that each cargo tank is fitted with means for indicating the temperature and pressure.</p> <p>6.42 Explain how cargo leakage through the primary barrier can be detected.</p> <p>6.43 State that gas tankers have a fixed gas detection system that gives audible and visual alarms of the accumulation of gas in enclosed spaces such as cargo pump- rooms, compressor rooms hold spaces and inter barrier spaces.</p>					
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General Objective 7.0: Know cargo operations on gas tankers.

14 - 15	<p>7.1 State that information for each product may be found on cargo data sheets contained in safety guides or obtained from the shippers.</p> <p>7.2 State that information needed before loading includes:-</p> <ul style="list-style-type: none"> • A full description of the physical and chemical properties that are necessary for the safe containment of the cargo; • Action to be taken in the event of spills or leaks; • Counter measures against accidental personnel contact; • Fire fighting procedures and fire fighting media; • Procedures for cargo transfer, gas freeing, ballasting, tank cleaning and changing cargoes; • Special equipment for particular cargoes; • Minimum temperatures of the inner hull steel; 	<p>Explain where to find information on cargo data.</p> <p>Describe the type of information needed.</p> <p>Describe the various safety precautions to be taken during cargo operation.</p> <p>Describe the cargo operations.</p> <p>State that applicable Pollution Regulations should be adhered to during cargo, ballast or bunkering operations.</p>	Reference Textbooks.		Visit to Port (Observe Tanker on loading or off loading).	
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	<ul style="list-style-type: none"> • Emergency procedures. <p>7.3 State those products that react when mixed should only be loaded if complete cargo separation is possible.</p> <p>7.4 State that personnel should be aware of the hazards and be required to use the appropriate protective equipment provided.</p> <p>7.5 State that the master should ensure proper liaison between the ship and the terminal before and throughout cargo transfer operations.</p> <p>7.6 Describe briefly the following cargo operations:-</p> <ul style="list-style-type: none"> • Drying; • Inerting; • Purging; • Cooling down; • Loading; • Cargo conditioning on passage; • Discharging; • Changing cargoes; • Gas freeing; • Preparing for tank inspection. <p>7.7 State that all operations involving cargo ballast and bunkers should be carried</p>					
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	out in accordance with the applicable international and local pollution regulations.					
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Programme: HND Nautical Science	Course Code: NSC 434	Contact Hours 30/Credit unit: 2
Course: Ship Stability and Structure II0	Semester: 1	Theoretical: 2 hours/week
Year: 2	Pre-requisite:	Practical: 0 hours /week

GOAL: To enable students have detailed theoretical understanding of ship stability requirement and its application on ships.

GENERAL OBJECTIVES: On completion of this course the students will be able to:

- 2.0** Know how to calculate volume and area of awkward objects.
- 3.0** Understand the effects of density on floating vessels.
- 4.0** Know the effect of heel and free surface effects on stability.
- 5.0** Understand List and its applications on ships.
- 6.0** Understand Trim and its applications on ships.
- 7.0** Understand intact stability.
- 8.0** Know action to take in the event of partial loss of intact stability.

PROGRAMME: HIGHER NATIONAL DIPLOMA IN NAUTICAL SCIENCE						
COURSE: Ship Stability and Structure			Course Code: NSC 434	Contact Hours: 2-0-0		
	THEORETICAL CONTENTS			PRACTICAL CONTENTS – No Practical		
WEEK	General Objective 1.0: Know how to calculate volume and area of awkward objects					
	Specific Learning Outcomes	Teacher’s Activities	Resources Theoretical/Practical	Specific Learning Outcomes	Teacher’s Activities	Evaluation
1 - 2	1.1 State Simpson’s Rules 1.2 Explain how to number ordinates in each rule. 1.3 Explain that errors can be reduced by using small intervals.	State Simpson’s Rules. Work exercises of each rules’ applications e.g.: (a) find area of objects. (b) find volume of objects. (c) Solve examples using 5-8-1 rule.	Ship Stability by Derret.			

	General Objectives 2.0: Understand the effects of density on floating Vessels.					
3 - 4	2.1 Define specific gravity. 2.1 State Archimedes Principle. 2.2 State Law of floatation. 2.3 Explain meaning of TPC. 2.4 Explain what is meant by F.W.A.	State the formula Specific Gravity or Relative Density. Solve exercises with the T.P.C. formula. Relate F.W.A to the load line rule.	Ship Stability by Derret.			
	General Objectives 3.0 :Know effect of heel and free surface effects on stability					
5 - 6	3.1 Explain the meaning of a free surface effect. 3.2 Explain what is meant by the term Heel. 3.3 Explain what is meant by initial KM. 3.4 Derive the following expression $KM=KB + KM, BM=1/W$. 3.5 Explain the uses of stability curves. 3.6 Explain what is meant by GZ as righting lever. 3.7 Show that GZ can also be found through Wall Side formula for large angles. 3.8 Explain KN curve. 3.9 State the uses of KN curves. 3.10 Explain the stability curves. 3.11 Explain what is positive and negative G.M.	Sketch figures to show the vertical loss of GM. Explain how it can be corrected. Relate these formula to real ship situation. Solve examples. Show that $GZ=GM \sin \theta$ for small angles i.e. 10° and below. Solve exercises involving both large and small angles. Show how to	DITTO.			

		extract information from stability curves.				
General Objectives 4.0: Understand List and its applications on ships.						
7 - 8	<p>4.1 Explain what is meant by List</p> <p>4.2 Explain different conditions of Equilibrium.</p> <p>4.1 Explain the term stiff.</p> <p>4.2 Explain the term tender ship.</p> <p>4.8 Explain Angle of Loll.</p> <p>4.9 Explain how it can be corrected.</p> <p>4.10 Explain roll period, synchronism</p> <p>4.11 of roll of a ship.</p> <p>4.12 Explain what is meant by final KG.</p> <p>4.13 Explain how it can be measured at the shipyard using inclining experiment.</p>	<p>Illustrate with sketches item 4.1 – 4.9.</p> <p>Explain the terms stable, neutral and unstable conditions.</p> <p>Relate the three conditions to ship operations e.g. loading.</p> <p>Show that angle of loll starts from negative GM.</p> <p>State several ways angle of loll can be corrected.</p> <p>Solve exercises involving final KG.</p> <p>State the precautions to be taken before and after the inclining experiment.</p> <p>State how the inclining experiment is performed.</p>	DITTO.			

	General Objectives 5.0: Understand Trim and its applications on ships					
9	<p>5.1 Explain what is meant by trim.</p> <p>5.2 Explain how change of draft can be determined.</p> <p>5.3 Explain the effect of shifting weights, loading weights and discharging weights.</p> <p>5.4 Explain loading to keep a content draft.</p> <p>5.5 Explain loading to keep a required draft.</p>	<p>Derive $GG_1 = \frac{W}{D} X$</p> <p><u>D</u></p> <p>W</p> <p>Solve exercises involving 5.2 – 5.5.</p>	DITTO.			
	General Objectives 6.0: Understand intact stability					
10	<p>6.1 Explain what is meant by bilging.</p> <p>6.2 Explain permeability.</p> <p>6.3 Explain its effect during flooding of compartment.</p> <p>6.4 Explain the effect of bilging on stability.</p> <p>6.5 Explain the above using emergencies cases like dry docking, grounding and collision.</p>	<p>Show that permeability $= \frac{B.S}{S.F} * 100$</p> <p>Explain the applications of the above formula.</p> <p>Solve exercises.</p>	DITTO.			
	General Objectives 7.0: Know action to take in the event of partial loss of intact stability					
11 - 13	<p>8.1 State the action to be taken in the event of flooding.</p> <p>8.2 State the application of cross-flooding arrangements.</p> <p>8.3 State any action required to stop or reduce the inflow of water.</p>					

Programme: HND Nautical Science	Course Code: NSC 435	Contact Hours/ 60 Credit unit: 4
Course: COASTAL NAVIGATION IV	Semester: 3	Theoretical: 4hours/week
Year: 2	Pre-requisite:	Practical: 3hours /week
GOAL: To enable students to have in-depth knowledge of Coastal Navigation.		
GENERAL OBJECTIVES 1.0: On completion of this course the students will be able to:		
<ul style="list-style-type: none"> 1.0 Know the basic application of radar plotting to special cases of ship maneuvering 2.0 Know parallel index techniques 3.0 Know the principle of planning and executing a coastal voyage 4.0 Know basic emergency maneuvering 		

General Objective: 1.0: Know the basic application of radar plotting to special cases of ship maneuvering

General Objective: 1.0: Know the basic application of radar plotting to special cases of ship maneuvering						
	THEORETICAL CONTENTS			PRACTICAL CONTENTS		
Week	Specific Learning Outcomes	Teacher's Activities	Resources Theoretical/practical	Specific Learning Outcomes	Teacher's Activities	Evaluation
1-4	1.1 Explain basic plotting techniques. 1.2 Explain the importance of the followings: (i) C.P.A; (ii) T.C.P.A; (iii) Aspect e.t.c.. 1.3 Explain how known position of a storm can be tracked. 1.4 Explain how evasive action can be monitored.	Explain basic plotting techniques. Describe what is meant by: C.P.A; T.C.P.A; Aspect e.t.c.. Show how course is altered. Show how speed is altered. Use a typical case of storm report to explain how storm can be monitored i.e. tracked. Explain the evasive actions. Explain need to continue to monitor the storm after passing it.	Plotting Sheets. Reference Textbooks. O.H.Ps. Transparencies	Use plotting sheets to show CPA, TCPA Aspect. Use Plotting to show course and speed alterations	Ensures students plots accurately	Assignment, Test and Examinations

General Objective 2.0: Know parallel index techniques

5-8	<p>2.1 Explain what is meant by parallel index techniques.</p> <p>2.2 Describe how the parallel index technique can be used to monitor the vessel's progress.</p> <p>2.3 Explain how to apply the parallel index technique for pilotage in harbor approaches.</p> <p>2.4 Explain how parallel index technique can be used to avoid a known danger along a chartered course.</p> <p>2.5 Explain how to apply parallel index technique to anchoring.</p>	<p>Illustrate with sketches learning objective 2.1 – 2.5.</p>	<p>Bridge Simulator. O.H.P.S. & Transparencies. Audio Visuals. ECDIS ARPA/RADAR</p>	<p>Use ARPA/RADAR ECDIS and Bridge simulator to demonstrate various aspect of parallel index techniques</p>	<p>Uses the Bridge Simulator ECDIS and ARPA Radar to show learning objective 2.2, 2.3, 2.4</p>	<p>Assignment, Test and Examinations</p>
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General Objective: 3.0 Know the principle of planning and executing a coastal voyage

9 - 12	<p>3.1 Explain the general philosophy of conducting a ship in coastal waters.</p> <p>3.2 Explain the types of dangers the ship is exposed to.</p> <p>3.3 Explain the importance of timing the departure to achieve passing specific areas in day light or to arrive at a particular time.</p> <p>3.4 Explain the principle of selecting alteration points that will ensure high accuracy.</p> <p>3.5 Explain the principle of tracking the vessel with the port navigation aids such as: (i) Buoys;</p>	<p>State the need to keep vessel in safe water always.</p> <p>State the need to avoid danger spots of heavy traffic or coastal activities.</p> <p>State the need to plan the voyage in such a way that the departure/arrival of port approaches will be safe.</p> <p>Explain the need to</p>	<p>Bridge Simulator. O.H.Ps. & Audio Visuals.</p>			<p>Assignment, Test and Examinations</p>
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	(ii) Light House; (iii) Transit Bearing/Object; (iv) Sector Light; (v) Beacons.	use more means to check vessel position at the point of alteration.				
General Objective 4.0 Know basic emergency maneuvering						
13-15	4.1 Explain the basic procedure of handling helicopter operations. 4.2 Explain how a basic double banking operation can be done. 4.3 Explain the principle of checking a Lee for light craft that is approaching the vessel. 4.4 Explain the principle of radar routing a vessel in poor visibility. 4.5 Explain the principle of navigation in restricted visibility. 4.6 Explain need to compare various position fixing aids to evaluate vessel safety.	State basic application of wind direction, sea state to conduct a ship for safe helicopter operation. State the bigger vessel must be the receiving ship. State that the smaller ship must be the maneuvering ship. State the need to accommodate pilot cutters, tugs and other related vessels. State how the vessels course must be preplanned to achieve a successful rendezvous. Explain the	Bridge Simulator. O.H.Ps. & Transparencies. Audio Visuals.			Assignment, Test and Examinations

		application of Collision Regulations to any prevailing situation. State the need to evaluate the related accuracy of available navigational aids to peculiar situations.				
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Programme: HND Nautical Science	Course Code: NSC 437	Contact Hours/Credit unit: 3
Course: Watch Keeping	Semester: 1	Theoretical: 2 hours/week
Year: 2	Pre-requisite:	Practical: 1hours /week
GOAL: To enable students understand basic principles of deck and navigational watch keeping.		
GENERAL OBJECTIVES		
1.0 Know basic principles of keeping a navigational watch 2.0 Understand how to keep anchor watch 3.0 Understand how to keep cargo watch 4.0 Understand how to keep port watch 5.0 Understand how to keep dry dock or lay by watch 6.0 Understand how to conduct ice and weather watch 7.0 Understand how to conduct security watch 8.0 Understand how to conduct safety watch		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN NAUTICAL SCIENCE**COURSE: WATCH KEEPING****Course Code:
NSC 438****Contact Hours: 2-0-1****THEORETICAL CONTENTS****PRACTICAL CONTENTS**

WEEK	General Objective 1.0: Know basic principles of keeping a navigational watch					
	Specific Learning Outcomes	Teacher's Activities	Resources Theoretical/Practical	Specific Learning Outcomes	Teacher's Activities	Evaluation
1 - 2	1.1 Explain the watch structure of a bridge team. 1.2 Explain the relieving systems. 1.3 Explain the role of pre-voyage meetings of the bridge team. 1.4 Explain master's night order Book. 1.5 State the importance of 1.4. 1.6 Explain the need to fill the Log Book carefully. 1.7 Explain how to hand over a watch.	Explain in detail the structure of a bridge team. Explain the issue of using more than one means to check position especially when making port approaches, during course alteration and approaching anchorage. State the need to keep a VHF	Reference Textbooks.			

		<p>watch on dual channels of 16 & 70.</p> <p>State the need for adequate rest period for watch keepers.</p>				
General Objectives 2.0: Understand how to keep anchor watch						
3	<p>2.1 Explain how to keep on anchor watch.</p> <p>2.2 Explain how to determine if the anchor is dragging.</p>	<p>State duties of Officer On Watch (OOW) during anchor watch.</p> <p>State the uses of cross and transit bearings.</p> <p>State the need to use more than one method to fix position.</p> <p>Explain the use of Radar for position monitoring.</p>	<p>Reference Textbooks.</p> <p>International Chamber of Shipping Guidelines.</p>	<p>Students to be able to use Radar in effective Bridge Watch Keeping.</p>	<p>Use Radar to illustrate various methods of position fixing and monitoring.</p>	<p>Practical Assessment.</p> <p>Tests.</p>
General Objectives 3.0 :Understand how to keep a cargo watch						

4 - 5	<p>3.1 Explain composition of a cargo watch team.</p> <p>3.2 Explain the relationship with the dock labour.</p> <p>3.3 Explain the role of Tally clerk during cargo operation.</p> <p>3.4 Explain the importance cargo plan.</p> <p>3.5 Explain the need to know how to obtain help in case of emergency.</p> <p>3.6 Explain the need for additional awareness when carrying hazardous cargo.</p>	<p>State the role of the client officer and that of the cargo officer.</p> <p>State the need to jointly inspect cargo gears and the hold before and after loading or discharge.</p> <p>Explain with sketches a typical cargo plan of a ship. Describe hazard associated with handling hazardous cargo at sea and in port.</p>	<p>Reference Textbooks.</p> <p>Pictures.</p> <p>IMDG Code Extract.</p>			
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General Objectives 4.0: Understand how to keep a port watch						
6 - 7	4.1	Explain the need to have a gangue way manned at all times.	Demonstrate with sketches items 4.1 – 4.5	Reference Textbooks.		
	4.2	Explain the need to conducting rounds.				
	4.3	Explain the need for security of crew and cargo.				
	4.4	Explain the role of drawing information on how to get port fire service, Ambulance etc.				
	4.5	Describe the importance of shore leave notice.				
General Objectives 5.0: Understand how to keep dry dock or lay by watch						
8 - 9	5.1	Explain the role of OOW during dry dock.	State the job of each key officer entering dry dock.	Reference Textbooks. International Chamber of Shipping Standards.		
	5.2	Explain how to get help during any emergency.	State the need to be vigilant and keep to yard's rule.			
	5.3	Explain the enforcement of safely rules during repairs.	Stress the importance of permit to work procedure.			
	5.4	Explain how to handle shore repair personnel and ship chandlers.	Describe Checking of store.			
	5.5	Explain roles of officers during lay by.	State how to handle repairs, personnel and ship chandlers.			
	5.6	Explain role of OOW during surveys.	Explain the need to monitor the progress of repairs.			

General Objective 6.0: Understand how to conduct ice and weather watch

10 - 11	<p>6.1 Explain the need to get information of movement of icebergs or ice accretion.</p> <p>6.2 Explain the action of OOW on obtaining information on 6.1.</p> <p>6.3 Explain the risk impose by the movement of iceberg or ice accretion.</p> <p>6.4 Explain the Need to call the master.</p>	<p>State the role of port radio on ice watch.</p> <p>Enumerate the risk posed to ships by iceberg, ice accretion, and ice park.</p>	<p>Reference Textbooks.</p> <p>Audio Visuals.</p>			
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General Objectives 7.0: Understand how to keep security watch

12 - 13	<p>4.14 Explain the need to obtain security information before arrival at port/anchorage or terminal.</p> <p>4.15 Explain the requirements of ISPS codes.</p> <p>4.16 Explain the three (3) level of security.</p> <p>4.17 Explain the importance of physical and mental alertness in security watch keeping.</p> <p>4.18 Describe various facilities/equipment used for security watch keeping.</p>	<p>State the importance of reading sailing directions and various notices prior to arrival. Use the ISPS codes to describe practical security applications. Explain the importance of general security awareness. List and explain the use of AIS, Radar, Binoculars,</p>	<p>Reference Textbook. ISPS Code Manual.</p>			
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		Lighting, Horns, Ship Engines and other shipboard facilities in security watch keeping. Explain the importance of access control on board ship.				
General Objectives 8.0: Understand how to conduct safety watch						
14 - 15	<p>8.1 Explain the risks associated with general deck work such as working aloft and on heights.</p> <p>8.2 Explain how to keep watch on personnel working on deck, aloft and on heights.</p> <p>8.3 Explain how to conduct fire rounds/watch.</p> <p>8.4 Explain the importance of watch keeping to collision avoidance at anchor.</p>	<p>Enumerate concurrent hazardous work and the management by permit.</p> <p>Emphasize the need to also keep an eye on safety-related risks while keeping other watches.</p>	Reference Textbooks.			

HND II FOURTH SEMESTER

Programme: HND Nautical Science	Course Code: NSC 441	Contact Hours/Credit unit: 2
Course: Maritime Law II	Semester: 2	Theoretical: 2 hours/week
Year: 2	Pre-requisite: NSC 432	Practical: 0 hours /week
GOAL: To enable students understand the international rules and regulations governing marine salvage, marine insurance and collision regulation.		
GENERAL OBJECTIVES: On completion of this course the student will be able to:		
1.0 Know the relevant international collision regulations.		
2.0 Understand the relevant international treaty instruments dealing with marine salvage.		
3.0 Understand the relevant international instruments dealing with limitation of liability for maritime claims, general average and marine insurance.		
4.0 Understand the rule of classification societies, certificates and documents required to be carried by ships.		
5.0 Understand the relevant international convention dealing with the carriage of passengers and their goods.		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN NAUTICAL SCIENCE						
COURSE: MARITIME LAWII			Course Code: NSC 441	Contact Hours: 2-0-0		
	THEORETICAL CONTENTS			PRACTICAL CONTENTS – No Practical		
WEEK	General Objective 1.0: Know the relevant international collision regulations					
	Specific Learning Outcomes	Teacher’s Activities	Resources Theoretical/Practical	Specific Learning Outcomes	Teacher’s Activities	Evaluation
1 - 3	1.1 Explain the provisions of the International Convention for the unification of certain rules of law with respect to collision between vessels (Collision 1910). 1.2 Discuss the provisions of the international convention for the unification of certain rules relating to panel jurisdiction in matters of collision or other incidents of navigation 1952.	Explain the provisions of the international convention for the unification of certain rules of law with respect to collision between vessels (Collision 1910). Discuss the provisions of the international convention of certain rules relating to panel	O.H.Ps. & Transparencies. International convections on relevant rules.			Tests Assignment Examination

		jurisdiction in matters of collision or other incidents of navigation 1952.				
General Objectives 2.0: Understand the relevant international treaty instruments dealing with marine salvage						
4 - 6	2.1 Interpret the international convention for the unification of certain rules of law relating to assistance and salvage at sea (Assistance and Salvage 1910). Discuss the Lloyds standard form of salvage Agreement (LOF 1990).	Explain the international Convention for the unification of certain rules of law relating to assistance and salvage at sea (Assistance and Salvage 1910). Discuss the Lloyds standard form of salvage agreement (LOF 1990).	Assistance and Salvage, 1910. Lloyds standard form of salvage agreement (LOF, 1990).			
General Objectives 3.0 :Understand the relevant international instrument dealing with limitation of liability for maritime claims, general average and marine insurance						
7 - 9	3.1 Explain the provisions of the convention on limitation of liability for Maritime claims (LLMC 1976) 3.2 Define a General Average Act. 3.3 Explain the provision of the York-Antwerp rules, 1974 regard general average.	Explain the provision of the convection on limitation of liability for Maritime claims (LLMC 1976). Define general average Act. Explain the	Reference Textbooks.			

	<p>3.4 Explain voyage policies, time policies and floating policies.</p> <p>3.5 Explain why a deviation clause will often permit the assured to extend his cover at a premium to be arranged as long as the insurer is given prompt notice of the deviation (“Held covered” Clause).</p> <p>3.6 Explain the function of the P and I clubs.</p>	<p>provisions of the York-Antwerp rules.</p> <p>Explain voyage policies, time policies ,floating policies.</p> <p>Explain why a deviation clause will often permit the assured to extend his cover at a premium to be arranged as long as the insurer is given prompt notice of the deviation (“Held covered” clause).</p> <p>Explain the function of the P & I clubs.</p>				
General Objectives 4.0: Understand the role of classification societies and certificates and documents required to be carried by ships						
10 - 12	<p>4.1 Explain the reasons for classifying a ship with a classification society.</p> <p>4.2 Examine the functions of classification societies in equipment manufacture.</p> <p>4.3 List the various types of surveys undertaken by classification societies.</p> <p>4.4 List the various certificates required to be carried as provide by international conventions and</p>	<p>Explain the reasons for classifying a ship with a classification society.</p> <p>Examine the functions of classification societies in equipment manufacture and operation.</p> <p>List the various types</p>	Lloyds and American Bureau of shipping (ABS) classification rules.			

	<p>state their periods of validity.</p> <p>4.5 State their period of validity.</p> <p>4.6 List arrival documents and procedures.</p>	<p>of surveys undertaken by classification societies.</p> <p>List the various certificates required to be carried as provided by international convention.</p> <p>State their periods of validity.</p> <p>List arrival documents and procedures.</p>				
General Objectives 5.0: Understand the relevant international conventions dealing with the carriage of passengers and their goods.						
13 - 15	<p>5.1 Analyze the Special Trade Passenger ships agreement 1971 and related duties rules.</p> <p>5.2 Explain the protocol and rules on space requirements for special trade passenger ships (SPACE STP 1973).</p> <p>5.3 Explain the Athens convention relating to the carriage of passengers and their Luggage by sea (PAL 1974).</p> <p>5.8</p>	<p>Analyze the Special Trade Passenger ships agreement, 1971 and related duties that may be assigned.</p> <p>Explain the protocol and rules on space requirements for Special Trade Passenger ships (SPACE STC, 1973).</p> <p>Explain the Athens convention relating to the carriage of passenger and luggage by sea (PAL, 1974).</p>	<p>Special trade passenger ships agreement, 1971.</p> <p>Protocol and rules on space requirements for STP ships.</p> <p>Athens convention</p>			

Programme: HND Nautical Science	Course Code: NSC 442	Contact Hours/Credit unit: 3
Course: Emergency Procedure	Semester: 2	Theoretical: 3 hours/week
Year: 2	Pre-requisite:	Practical: 0 hours /week
GOAL: To enable students have basic understanding of shipboard emergencies, emergency management preparedness and procedures on the ships.		
GENERAL OBJECTIVES: On completion of this course the student will be able to:		
1.0 Understand contingency plans for response to emergencies. 2.0 Know how to beach a vessel. 3.0 Understand actions to be taken on stranding of a ship. 4.0 Understand to be taken on collision of ship(s). 5.0 Know the precautions for the protection and safety of passengers on emergency. 6.0 Know the means of limiting damage and salvaging a ship after fire or explosion. 7.0 Know the procedure for abandoning a ship. 8.0 Know how to rescue a person from a vessel in distress or from a wreck. 9.0 Know man over board procedures. 10.0 Know action to be taken when there are emergencies in port.		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN NAUTICAL SCIENCE						
COURSE: Emergency Procedure		Course Code: NSC 442		Contact Hours: 3-0-0		
	THEORETICAL CONTENTS			PRACTICAL CONTENTS – No Practical		
WEEK	General Objective 1.0: Understand contingency plans for response to emergencies					
	Specific Learning Outcomes	Teacher’s Activities	Resources Theoretical/Practical	Specific Learning Outcomes	Teacher’s Activities	Evaluation
1 - 2	1.1 Explain the contents of muster list. 1.2 List the duties assigned for the operation of theremote controls. 1.3 State divisions of the crew during emergency. 1.4 State the composition of emergency teams. 1.5 State importance of good communication during emergency. 1.6 State actions to take during fires in specific areas-galley, accommodation, engine room, etc. 1.7 State the importance of drills and practices. 1.8 State role of a ship board safety committee in contingency planning.	Show a sample of list used on board. Emphasize the need to have a muster list drawn. State the need for regular drills on board. Show samples of training manuals. Demonstrate the action of fire extinguishing system. State those small fires could be tackled to avoid same getting out of control show what benefits in practicing drills, demonstration of	Video clips, O.H.Ps. & Transparencies. Reference Textbooks. Sample of Boat Drills/Muster List. Trip to Ship			

		boat drills. Explain the purpose and usefulness of safety committee to ship and management.				
General Objectives 2.0: Know beach a vessel						
3	2.1 Explain the concepts of beaching of a vessel. 2.2 Describe the factors to consider before beaching a vessel. 2.3 Explain the rigging of a ground tackle.	List precaution to take before beaching. Describe what may lead to beaching a vessel. State the dangers of not selecting a suitable beach for beaching.	Video Clips, O.H.Ps. & Transparencies .			
General Objectives 3.0 :Understand actions to be taken on stranding of a ship						
4	3.1 Explain stranding and circumstances under which stranding can occur. 3.2 State what actions to take when Stranding occurs. 3.3 State action to assist further refloating:- use of Tugs, Movement of ballast, Ground tackles, etc. 3.4 Describe the use main engines :- danger of silt building up.	Define stranding. State what may lead to stranding. Explain that stranding will result in damage to vessel. Discuss the legal implication. Describe ground tackles.	Reference Textbooks. O. H. Ps. & Transparencies . Video Clips etc.			

General Objectives 4.0: Understand action to be taken on collision of ships					
5	<p>4.1 Explain what actions to be after collision.</p> <p>4.2 Describe what measures to limit danger to own vessel.</p> <p>4.3 Describe legal implications and what penalty to master for breaching such requirements.</p>	<p>State what may lead to collision.</p> <p>Identify actions to take to reduce risk of foundering.</p> <p>State the legal implications. State information to be exchanged by both masters.</p>	<p>Reference Textbooks on collision Regulations. Publications on IMO Procedure on collision ICS publication on Bridge Procedure.</p>		

General Objectives 5.0: Know the precautions for the protection and safety of passengers in emergency						
6	<p>5.1 State that some crew members would be assigned specific duties in relation to passengers during emergency situation.</p> <p>5.2 List these duties as:</p> <ul style="list-style-type: none"> -Warning the passengers, -Ensuring that all passengers spaces are evacuated, -Guiding passengers to muster stations, -Maintaining discipline in the passageways, stare ways and doorways, -Checking that passengers are suitably clotted and that life jackets are correctly donned, -Taking a role call of passengers, -Instructing passengers on procedures for boarding survival craft or jumping in to the sea, -Directing passenger to embarkation points, -Instructing passengers during drills, -Ensuring that a supply of blankets is taking to the survival craft. 	Explain the duties as in 5.1.	Copy of the muster list			

General Objectives 6.0: Know the means of limiting damage and salvaging a ship from a fire or explosion						
7 - 8	<p>6.1 Describe methods of fighting fires.</p> <p>6.2 State need to keep compartment Boundaries cool.</p> <p>6.3 Explain the dangers of accumulated water from</p> <p>6.4 Fire fighting and how to deal with it.</p> <p>6.5 Explain need to maintain watch for re-ignition.</p> <p>6.6 Describe precautions to take before entry into a Compartment where fire has been extinguished.</p> <p>6.7 Describe the inspection for damage.</p> <p>6.8 State that continues watch should be kept on the damage areas and temporary repairs.</p>	<p>Define Fire Triangle.</p> <p>Explain the purpose of boundary cooling</p> <p>– spread of the fire to adjacent compartments.</p> <p>State that accumulation of water will affect vessel’s stability.</p> <p>Explain that fires re-ignite if conditions are conducive.</p> <p>Describe dangers of entering unventilated space after the fire.</p>	<p>Audio Video Clips</p> <p>O.H.Ps& Transparencies</p> <p>.</p> <p>IMO Model Course 2.03</p> <p>Reference Textbooks</p> <p>Atmospheric testing equipment e.g. oxygen meter.</p>			

	General Objectives 7.0: Know the procedure for abandoning ship					
9 - 10	<p>7.1 Explain the circumstances that may lead to or 'abandoned ship'.</p> <p>7.2 State the procedure.</p> <p>7.1 Describe the messages to be sent.</p> <p>7.2 Describe the launching of survival boats and life rafts in heavy weather.</p> <p>7.3 Describe the launching of life boat when the ship is listing.</p> <p>7.4 Describe the use of oil to calm the sea surface.</p>	<p>State that fires can get out of control.</p> <p>State that ingress of water may be more than the pumps can cope with.</p> <p>Describe the different distress messengers.</p> <p>Explain methods of launching survival crafts.</p> <p>Explain the use of oil to calm the sea.</p>	<p>Video Clips of rescue operations using ships.</p> <p>Life Boat/Life Raft launching procedure display.</p>			
	General Objectives 8:0 Know how to rescue a person from a vessel in distress or from a wreck					
11 - 12	<p>8.1 State the actions to take to rescue person from a wreck or distressed Vessel.</p> <p>8.2 Explain the need to wait for daylight if there is no immediate danger.</p> <p>8.3 State precautions to take to maneuver boats to recover survivors.</p>	<p>State precautions to take lower boat taking into account wind/current.</p> <p>Describe how to create Lee.</p>	<p>Overhead Projector.</p>			

General Objectives 9.0: Know man over board procedures					
13	<p>9.1 Explain the actions to take when a man falls.</p> <p>9.2 State consequences of delayed action.</p> <p>9.3 Describe the various maneuvers used for search and rescue.</p> <p>9.4 Describe the merits of each maneuver.</p> <p>9.5 Explain factors that determine the best maneuver to return vessel to its original position.</p>	<p>Describe various types of maneuvers to rescue a man over board.</p> <p>Compare Williamson turn with single turn procedure.</p> <p>Show on a diagram the merits/demerits of each maneuver.</p>	<p>Reference Textbooks.</p> <p>Quick Release man over board smoke signal.</p>		

General Objectives 10.0: Know actions to be taken when there are emergencies in port						
14 - 15	10.1	Describe actions to take in the event of fire on ship.	Explain that shore authority be informed.	Reference Textbooks.		
	10.2	Describe actions to take when fire occurs on nearby ship or adjacent port facility.	State that fire plan should be made available.			
	10.3	State the need to leave when own ship is in danger.	Explain the need to assist without putting your ship in danger.			
	10.4	State actions to take to avoid ship dragging anchor towards own ship.	Explain need for good anchor watch.			
	10.5	State actions to take when submarine cable is lifted by anchor.	State the need not to anchor near submarine cables.			
	10.6	Describe how to buoy and slip the anchor.	Show by sketch how a cable can be slipped from the anchor.			
	10.7	Describe how to recover an anchor without power on windlass.	State why the anchor has to be slipped and the need to recover it. Explain the manpower or tackle can be used.			

Programme: HND Nautical Science	Course Code: NSC 443	Contact Hours 45 /Credit unit: 3
Course: Meteorology and Oceanography	Semester: 2	Theoretical: 2 hours/week
Year: 2	Pre-requisite:	Tutorial: 1 hours /week
GOAL: To enable students understand the basic concept of atmospheric and oceanographic science with the strategic applications of their effect on navigation.		
GENERAL OBJECTIVES: On completion of this course the student will be able to:		
1.0 Understand climatology. 2.0 Know tropical revolving storms. 3.0 Understand the behavior and properties of ocean current. 4.0 Know the properties and behavior of waves. 5.0 Understand the effect of sea ice on navigation. 6.0 Understand the concept of an air mass and its effect on weather. 7.0 Understand the process of weather forecasting.		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN NAUTICAL SCIENCE						
COURSE: Meteorology and Oceanography		Course Code: NSC 443		Contact Hours: 2-1-0		
THEORETICAL CONTENTS				PRACTICAL CONTENTS – No Practical		
WEEK	General Objective 1.0: Understand climatology					
	Specific Learning Outcomes	Teacher's Activities	Resources Theoretical/Practical	Specific Learning Outcomes	Teacher's Activities	Evaluation
1 - 2	1.1 Describe the general distribution of sea surface temperature over the oceans. 1.2 List the areas and season in which a high increase of sea fog can be expected. 1.3 Describe in general terms the pattern of cloud and rainfall over the ocean.	Discuss the areas and seasons with a high incidence of sea fog.	Reference Textbooks. Diagrams. Charts. "Temperature" by Alan Rodger "Precipitation" by Alan Rodger			

General Objectives 2.0: Know tropical revolving storms						
3 - 5	2.1 Explain tropical revolving storm. 2.2 Describe the pattern and characteristics of 2.1. 2.3 Describe the conditions necessary for a tropical storm to develop. 2.4 State the weather signs of the approach of a tropical storm. 2.5 Mention areas and times where tropical storm frequently occurs. 2.6 Describe the behavior of tropical revolving storms in each hemisphere. 2.7 Explain the early detection of a tropical revolving storm. 2.8 Explain action to take to avoid the storm centre. 2.9 List the information which should be included in a report of a tropical revolving storm.	Illustrate with sketches item 2.1 – 2.9.	Reference Textbooks. Diagrams. “The Perfect Storm” by Sebastian Tunger “ Into the Storm” by Reed Timmer			
General Objectives 3.0: Understand the behavior and properties of ocean current						
6 - 8	3.1 Explain the term Ocean Current. 3.2 state the characteristics of ocean current. 3.3 Describe the Global wind system. 3.4 Describe the system of the oceans. 3.5 Describe the current systems of North Atlantic Ocean, North Indian Ocean etc. 3.6 Explain the interrelationship between	Explain with aid of sketches items 3.1 – 3.7.	Diagram. Routine Charts. Reference Textbooks. Ocean			

	the global wind system and the current system. 3.7 Differentiate between tidal current & ocean current.		Circulation (2 nd Edition) by Angela Collin			
General Objectives 4.0: Know the properties and behaviour of waves						
9	4.3 Explain the formation of waves. 4.4 Define the speed, length, period, height, significant height, duration and fetch of a wave. 4.5 Distinguish between waves and swell.	Illustrate with sketches 4.1 – 4.3.	Wave Diagrams. Reference Textbooks. Swell: A year of waves by Evan Slater			
General Objectives 5.0: Understand the effect of sea ice on navigation						
10	5.1 Explain the formation of sea ice. 5.2 State the types of sea ice i.e. fast ice, floe ice, pack ice, ice berg etc. 5.3 Explain the formation of ice accretion. 5.4 Explain the dangers pose by 5.2 and 5.3.	Illustrate with sketches 5.1 – 5.4.	Reference Textbooks. Maps and Pictures. Beyond the Sea of Ice by William Sarabande			

	General Objectives 6.0: Understand the concept of an air mass and its effect on weather					
11 - 12	6.1 Define air mass and its source region. 6.2 Describe the weather experienced during the passage of a cold and warm fronts. 6.3 Identify the symbols used to denote warm and cold front on weather map. Define warm and cold front.	Explain with sketches 6.1 – 6.4.	Reference Textbooks. Code and Decode Books. Weather Maps			
	General Objectives 7.0: Understand the process of weather forecasting					
13 - 15	7.1 Explain the codes on synoptic chart. 7.2 Describe analysis of a synoptic chart. 7.3 Estimate areas of expected precipitation of fog. 7.4 Estimate areas of expected icing. 7.1 Forecast weather for an area with synoptic chart.	Explain with Charts item 7.1 – 7.5.	Reference Textbooks. Synoptic Charts			

Programme: HND Nautical Science	Course Code: NSC 444	Contact Hours 60/Credit unit: 4
Course: VOYAGE PLANNING	Semester: 4	Theoretical: 2hours/week
Year: 2	Pre-requisite:	Practical: 2hours /week
GOAL: To enable students have clear understanding of Voyage conception, Planning, execution, assessment and reporting with due consideration to timeliness and safety.		
GENERAL OBJECTIVES 1.0: On completion of this course the student will be able to:		
1.0 Know the initial steps of planning voyage 2.0 Know how to use publication for voyage planning 3.0 Know how to plan the passage 4.0 Comprehend how to write voyage report 5.0 Know the keeping of log 6.0 Know passage planning for all conditions 7.0 Know routing in accordance with the general principles on ship routing		

General Objective: 1.0: Know the initial steps of planning voyage						
	THEORETICAL CONTENTS			PRACTICAL CONTENTS		
Week	Specific Learning Outcomes	Teacher's Activities	Resources Theoretical/practical	Specific Learning Outcomes	Teacher's Activities	Evaluation
1	1.1 Explain the need for over-viewing last voyage. 1.2 State the importance voyage meeting. 1.3 State need to develop Repair and Supply List. 1.4 Explain the need to assemble all information e.g. Next port, next cargo, agent contact telephone, telex or fax.	Explain the need to Over-View last voyage report. State the need to assemble all relevant information.	Reference Textbooks.			Assignment, Test and Examinations
General Objective 2.0: Know how to use publication for voyage planning						
2	2.3 List all the Nautical Publications. 2.4 Explain how the information are used to plan a voyage.	Explain how to extract information from the publication. Explain how the information are used.	Reference Textbooks. Sample of publications.			Assignment, Test and Examinations
General Objective: 3.0 Know how to plan the passage						
3-5	3.1 Explain that a voyage is made up of initial port, departure, ocean passage and final port approach.	Discuss each leg greatly into details showing how	Sample of every Nautical Publications	Students should have clear understanding of how to plan a voyage	Use chart catalogue in chart selection.	Assignment, Test and

	<p>3.2 Explain chart selection process.</p> <p>3.3 Explain that course must be laid in advance.</p> <p>3.4 Explain the use of routing charts/Navtex for weather information.</p> <p>3.5 Explain the use of planning sheets.</p> <p>3.6 Explain how to track cyclone or tropical revolving storm.</p> <p>3.7 Explain basic application of ocean current direction to planned course.</p>	<p>important it is to the entire voyage. Show the use of chart catalogue, chart index, folio and consecutive numbers. Show print out of the Nav. Tex. Explain the use of every information contained in the print out. Show how the routing charts are use in the course of a voyage. Use an example to explain the uses of planning sheets. Use basic and relevant Nav. Warnings to lay an evasive track for the ship.</p>	<p>that is used to plan a Voyage.</p> <p>Reference Textbooks.</p>	<p>using all appropriate resources</p>	<p>Demonstrate the use of routing chart and interpret various voyage related messages</p>	<p>Examinations</p>
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General Objective 4.0 Comprehend how to write voyage report						
6	4.1 Explain the role of voyage reports 4.2 Explain what constitute voyage reports	Choose a case study and write out a voyage report. Itemise what constitute a voyage report.	-Text Books			Assignment, Test and Examinations
General Objective 5.0 Know the keeping of log						
7	5.1 Explain how to keep a proper log in accordance with maritime shipping acts and other laws and regulations.	Identify the various log books required in the deck department. Show the proper method of making entries.	Samples of extracts from various log books. Reference Textbooks.			Assignment, Test and Examinations
General Objective 6.0 Know passage planning for all conditions						
8-12	6.1 Describe planning of navigation in restricted water by day, using terrestrial observations such as bearings of lighthouses, beacons and buoys in conjunction with	With aids of learning aids describe in detail	Mercator Charts. Routeing Charts.	Students should have a clear understanding of how to plan passage in restricted waters and various sea conditions	Use audio visual system to illustrate the movements of	Assignment, Test and Examinations

	<p>appropriate charts, sailing directions and other publications.</p> <p>6.2 Describe planning of navigation in restricted waters by night, using the same navigation means as the above objective but with special emphasis on the characteristics, colours and sectors of lights.</p> <p>6.3 Explain planning of navigation in restricted visibility, with special emphasis on navigation in coastal waters and in areas of heavy traffic, including the use of radar, with its possibilities and limitations.</p> <p>6.4 Explain planning of navigation in traffic separation schemes in accordance with routing instructions.</p> <p>6.5 Plan navigation in ice.</p> <p>6.6 Determine the change of date on crossing the International Date Line.</p>	6.1 – 6.6.	<p>Reference Textbooks.</p> <p>Admiralty List of Lights.</p> <p>Audio visuals</p>		<p>ship in various sea condition and geographical limitations</p>	ions
General Objective 7.0 Know routing in accordance with the general principles on ship routing						
13-15	<p>7.1 Explain the use of ocean passage for the world.</p> <p>7.2 Use pilot charts and other publications such as sailing directions, Notices to Mariners and the like to determine areas of ice and iceberg.</p> <p>7.3 Use pilot charts and other information sources to determine</p>	<p>Explain in detail</p> <p>7.1 – 7.5.</p>	<p>Routeing Charts.</p> <p>Load line Charts.</p> <p>Ocean Passages</p>			<p>Assignment, Test and Examinations</p>

	<p>areas in which visibility is likely to be reduced.</p> <p>7.4 Demonstrate an ability to choose or select a route taking into account distance, wind, sea states, current, ice, iceberg, bad visibility, the nature of the cargo, load lines, crew agreements, etc.</p> <p>7.5 Explain the principle of weather routing.</p>		<p>of the World.</p> <p>Reference Textbooks.</p>			
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Programme: HND Nautical Science	Course Code: NSC 445	Contact Hours 45	Credit unit: 3
Course: SEARCH AND RESCUE	Semester: 4	Theoretical: 2hours/week	
Year: 1	Pre-requisite: SEAMANSHIP III	Practical: 1hours /week	
GOAL: To enable students have a clear operational over view of the search and rescue system with its proficient applicability to shipping.			
GENERAL OBJECTIVES 1.0: On completion of this course the student will be able to:			
1.0 Understand the outline of SAR Administration 2.0 Know SAR communication 3.0 Know SAR international provision 4.0 Understand SAR Navigation 5.0 Understand SAR operation and public relation 6.0 Know operating procedure 7.0 Understand SAR resources and search pattern 8.0 Understand ship reporting system 9.0. Know SAR Meteorology			

General Objective: 1.0: Understand the outline of SAR Administration						
	THEORETICAL CONTENTS			PRACTICAL CONTENTS NOT REQUIRED		
Week	Specific Learning Outcomes	Teacher's Activities	Resources Theoretical/practical	Specific Learning Outcomes	Teacher's Activities	Evaluation
1	1.1 Explain SAR Administration. 1.2 Identify responsibilities of RCC. 1.3 Identify the responsibilities of SAR, organization and co-ordination of SAR. 1.4 Explain the co-ordination of RCC/OSC/CSS in a major operation. 1.5 Explain SAR policy and administrative policy.	Explain using SAR organogram (Chart) the structure of SAR Administration. Explain the responsibilities of RCC/OSC/CSS, etc.	Test Books, IMO Mode Course 2.02, Diagrams ,etc.			Assignment, Test and Examinations
General Objective:2.0 Know SAR communication						
2-4	2.1 Explain SAR Communication. 2.2 Describe Maritime terrestrial communication. 2.3 Explain Global maritime distress and safety system (GMDSS) 2.4 State the Minimum requirement for SAR Communication Network.	Explain to students: - distress alerting - communication a. ship-to-shore b. ship-to-ship c. shore to-ship	IMO Model Course 2.02 Audio Visual Aids Reference Textbooks.	To clearly understand the proficient application of the GMSSS to SAR communication	Use audio visual system to illustrate the application of GMDSS to SAR operations	Assignment, Test and Examinations

General Objective: 3.0 Understand SAR Navigation						
5-6	3.1 Explain SAR International Provision. 3.2 Outline the contents of International Conventions and Maritime SAR 1979. 3.3 Outline the contents of Merchant Ship SAR manual. 3.4 State SAR Annex to ICAO Convention and manual. 3.5 State International Organization relevant to SAR function.	Explain: - International Convention on SAR 1979. - Merchant Ship SAR Manual - SAR Annex to ICAO Convention etc.	IMO Model Course 2.02 Reference Text books.			Assignment, Test and Examinations
General Objective 4.0 Understand SAR international provision						
7-8	4.1 Explain SAR Navigation. 4.2 Describe Navigational aspects affecting SAR. 4.3 Explain Chart work and Plotting. 4.4 Explain Set and Drift.	Demonstrate: - aspects affecting navigation in SAR operation. - display of charts	Audio Visual Aids. IMO Model Course 2.02 Reference Textbooks.			Assignment, Test and Examinations
General Objective 5.0 Understand SAR operation and public relation						
9-10	5.1 Explain SAR operations and public relation.	Explain: - emergency	Audio Visual			

	<p>5.2 Identify the emergency phases.</p> <p>5.3 Describe the surface rescue equipment and methods.</p> <p>5.4 Describe the contingency plans for dealing with major crises.</p> <p>5.5 Describe reporting, recording, abbreviation procedures.</p> <p>5.6 Explain day-to-day media relation.</p> <p>5.7 State that for SAR organization needs a formulated policy for the release of information.</p> <p>5.8 Explain the major factors to be considered when drawing up a policy.</p>	<p>phases</p> <ul style="list-style-type: none"> - surface rescue equipment and methods. - contingency plans - reporting, recording, abbreviation Procedures. - Explain SAR organization formulated policy for release of SAR information. - State major factors to be considered when formulating or drawing up a policy. 	<p>Aids.</p> <p>IMO Model Course 2.02.</p> <p>Reference Text books. pictures</p>			<p>Assignment, Test and Examinations</p>
General Objective 6.0 Know operating procedure						
11	<p>6.1 Describe operating procedures.</p> <p>6.2 Describe Lookout procedure.</p> <p>6.3 Explain Surface rescue operation of survivors.</p> <p>6.4</p>	<p>Demonstrate:</p> <ul style="list-style-type: none"> - operating procedure - lookout procedure - recording - surface rescue 	<p>Audio Visual Aids.. IMO Model Course 2.02.</p> <p>Reference Textbooks.</p>			<p>Assignment, Test and Examinations</p>

		operation of survivors.	MERSER Manual.			
General Objective 7.0 Understand SAR resources and search pattern						
12-13	<p>7.1 Explain SAR Resources and Search Patterns.</p> <p>7.2 Identify the role of other SAR organizations.</p> <p>7.3 Analyze the provision of supplies and survival equipment.</p> <p>7.4 Explain SAR training and qualification.</p> <p>7.5 Describe Search Areas.</p> <p>7.6 Describe most probable position (MPP).</p> <p>7.7 Describe basic search patterns.</p> <p>7.8 Describe air search patterns.</p>	<p>Explain:</p> <ul style="list-style-type: none"> - SAR resources - Search patterns - Identify the role of other organization. 	<p>Audio Visual Aids.</p> <p>IMO Model Course 2.02.</p> <p>Reference Textbooks.</p> <p>MERSER Manual.</p>			Assignment, Test and Examinations
General Objective 8.0 Understand ship reporting system						
14	<p>8.1 Explain Ship Reporting System.</p> <p>8.2 Explain the IMO recommendation on reporting system and the AMVER System.</p>	<p>Explain the IMO recommendation on reporting system and the AMVER System.</p>	<p>Audio Visual Aids. IMO Model Course 2.02.</p> <p>Reference Textbooks.</p>			Assignment, Test and Examinations

General Objective 9.0 Know SAR Meteorology

15	9.1 Describe SAR Meteorology. 9.2 Describe the effects of weather (wind) on SAR operations. 9.3 Explain the interpretation of weather, maps, local weather phenomena.	Explain: - the effects of weather (wind) on SAR operations. - the interpretation of weather maps, local weather Phenomena.	Audio Visual Aids. IMO Model Course 2.02. Reference Textbooks.	Clearly display the ability to read and interpret weather maps	Demonstrate the reading and interpretation of weather maps	Assignment, Test and Examinations
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