



GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH

MINISTRY OF SHIPPING



Bangladesh Marine Academy

(A branch of World Maritime University, Malmo, Sweden since 1990)

(Affiliated to Bangabandhu Sheikh Mujibur Rahman Maritime University since 2013)

Proposal for conversion of 3-years Bachelor of Maritime Science (Nautical)
Degree into 4 –years B.Sc (Honors), Nautical Science degree under
Bangabandhu Sheikh Mujibur Rahman Maritime University

Date: 07 January 2016



BRIEF DETAILS AND SYLLABUS OF **B.Sc(HONORS).NAUTICAL SCIENCE UNDER BSMRMU**

1.Duration and Total credits

The B.Sc(Honors), Nautical Science degree spread over 4-years and carry a total of 162 Credits. There will be 100 marks for each credit which will consists of 1 (one) class hour per week for theoretical subjects and 2 (two) class hour per week for practical/sessional subjects for a period of 1(one) term.

There will be two terms (Term 1 and Term 2) in each academic year. The duration of each term will be of 18 weeks, which will be used as follows:

Classes	14 weeks
Recess before term final examination	2 weeks
Term final examination	2 weeks

Each term will consist of 26 credits and third year on board or practical field training will consist of 6 credits. Each cadet should complete minimum 500 hours work load in each term. The workload indicates the time cadets typically need to complete all learning activities (such as lectures, seminars, projects, practical work, self study and examinations) required to achieve the expected learning outcomes.

2. Year 1 & 2

The 1st term period will be February to June and 2nd term period will be July to December for the 1st and 2nd year. Weekly classes will be in 5 days and 5 hrs per day will be theoretical class (0815 hrs to 1315 hrs) and practical / demonstration classes will be 2 hrs (1415 hrs to 1615 hrs) .



3. Year 3

The 3rd year period will be covered on board by completion of 12 months practical sea time under supervision of on-board management level officers of the respective ship or in any dockyard, shipbuilding yard, ship-owner or ship manager's office as approved by the BSMRU.

4. Year 4

The 1st and 2nd term of 4th year period will start from first week of April and October and will be completed on August and February in each academic year.

5. Time Limits for completion of the Bachelor Degree :

A student must complete his/her studies ie complete 162 credits within a maximum period of 8 years.

6. Course Code and Numbering system :

The entire programme is covered through a set of theoretical and sessional courses. The course number is designated by BNS followed by four digit and name of the course. The BNS will correspond to the Nautical Department and the first digit will correspond to the Year and second digit will correspond to the term and third and fourth digit to identify the various courses. The last digit will usually be odd for theoretical and even for laboratory courses.



7. Grading System

The grading system throughout the programme will be as follows:

Numerical Grade	Letter Grade	Grade Points(GP)
80% and above	A+ (A Plus)	4.00
75% to 79%	A(A Regular)	3.75
70% to 74%	A-(A Minus)	3.50
65% to 69%	B+(B Plus)	3.25
60% to 64%	B(B Regular)	3.00
55% to 59%	B-(B Minus)	2.75
50% to 54%	C+(C Plus)	2.50
45% to 49%	C(C regular)	2.25
40% to 44%	D	2.00
Less than 40%	F	0.00

8. Calculation of GPA

Grade Point Average (GPA) is the weighted average of the grade points obtained in all the courses passed/completed by a student. For example, if a student passes/completes five courses in a term having credits of C1, C2, C3, C4, and C5 and his grade points in these courses are G1, G2, G3, G4, and G5, respectively then:

$$GPA = \frac{\sum C_i G_i}{\sum C_i}$$

$$\sum C_i$$

9. GPA Requirements for obtaining Graduation

The Minimum CGPA requirement for obtaining bachelor's degree in Nautical science is 2.25.

10. Distribution of Marks

Thirty percent (30%) of marks shall be allotted for continuous assessment, i.e., quizzes and homework assignments, in class evaluation and class participation. The remainder



of the marks will be allotted to TERM FINAL examination which will be supervised by Bangabandhu Sheikh Mujibur Rahman Maritime University. The distribution of marks for a given course will be as follows:

Serial no.	Examination type	Weightage
1.	Class Participation	10%
2.	Homework Assignment and Quizzes	20%
3.	Final Examination (3 hours)	70%
4.	Total	100%

11. Time Duraton for written examinations

The time duration for written term end final examination of all the 2(two) and 3(three) credit course will be 3(three) Hours.

12. Earned Credits

The courses in which a student has obtained 'D' or a higher grade will be counted as credits earned by him/her. Any course in which a student has obtained 'F' grade will not be counted towards his/her earned credits. A student who obtains 'F' grade in a minimum two Course in any term will have to appear the examination of same course in subsequent years. If a student obtains 'F' grade in more than two courses or earn GPA 2.5 in any term will not be allowed to promote in next term but to continue the full course of that term in subsequent year. "F" grade will not be counted for GPA calculation but will stay permanently on the Grade Sheet and Transcript. When a student will repeat a course in which he / she previously obtained 'F' grade, he/she will not be eligible to get a grade better than 'B' in such a course. If a student obtains a grade lower than 'B' in a course, he/she will be allowed to appear the examination of the same course only once for the purpose of grade improvement by forgoing his/her earlier grade, but he/she will not be eligible to get a grade better than 'B' in such a course. A student will be permitted to repeat for grade improvement purposes a maximum of four courses. If a student obtains 'B' or a better grade in any course, he/she will not be allowed to repeat the course for the purpose of grade improvement.



13. Performance Evaluation

The performance of a student will be evaluated in terms of two indices, viz. term grade point average, and cumulative grade point average, which is the grade average for all the terms.

The term grade point average is computed by dividing the total grade point earned in a term by the number of term hours taken in that term. The overall or cumulative grade point average (CGPA) is computed by dividing the total grade points accumulated up to date by the total credit hours earned.

14. Attendance, Conduct, Discipline etc.

All students are expected to attend classes regularly. The first responsibility of a student is to attend classes regularly, and one is required to attend at least 60% of all classes held in every course. A student should not be absent from quizzes, tests, etc. during the term. Such absence will naturally lead to reduction in points/marks which count towards the final grade. Absence in Term Final Examination will result in 'F' grades. A student who has been absent for short periods, up to a maximum of three weeks due to illness, should approach the course in charge or head of the department for a make-up quizzes or assignments immediately on returning to the classes.

15. Programme Monitoring Committee :

To keep pace with new developments of the Maritime science and technology, the University will update the course curriculum at frequent intervals (at least every three years). Such updating will aim not only to include expanding frontiers of knowledge in the maritime field but also accommodate the changing social, industrial and professional needs. This will be done through deletion and modification of some of the courses and also through the introduction of new ones. With this view, the university will constitute a programme monitoring committee with representatives from Bangladesh Marine



Academy and Department of Shipping. The committee will monitor and evaluate the performance of the course. The committee may also propose from time to time to the University any changes and modifications needed for upgrading the curriculum and the course system.

16.Procedure to complete 3rd Year :

Each cadet must serve in ocean going merchant vessel for 12 months, which should be recorded in the Continuous Discharge certificate (CDC) book and the training is documented in an approved training record book.

As an alternative of the On board training cadets may perform 12 months apprenticeship in a Ship Owner, Managers or Agents company, Port Authority, Shipyard, Dry-dock, marine workshop, coastal ships of 500 GT and above and any other similar organization approved by the authority.

The assessment of the 3rd year will be conducted on Training Record Book, assignments and by one oral examination. For Training record book the marks allocated will be 200, submission of various assignments or drawing of the ship will be 200 marks and the oral examination will be 200 Marks.

17. Name of the Certificate :

After successful completion of the 4 year programme and 162 credits the students will be issued a certificate as follows :

- a) Bachelor of Science(honors), Nautical science for those completed 3rd year on board.
- b) Bachelor of Maritime Science(honors),Nautical for those completed 3rd year in alternative method.



TERM WISE SUBJECT LIST WITH CREDIT POINT,
CONTACT HOUR AND MARKS ALLOCATION

1st Year 1st Term

Course No	Course Title	Credit	Hour	Mark
BNS 1101	English	2	28	200
BNS 1103	Applied Physics Paper - 1	2	28	200
BNS 1105	Applied Mathematics Paper-I	2	28	200
BNS 1107	Bangladesh Studies and Emergence of maritime sector in Bangladesh	2	28	200
BNS 1109	Managerial Economics	2	28	200
BNS 1111	Principles of Ship Construction	3	42	300
BNS 1113	Principles of Sailings	3	42	300
BNS 1115	Maritime Geography and Oceanography	2	28	200
BNS 1117	Shipboard Operation	2	28	200
BNS 1119	OHS studies	2	28	200
BNS 1102	English Sessional	1	28	100
BNS 1122	Computer Fundamentals and Operation	1	28	100
BNS 1124	Signaling & Basic Radio Communication	1	28	100
BNS 1126	Basic Seamanship Practice	1	28	100
	TOTAL	26		2600



1st Year 2nd Term

Course No	Course Title	Credit	Hour	Mark
BNS 1201	Applied Physics Paper 2	2	28	200
BNS 1203	Applied Mathematics Paper-2	2	28	200
BNS 1205	Accounting and Finance	2	28	200
BNS 1207	Basic Maritime Safety and Security	3	42	300
BNS 1209	Maritime Legislation	2	28	200
BNS 1211	Basic Ship's Stability	2	28	200
BNS 1213	Celestial Navigation	3	42	300
BNS 1215	Navigational Instrument	3	42	300
BNS 1217	Meteorology and Instrumentation	3	42	300
BNS 1202	Physics Sessional	1	28	100
BNS 1208	Basic Maritime Safety and Security Sessional	1	28	100
BNS 1220	Maritime English & Communication Skill	1	28	100
BNS 1222	Principles of Chart Work	1	28	100
	TOTAL	26		2600



2nd Year 1st term

Course No	Course Title	Credit	Hour	Mark
BNS 2101	Leadership and Principles of Management	2	28	200
BNS 2103	Computer Programming Language	2	28	200
BNS 2105	General Cargo Operation	3	42	300
BNS 2107	Maritime Environment and Sustainability	3	42	300
BNS 2109	Applied Navigation	3	42	300
BNS 2111	Collision Prevention Regulation	3	42	300
BNS 2113	Satellite and Hyperbolic Navigation	3	42	300
BNS 2115	Marine Engineering and Control system	3	42	300
BNS 2104	Computer Programming Sessional	1	28	100
BNS 2120	Coastal Navigation	2	56	200
BNS 2122	Workshop Practice	1	28	100
	Total	26		2600



2nd Year 2nd term

Course No	Course Title	Credit	Hour	Mark
BNS 2201	Advance Maritime Safety & Security	3	42	300
BNS 2203	Basic Oil and Chemical Tanker Cargo Operation	3	42	300
BNS 2205	Naval Architecture and Metallurgy	2	28	200
BNS 2207	Radar Navigation	3	42	300
BNS 2209	Navigational Watch Keeping	2	28	200
BNS 2211	Applied Stability	2	28	200
BNS 2213	Advance Cargo and Shipboard Operation	3	42	300
BNS 2217	Climatology	2	28	200
BNS 2219	Ocean Navigation	2	28	200
BNS 2202	Advance Maritime Safety and Security Sessional	1	28	100
BNS 2208	Radar Navigation Sessional	1	28	100
BNS 2222	Advance Seamanship Practice	1	28	200
BNS 2224	Admiralty Navigation	1	28	200
		26		2600



3RD Year

Course No	Course Title	Credit	Hour	Mark
BNS 3102	<p style="text-align: center;">On board Training</p> <p>An approved seagoing service of not less than 12 months as part of an approved training programme, which includes onboard training that meets the requirements of section A-II/1 of the STCW Code and is documented in an approved training record book.</p>	6		600
BNS 3104	<p style="text-align: center;">Alternative</p> <p>Students may perform 12 months apprenticeship in a ship management, owners, or agency company, port authority, Ship yard, dry-dock, marine workshop or any other similar organization approved by the Bangabandhu Sheikh Mujibur Rahman Maritime University.</p>	6		600
		6		600



4th Year 1st Term

Course No	Course Title	Credit	Hour	Mark
BNS 4000	Thesis on Maritime Topics	4	56	400
BNS 4101	Research Methodology	2	28	200
BNS 4103	Meteorology for Navigation	2	28	200
BNS 4105	Damage Control and Stability	2	42	300
BNS 4107	Great circle sailings and Advance Navigation	3	42	300
BNS 4109	Ship Structure and Stresses	2	42	300
BNS 4111	Shipboard Maintenance & Port Watch	3	42	300
BNS 4113	Global Maritime Distress & safety system	2	28	200
BNS 4115	Bridge Team and Bridge Resource Management	2	28	200
BNS 4114	Global Maritime Distress & safety system Sessional	2	56	100
BNS 4116	Bridge Team and Bridge Resource Management sessional	2	56	100
		26		2600



4th Year 2nd Term

Course No	Course Title	Credit	Hour	Mark
BNS 4000	Thesis on Maritime Topics	4	56	400
BNS 4201	Professional Ethics	2	28	200
BNS 4203	Maritime Law, Insurance and Risk Management	3	42	300
BNS 4205	Shipboard and Shipping Management	3	42	300
BNS 4202	Ship Handling Simulation	2	56	200
	(Any four subject can be taken)			
BNS 4221	Advance Oil Tanker cargo Operation	3	42	300
BNS 4223	Advance Chemical Tanker cargo Operation	3	42	300
BNS 4225	Maritime Economics	3	42	300
BNS 4227	Maritime Safety and Environment Administration	3	42	300
BNS 4229	Supply chain management	3	42	300
BNS 4231	Integrated Coastal Zone and Marine Fisheries management	3	42	300
BNS 4233	Marine off Shore Technology	3	42	300
BNS 4251	Marine Environmental Science	3	42	300
BNS 4253	Port Management	3	42	300
BNS 4255	Marine Surveying and Casualty Investigation	3	42	300
BNS 4257	International Trade and Ship Chartering	3	42	300



		26		2600
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NON-CREDIT SUBJECT

Course No	Course Title
BNS 0001	Contemporary Maritime Issues
BNS 0002	Discipline and Team work



Year-1 Term-1

Course Contents of

B.Sc Honors, Nautical Science

Bangladesh Marine Academy

Under the Recognition of

Bangabandhu Shiekh Mujibur Rahman Maritime University





Course Title : English

Course Code	:BNS 1101
Credits	: 2
Contact Hours	: 28
Assessment	: Term end written examination, Class tests
Faculty in Charge	:

Learning outcomes: Enable the students to communicate verbally and in writing with the multi-national crew on board. Enable to report writing for on board and ashore management. Enable the students to understand the publications available on board also to understand the manufacturer's manual.

Syllabus Content:

1. Grammar - Structure of sentences - Active / Passive Voice - Direct / Indirect Narration
2. Essay - Descriptive - Comparative - Argumentative - Thesis statement- Structure of opening / concluding paragraphs - Body of the essay
3. Reading Comprehension - Global- Contextual- Inferential- Select passages from recommended text
4. Business Correspondence - Letter Writing - Formal. Drafting. Bio-data- Resume/Curriculum Vitae
5. Report Writing - Structure, Types of report - Practice Writing
6. Communication / Public Speaking skills, Features of effective speech, verbal-nonverbal
7. Group discussion - principle – practice
8. the places and manners of articulation of the English sounds,
9. Vocabulary,
10. Comprehension;
11. Composition on current affairs;
12. Précis writing;
13. Short stories written by some well known classic writes.

Recommended Text(s):

1. Communication Skills (Book 1) - S. R. Inthira & V. Saraswati
2. Communication Skills workbook - S. R. Inthira & V. Saraswati
3. Spoken English for Indian - R. K. Bansal & B. Harrison
4. English language Books 1 & 2 - L. A. Hill, C. J. Daswani & C. T. Daswani (Oxford University Press 1975)



5. Writing Communication - Freeman & Sarah
6. Note Marking & Composition Exercises 1979 - ELT Cell, Bombay University
7. Business Correspondence & Report Writing - R. C. Sharma & Krishnamohan
8. Academic Skills - CIEFL, Hyderabad

9. Academic Skills Workbook - CIEFL, Hyderabad
10. Supplementary Reader - CIEFL, Hyderabad
11. Sea Speak Manual - International Maritime Organisation

Course Title : Applied Physics : Paper-I

Course Code	: BNS 1103
Credits	: 2
Contact Hours	: 28
Assessment	: Term end written examination, Class test
Faculty in Charge	:

Learning outcomes: To understand the physical properties of various materials used to build the ship. Also to enable the students to understand the magnetic compass and electro-magnetic induction used in various equipment and machineries on board. Also to understand the properties of various cargo carried on board specially hazardous and dangerous cargo.

Syllabus Contents:

1. Structure of Matter:

Crystalline and non-crystalline solids, Single crystal and polycrystal solids, Unit cell, Crystal systems, Co-ordinations number, Crystal planes and directions, NaCl and CsCl structure, Packing factor, Miller indices, Relation between inter-planer spacing and Miller indices, Bragg's Law, Methods of determination of inter-planer spacing from diffraction patterns; Defects in solids: Point defects, Line defects, Bonds in solids, Inter-atomic distances, Calculation of cohesive and bonding energy, Introduction to bond theory, Distinction between metal, Semiconductor and insulator.

2. Electricity & Magnetism

Coulomb's Law, Electric field (E), Gauss's Law and its application, Electric potential (V), Capacitors and capacitance, Capacitors with dielectrics, Dielectrics-an atomic view, Charging and discharging of a capacitor, Ohm's Law, Kirchoff's Law, Magnetic field, Magnetic induction, Magnetic force on a current carrying conductor, Torque on a current carrying loop, Hall effect, Faradays Law of electromagnetic induction, Lenz's Law, Self induction, Mutual induction, Magnetic properties of matter, Hysteresis curve, Electromagnetic oscillation, L-C oscillation and its analogy to simple harmonic motion.



3. Modern Physics:

Michelson-Morley's experiment, Galilean transformation, Special theory of relativity and its consequences, Quantum theory of radiation, Photo-electric effect, Compton effect, Wave Particle duality, Interpretation of Bohr's postulates, Radioactive disintegration, Properties of nucleus, Nuclear reactions, Fission, Fusion, Chain reaction, Nuclear reactor.

Recommended Text(s):

1. Applied Physics - J.H. Clough - Smith
2. Fundamental of Physics - M.Nelkon
3. Principles of Physics - Fredrick J. Bueche
4. Physics: Classical & Modern - Gettys , Keller , Skove
5. University Physics - Young , Sears and Zemansky

Course Title : Applied Mathematics: Paper-I

Course Code	: BNS1105
Credits	: 2
Contact Hours	: 28
Assessment	: Term end written examination, Class test
Faculty in Charge	:

Learning outcomes: To understand the mathematical calculation used in entire degree programme.

Syllabus Contents:

Algebra:

1. Inequalities
2. Theory of Equations: relations between roots and Co-efficient; Sums of the power of the roots; Descartes' rule of signs; increasing or decreasing all roots of the equation by the same number.
3. Determinants: Determinants up to the third order; Elementary properties.
4. Matrices: Different kind of matrices; elementary properties; solution of systems of equations.
5. Summation of series.

Trigonometry:

1. De Moivres' Theorem
2. Deduction from De-Moivres' Theorem
3. Trigonometrical and exponential functions of complex arguments
4. Gregory's Series

Statistics:

1. Discrete and continuous variables
2. Frequency Distributions
3. Mean, Median and Mode



4. Mean deviation and standard deviation
5. Correlation and its applications

Recommend Text(s):

1. Elements of Applied Mathematics – Vol: I - Wartikar P.N. & Wartikar J.N.
2. Text book of Applied Mathematics – Vol: II - Wartikar P.N. & Wartikar J.N.
3. Vector Algebra - Shanti Narayan
4. Vector Calculus - Shanti Narayan
5. Differential Calculus - Shanti Narayan
6. Engineering Mathematics - Bali Saxena Iyengar
7. Plane Trigonometry - Loney S.L.
8. Higher Engineering Mathematics - Dr. Grewal B.S.
9. Differential Equations - Raisinghania
10. Engineering Mathematics - Bhatia M.L.
11. Engineering Mathematics - Baphana R.M.
12. Vector Methods and Vector Calculus - Vaishista
13. Differential equations - Murray P.A.
14. Differential Calculus - Das & Mukherjee
15. Integral Calculus - Das & Mukherjee



Course Title : Bangladesh Studies and Emergence of maritime sector in Bangladesh

Course Code : BNS1107
Credits : 2
Contact Hours : 28
Assessment : Term end written examination, Class test
Faculty in Charge :

Aims:

The aim of this course is to enlighten the cadets on the national identities i.e. culture, social structure, constitution and various national issues that include social problem and development agendas of the country. The course is also aimed at giving specific knowledge on the activities of the maritime domain of the country.

Learning outcomes:

After successful completion of this course, the students will have clear understanding on:

1. History, culture, climate, geography, environment and development agenda of the government of Bangladesh.
2. Bangladesh's heritage and cultural influences, and about events which have shaped national identity.
3. A general overview on the maritime affairs in Bangladesh and will be able to appreciate the huge potential of Bangladesh in maritime sector.

Syllabus Contents:

1. **History of the Emergence of Independent Bangladesh:** Proposal for undivided sovereign Bengal and the partition of the Sub-Continent, 1947; Pakistan: Structure of the state and disparity; Language movement and quest for Bengali identity; Military rule: the regimes of Ayub Khan and Yahia Khan (1958-1971); Rise of nationalism and the movement for self determination; Election of 1970 and the declaration of independence; The war of liberation 1971, and Independent Bangladesh
2. **Description of the country and its people:** Topography of Bangladesh; Demography of Bangladesh; Climate of Bangladesh and Natural Resources of Bangladesh.
3. **Society and Culture:** Social structure; Social problem- Poverty; Unemployment Drug addiction and Corruption



4. **Some provisions of the Constitution of Bangladesh:** Basic knowledge on the Constitution of Bangladesh; Parliament; Judicial system of Bangladesh and Administrative system of Bangladesh
5. **Economic Sector Highlights:** Agriculture; Industry; Energy, Trade and Commerce and Financial Administration of GOB
6. **Emergence of Maritime Sector in Bangladesh:** Historical background; Bangladesh in International Maritime Forum
7. **Maritime Cluster in Bangladesh:** Maritime Administration; Maritime Human; Resource Development; Sea-Ports and Port infrastructure; Ship management and logistic services in Bangladesh; Inland Shipping in Bangladesh and Shipbuilding industry in Bangladesh
8. **Bangladesh Maritime Sector Highlights:** Ship recycling in Bangladesh; Management of Marine Fisheries Resources in Bangladesh and Hydrocarbon exploration in the deep offshore area in Bangladesh.
9. **Contemporary Maritime Issues:** Delimitation issue; Maintaining law and order at Sea.

Recommended text(s):

1. History of the emergence of independent Bangladesh, Sabiha Islam and Dr. Md. Ibrahim Khalil, 2014, Merit Fair Publishers, Dhaka.
2. Bangladesh economic reviews, Finance division, Ministry of Finance, www.mof.gov.bd
3. The constitution of Bangladesh
4. Bangladesh Economic Survey and regular updates by Bangladesh Bank, Ministry of Finance, Bangladesh Bureau of Statistics, World Bank, Asian Development Bank, IMF, WTO etc.
5. Web site of Ministry of Shipping: www.mos.gov.bd; Department of Shipping: www.dos.gov.bd; Bangabandhu Sheikh Mujibur Rahman Maritime University: www.bsmrstu.edu.bd; Bangladesh Marine Academy: www.macademy.gov.bd; Marine Fisheries Academy: www.mfa-mofl.org; National Maritime Institute: www.nmi.gov.bd; Chittagong Port Authority: www.cpa.gov.bd; Mongla Port Authority: www.mpa.gov.bd; Bangladesh Inland Water Transport Authority: www.biwta.gov.bd; Bangladesh Inland Water Transport Corporation: www.biwtc.gov.bd; Department of Fisheries: www.fisheries.gov.bd; Bangladesh Coastguard: www.coastguard.gov.bd.



Course Title : Managerial Economics

Course Code	: BNS1109
Credits	: 2
Contact Hours	: 28
Assessment	: Term end written examination, Class test
Faculty in Charge	:

Learning Outcomes:

The objective of this course is to provide students with a basic understanding of the Economic theory and analytical tools that can be used in decision making problems. Moreover the course will impart the students with the knowledge of economic concepts, direct managerial applications, and analytical skills through integrating the knowledge of economic theory with decision making process and practices.

Syllabus Contents:

1. **Introduction to Micro to Managerial Economics:** Definition of Economics, Micro and macro economics – an Overview, relationship between economic theory and managerial decision, the nature and objectives of firms, the concepts of profit, alternative objectives of firms, the decision making model, and constraints of decision making.
2. **Basic tools:** Functional relationship, Economic model, Calculus and optimization, regression analysis.
3. **Demand theory and analysis:** Individual and market demand, total and marginal revenue, elasticity of demand: price, income and cross elasticity of demand.
4. **Demand estimation:** development of model, data collection, choice of functional form, estimation and interpretations using regression techniques. Problems with regression analysis: Omitted variables, identification and Multi-co linearity.
5. **Production theory:** Production function, short run production and law of diminishing returns, long run production, least cost factor combination, expansion path, returns to scale, economies of scale and scope, estimation of production function.
6. **Cost theory:** The economic concept of cost, short and long-run cost function, marginal and average costs, profit contribution analysis; operation leverage and estimation of cost function.
7. **Profit maximization under different market structure:** market structures, perfect competition, monopoly, monopolistic competition, oligopoly, profit maximization in short and long runs, evaluation of markets.
8. **Pricing decisions:** Pricing of goods and services, price discrimination, pricing of multiple products, product bundling, peak-load pricing, cost plus pricing, pricing of inputs,



- pricing under different market structures, economic rent, labour unions, minimum wages laws.
9. **Decision making under uncertainty:** The concept of risk and uncertainty, risk and decision making, adjusting business decision for risk, decision tree analysis.
 10. **Basic Macroeconomic Concepts :** Definition of Macroeconomics, GDP, GNP, NI and other derived measures; GDP identities. Real vs. nominal GDP, GDP growth rate, Inflation and its definition, Price level measurement; CPI, PPI, GDP Deflator, Construction of price indices..
 11. **National Income Accounting and Circular Flow of Income :**Methods of National Income Accounting, Problems of Double counting, The circular flow of income, A two sector model of income determination, a simplified circular flow, national income identity, equilibrium national income and Investment multiplier.
 12. **Aggregate Demand and Supply :**Aggregate Demand and Supply Analysis, Aggregate Expenditure, Consumption, Investment, Government Expenditure. Equilibrium National Income, Potential GDP, GDP Gap and Role of the Government
 13. **Bangladesh Economy :**
 - i) Economic Contribution of different sectors: Agriculture, Industry, Services in Bangladesh, Sectoral growth in agriculture, industry and service
 - ii) Measurement of economic inequality and poverty, Lorenz Curve and Ginni Coefficient. Causes of mass poverty, unemployment, policy of rural development and its evolution, Poverty alleviation, Grameen Bank and The Government and nongovernment organizations.

Recommended Text(s):

1. Samuelson PA and Nordhaus W, *Economics*, McGrawHill.
2. Fischer S, Dornbusch R and Sparks G, *Economics*, McGrawHill.
3. N. Gregory Mankiw, Principles of Microeconomics 5th Edition, SouthWestern,
4. N. Gregory Mankiw – *Macroeconomics* (5th edition).
5. Lipsey RG and Crystal, *Principles of Economics*, Oxford University Press, London,
6. Steve Jones, *Rural Development Programs in Bangladesh*.
7. Mohiuddin Alamgir, *Some Aspects of Bangladesh Agriculture: and Evaluation of Policies*.
8. Azizur Rahman Khan and Mahabub Hossain, *The Development Strategy of Bangladesh*.
9. Managerial Economics- Peterson H. Craig & Lewis W. Cris; Fourth Edition, PEARSON Education,
10. Managerial Economics- Mark Hirschey and James L. Pappas
11. Managerial Economics- James R. McGuigan & R. Charles Moyer.



Course Title : Principles of Ship Construction

Course Code : BNS1111
Credits : 2
Contact Hours : 28
Assessment : Term end written examination, Class test
Faculty in Charge :

Learning Outcomes : To understand the ship's dimensions and various hull and fitting parts of the ship, so that a student can carry out routine operation and the maintenance of the vessel.

Syllabus Contents :

Ship Dimension and Form :

- illustrates the general arrangement of the following ship types:
 - general cargo
 - bulk carriers
 - container
 - passenger
 - tankers
 - combination carriers
 - ro-ro
- draws an elevation of a general cargo ship, showing holds, engine-room, peak tanks, double-bottom tanks, hatchways and position of bulkheads
- draws an elevation of a typical crude oil carrier, showing bulkheads, cofferdams, pump-room, engine-room, bunker and peak tanks, cargo tanks and permanent ballast tanks
- draws a plan view of a tanker, showing the arrangement of cargo and ballast tanks
- defines and illustrate:
 - rise of floor
 - flare
 - rake
 - entrance
 - camber
 - tumblehome
 - sheer
 - parallel middle body
 - run
- defines:
 - forward perpendicular (FP)
 - after perpendicular (AP)
 - length between perpendiculars (LBP)
 - length on the waterline (LWL)
 - length overall (LOA)
 - base line



- moulded depth, beam and draught
- extreme depth, beam and draught

Hull Structure

- identifies structural components on ships' plans and drawings:
- frames, floors, transverse frames, deck beams, knees, brackets
- shell plating, decks, tank top, stringers
- bulkheads and stiffeners, pillars
- hatch girders and beams, coamings, bulwarks
- bow and stem framing, cant beams, breasthooks
- describes and illustrates standard steel sections:
- flat plate
- offset bulb plate
- equal angle
- unequal angle channel
- identifies longitudinal, transverse and combined systems of framing on transverse sections of the ships
- sketches the arrangement of frames, webs and transverse members for each system
- illustrates double-bottom structure for longitudinal and transverse framing
- illustrates hold drainage systems and related structure
- illustrates a duct keel
- sketches the deck edge, showing attachment of sheer strake and stringer plate
- sketches a radiused sheer strake and attached structure
- describes the stress concentration in the deck round hatch openings
- explains compensation for loss of strength at hatch openings
- sketches a transverse section through a hatch coaming, showing the arrangement of coamings and deep webs
- sketches a hatch corner in plan view, showing the structural arrangements
- sketches deck-freeing arrangements, scuppers, freeing ports, open rails
- illustrates the connection of superstructures to the hull at the ship's side
- sketches a plane bulkhead, showing connections to deck, sides and double bottom and the arrangement of stiffeners
- sketches a corrugated bulkhead
- explains why transverse bulkheads have vertical corrugations and for-and aft bulkheads have horizontal ones
- describes the purpose of bilge keels and how they are attached to the ship's side.

Fittings :

- describes and sketch an arrangement of modern weather-deck mechanical steel hatches
- describes how watertightness is achieved at the coamings and cross joints



- describes the cleating arrangements for the hatch covers
- describes the arrangement of portable beams, wooden hatch covers and tarpaulins
- sketches an oiltight hatch cover
- describes roller, multi-angle, pedestal and Panama fairleads
- sketches mooring bitts, showing their attachment to the deck
- sketches typical forecastle mooring and anchoring arrangements, showing the leads of moorings
- describes the construction and attachment to the deck of tension winches and explains how they are used
- describes the anchor handling arrangements from hawse pipe to spurling pipe
- describes the construction of chain lockers and how cables are secured in the lockers
- explains how to secure anchors and make spurling pipes watertight in preparation for a sea passage
- describes the construction and use of a cable stopper
- describes the construction of masts and Sampson posts and how they are supported at the base

Recommended Text(s):

1. Ship Construction notes - Kemp and Young
2. Ship Construction for Engineers - Reid
3. Ship Construction – Pursey
4. Ship Construction - Eyres

Course Title : Principles of Sailings

Course Code : BNS1113
Credits : 3
Contact Hours : 42
Assessment : Term end written examination, Class test
Faculty in Charge :

Learning Outcomes : To understand the principles of various types of sailing and enable the students to carry out the navigation watch keeping duties on board.

Syllabus Contents :

Definitions –Earth



- defines 'great circle', 'small circle', 'spherical angle', 'spherical triangle', 'poles of a great circle'
- defines 'earth's poles', 'equator' and 'meridians'
- defines 'latitude' and 'parallels of latitude', 'prime meridian' and longitude'
- defines 'difference of latitude' and 'difference of longitude'
- defines the earth as an ellipsoid.
- defines 'compression', and state its value
- defines 'international nautical mile', 'cable' and 'knot'

Charts Projection

- demonstrates a basic knowledge of chart projections
- defines 'natural scale' of a chart
- states the requirements of a chart appropriate for marine navigation
- identifies the Mercator chart as a mathematical projection and state the principles of its construction
- describes the properties of the chart and the degree to which it meets navigational requirements and Mercator limitations
- demonstrates the use of a chart catalogue

Solar System

- describes the composition and dimensions of the solar system
- identifies planets useful for navigation
- describes the earth's elliptical orbit, and states approximate perihelion and aphelion distances and dates
- explains the eccentricity of the earth's orbit describes the inclination of the earth's axis to the plane of the orbit and the stability of the axis (ignoring procession) and its effect on seasons changes
- states the dates of the solstices and equinoxes
- explains the concept of the earth's axial rotation giving day and night
- explains the varying length of daylight through the year explains daylight and darkness conditions in various latitudes at the solstices and equinoxes
- describes the significance of the tropics of Cancer and Capricorn and of the Arctic and Antarctic Circles

Sailings

- defines 'departure' and states the relationship to difference of longitude
- defines 'true course' and 'rhumb line'
- derives the plane sailing formulae
- explains the relationship between departure and difference of longitude in cases involving a change of latitude, by using mean latitude



- uses of the parallel sailing formula:
$$\frac{\text{Departure}}{\text{diff. of longitude}} = \text{cosine of latitude}$$
- states the meaning of, and derives, mean latitude
- states the Mercator sailing formula
- uses the Mercator formula to calculate course and distance between two positions
- uses the Mercator formula to calculate the final position, given the initial position, course and distance
- calculate the distance between two positions on the same parallel of latitude
- calculate the difference of longitude for a given distance run along a parallel of latitude
- derives the final position after sailing along a parallel of latitude
- applies the plane sailing formula in practical examples
- calculate the correct departure to use in a plane sailing problem
- calculate the course and distance between two positions, using the plane sailing formula
- calculate a DR position or an estimated position by using the plane sailing formula, given compass course and compass error, distance by log, estimated speed, tidal and current information and leeway
- describes the layout of a traverse table
- derives the information required in a parallel or plane sailing problem using a traverse table or calculator
- solves problems of plane sailing, using a calculator
- solves problems of DR and fixing positions, using plotting charts

Recommended Text(s):

1. Practical Navigation - Capt. H. Subramaniam
2. Principles of Navigation - Capt. P.M. Sharma
3. Principles of Navigation - Capt. T.K. Joseph and Capt. S.S.S. Rewari
4. Admiralty Manual of Navigation Vol:I and Vol:II - HMSO
5. Principles of Navigation - A. Frost
6. Nicholl's Concise Guide Vol:I and Vol:II - Brown, Son and Ferguson Ltd.



Course Title : Maritime Geography and Oceanography

Course Code : BNS1115
Credits : 2
Contact Hours : 28
Assessment : Term end written examination, Class test
Faculty in Charge :

Learning Outcomes : To understand the earth and ocean structure, ocean current circulation so that the students can carry out the navigation watch keeping duties on board.

Syllabus Contents :

01. Maritime Atlas : Geographical map of the world with oceans and major ports position.

02. Formation of the earth and its structure – Evolution of continents and ocean basins – Continental drift hypothesis – concept of isotasy and its application to surface phenomena – Recent ideas on drift: Plate tectonics – practical significance or recent information.

03. Materials of the earth's crust: minerals and rocks – rock types and their formation – Lithological characteristics and their impact on landform development – Tectonic landforms. Folds, faults and associated features – Volcanic and seismic activities: associated landforms.

04. Exogenic forces: denudation – Weathering, mass – wasting and erosion Marine landforms – Sea level changes – classification of coasts.

05. Fundamental of Ocean Science

Major relief features of the ocean – floor – Bottom relief of Indian, Atlantic and Specific Oceans – properties of ocean water: temperature, salinity and density – their vertical and horizontal distribution – ocean currents : factors and patterns – ocean deposits : types and their work – NIO and its activities.

06. Biotic resources of the oceans : fish , corals , mangroves, etc. – distribution of biotic resources – problems of their exploitation – environmental and other stresses – remedial measures – mariculture : merits and limitations

07. Abiotic resources : Types – oceanic minerals nodules and placers – oil and natural gas – technological advance – marine politics and law of the sea – environmental oceanic problems and oceanic hot spots – futures of scenario.

08. Oceanic water as a resource: Navigation, power generation, source of drinking water etc. – spatial pattern of feasibility – oceanic islands and their strategic



significance – Indian ocean island.

09. Physical Properties of Sea Water : Temperature, salinity, density and pressure – their relationship and measurement. Optical properties, sound and light in the sea, colour of the sea water.

10. The energy budget of the Oceans : Spatial variation of temperature and evaporation. Heat balance.

11. Salinity and Density : Distribution in surface layers of the ocean. Controlling processes.

12. Oceanic Circulation System: Causes and spatial distribution of surface circulation. Seasonal changes

13. Sub-Surface Circulation: Formation, source region and movement of water masses

14. Oceanic Waves and Tides: Types of waves, wave energy, behaviour of waves in deep and shallow waters. Free and co-oscillations in basins. Tideproducing forces. Types of tides. Tide prediction and analysis, tidal streams, co-tidal charts. Storm surges and tsunamis.

Recommended Text(s):

1. An outline of Geomorphology : Wooldridge, S. W. & Morgan R. S.
2. Continental Drift : Tarling D. H. & Tarling M. P
3. Putnam's Geology : Birkland P. W. & Larson E. E
4. Principles of Physical Geography : Monkhouse F. J.
5. Principles of Geomorphology : Thornbury W. D
6. Oceanography: Exploring the Ocean : Bhatt, J. J
7. Oceanography for Geographers : R. C. Sarma & M. Vatal
8. Climate & Weather : H. Flohn
9. World Climate & Weather : D. Riley & I. Spolton
10. Introduction to Meteorology : A. Petterssen
11. Introduction to Meteorology : F. W. Cole
12. The Atmosphere : R. A. Anthes
13. Climatology from Stallites : E. C. Barrett
14. Introduction to Climatology for the Tropics : J. O. Ayoade
15. Marine Meteorology - Capt. H. Subramaniam
16. Atmosphere and Weather - Barry R.G., Chorley R.J.
17. Introduction to theoretical Meteorology - HESS
18. Meteorology for Mariners - HMSO
19. Marine Observer's Handbook - HMSO
20. Elementary Meteorology – HMSO
21. An introduction to Meteorology - James R. Holton
22. Introduction to Meteorology - Petterson B.
23. Physical Oceanography Vol:I and Vol:II - Defant A.
24. General Oceanography - Deitrich G.



25. Descriptive physical oceanography - Pick and G. and Emery W.
26. Oceanography for Geographers - Sharma R.C. and Emery W.
27. Introductory Dynamical Oceanography - Stephen Pond and G.L. Pickard

Course Title : Shipboard Operation

Course Code : BNS1117
Credits : 2
Contact Hours : 28
Assessment : Term end written examination, Class test
Faculty in Charge :

Learning Outcomes : After completion of the course student will be able to work on deck also will be able to understand the functions of the various parts of the ship.

Syllabus Contents :

1. Common Nautical Terms

describes and explains the common nautical terms

2.The Names and Functions of Various Parts of the Ship

states the names and functions of various parts of the ship

3.Knowledge of the Compass Cards and Helm Orders

- describes how to read compass (gyro and magnetic)
- states how to report the approximate bearing of an object in degrees or points on the bow
- understands and demonstrates various helm orders.

4.Ropes and wires

- states various types of fiber rope and wire rope
- describes the construction of fiber rope and wire rope
- states the care & maintenance, and handling of fiber rope and wire rope
- states the particular use of different ropes
- explains breaking strains and safe working load (SWL)
- explains how to find out breaking strains and SWL
- states the advantages and disadvantages of synthetic rope
- states advantages and disadvantages of natural fiber rope
- states the safety precautions needed while handling rope
- Types of material used, natural fibres, synthetic fibres.



- Types of lay of ropes and their advantages. Plaited ropes. Characteristic of different types of fibre ropes.
- Comparison of strength and elasticity of different ropes.
- Care and maintenance of fibre ropes. Damage caused by surging. Meaning of Marline, spusyam, Oakum, tared hemp, 3 ply and 5 ply twines, halliards, loglines, leadlines.
- Grades of steel used for making wire ropes. Construction of wire ropes.
- Advantage of a fibre heart. Factors determining flexibility. Meaning of 6/12, 6/24, 6/37 etc. Plaited wire rope. Plastic covered wire rope. Non-rotating wire rope.
- Care and maintenance of wire ropes. Measuring sizes of ropes, wires and chains.
- Breaking strength and safe working load of ropes, wires and chains. To calculate the size of rope or wire required for lifting a weight with a tackle.

5.Anchor Work:

- Different types of anchors.
- Cables and their care.
- Anchoring procedure.
- Duties on anchor watch.
- Use of second anchor.
- Foul anchor or hawse.
- Hanging off an anchor,
- breaking and slipping cables.
- Mooring – standing Moor, Running Moor

6.Hand Lead Line

- shows what is a hand lead line
- describes the markings on a hand lead line
- states the use of hand lead line
- demonstrates how to use hand lead line and correctly reports the sounding obtained.

7.Means of Access on Board

8.Mooring Winch and operation

Recommended Text(s):

1. Theory and Practice of Seamanship - G. Danton
2. Seamanship Notes - Kemp and Young
3. Nicholls Seamanship - Brown, Son and Ferguson Ltd.
4. Seamanship technique – D.J. House



Course Title : OHS Studies

Course Code : BNS1117
Credits : 2
Contact Hours : 28
Assessment : Term end written examination, Class test
Faculty in Charge :

Learning Outcomes : To understand the occupational health and safety procedure on board.

Syllabus Contents :

1.Fundamentals of Occupational Health and Safety

2.Occupational Health and Safety Act

3.General Shipboard Housekeeping

4.Safety Officials and Permit to work systems

5.Manual lifting and carrying

6.Tools and Materials

7.Working aloft and outboard

8.Maritime Labor Convention

9.Code of Safe Working practices

- explains safety responsibility/shipboard management risk assessment
- health surveillance
- personal protective equipment
- means of access and safe movement
- explains personal health and safety
- emergency procedures security on board
- living on board
- food preparation and handling
- safe systems of work
- entering enclosed or confined spaces
- manual handling
- lifting plant
- hot work
- anchoring, mooring and towing operations
- hazardous substances
- safety officials
- safety signs
- work equipment
- safety induction
- fire precautions
- safe movement
- explains work activities
- permit to work systems
- boarding arrangements
- use of work equipment
- maintenance
- painting
- hatch covers and access lids
- use of safety signs

Precautions Before Entering Enclosed or Contaminated Spaces

- lists potentially dangerous spaces, including:
 - * cargo spaces
 - * cargo, fuel and ballast tanks
 - * pump-rooms
 - * cofferdams
 - * duck keels



- states that enclosed spaces should be entered only with authorization and after appropriate safety checks have been carried out
- states that an enclosed space may be locking in oxygen or contain flammable or toxic gases

Recommended Text(s):

1. Seamanship Technique- D.J. House
2. Code of Safe Working Practice - Maritime and Coastguard Agency (MCA) of the UK
3. Fundamental principles of occupational health and safety- Benjamin O. Alli
4. A Guide to the Occupational Health and Safety Act- ILO

Course Title : Signalling and Basic Radio Communication

Course Code : BNS1124
Credits : 1
Contact Hours : 28
Assessment : Attendance, Laboratory report, note book, Quiz, Viva voce
Faculty in Charge :

Learning Outcomes : To enable the Morse code signaling communication and VHF communication with other ships.

Syllabus Contents :

Signalling by Morse Code

- sends and receives Morse signals by flashing light
- states the recommendations on sound signalling
- lists the single-letter signals which may be sounded only in compliance with the requirements of the International Regulations for Preventing Collisions at sea

International Code of Signals

- recognizes all International Code flags and pendants
- explains the purpose of the International Code of Signals
- correctly uses substitute flags
- demonstrates how to call, using flags
- demonstrates the use of the answering pendant
- explains actions to take when signals are not understood
- states how the end of a signal is indicated
- states that names in the text of a signal are to be spelt out in plain



- language explains the use of identity signals
- states that, in flag signalling, the answering pendant is used to indicate the decimal point in numbers, demonstrates how to signal azimuth or bearing, course, date, latitude longitude, distance, speed, time
- explains the significance of the arrangement of the Code into:
 - single-letter signals
 - two-letter signals
 - three-letter signals beginning with 'M' for the Medical Section
- describes the use of complements and tables of complements
- describes how to signal depths
- explains the significance of text in brackets
- states that cross-referencing of signals in the right-hand column is used to facilitate coding
- states the meanings of single-letter signals
- states that there are single-letter signals for use between an ice-breaker and assisted vessels
- explains how time of origin may be included
- codes and decodes messages, using the General Sections
- codes and decodes messages, using the Medical Sections and complements
- states the International Code Signal of distress

Standard Marine Communication Phrases

- uses the IMO Standard **Marine Communication Phrases**

VHF communication practice

Recommended Text(s):

- Amendments to SOLAS Convention Manual for Maritime Mobile Communication and Maritime Mobile Satellite Communication : ITU
- International Volume of Radio Signals : HMSO
- International Code of Signals : IMO
- GMDSS for GOC : Clifford Merchant

Course Title : Basic Seamanship Practice

Course Code	: BNS1126
Credits	: 1
Contact Hours	: 28
Assessment	: Attendance, Laboratory report, note book, Quiz, Viva voce
Faculty in Charge	:

Course Objective: To be acquainted with the tools and seamanship practices on board.

Syllabus Contents :



1.Name and Use of various tools on board

2.Store inventory and management

3.Compass Card and helm order

4.Hand lead line

5.Anchor, cables and Mooring Winches

6.Ropes and Wires

7.Various types of ladders

8.Knots, hitches and bends in common use

demonstrates how to make:

- reef knot
- rolling hitch
- timber hitch
- figure of eight
- clove hitch
- wall and crown
- bowline and bowline on the bight.
- sheet bend (double and single).
- sheepshank
- round turn and two half hitches a marline spike hitch.
- demonstrates how to whip a rope's end using plain or palm and needle whipping
- demonstrates how to put a seizing on a rope and wire

Splicing

- demonstrates splicing of fiber rope (eye splice, short splice and back splice)
- demonstrates splicing of wire rope (eye splice, short splice and back splice)
- states the tools needed for splicing

Recommended Text(s):

1. Theory and Practice of Seamanship - G. Danton
2. Seamanship Notes - Kemp and Young
3. Nicholls Seamanship - Brown, Son and Ferguson Ltd.
4. Seamanship technique – D.J. House

Course Title : English Sessional

Course Code : BNS1102

Credit : 1

Contact Hours : 28

Assessment : Attendance, Laboratory report, note book, Quiz, Viva voce



Faculty in Charge :

Learning Outcome: Enable the students to communicate with multi-national crew on board and understand the maritime phrase and words.

Syllabus Content:

Reading: Skimming, Scanning, Reading for general information; Reading for specific information; Distinguish between important information and unimportant information; Distinguish between factual information and non-factual information; Understanding explicit information and implicit information; Comprehension based on selected short stories.

Writing: Sentence structure; Vocabulary and dictation; Presenting ideas in an organized way; Knowledge on genre based writing; Writing Paragraph and essay; Writing formal letters (tender, quotation, sales letter, letter of complaint, adjustment letter, writing in print media); Writing different types of reports.

Listening: Predicting, understanding native speaker's English from audio and video; Listening for correct pronunciation through audio and video; Distinguish between important and unimportant information during listening; Listening to recorded text for understanding main idea, specific information, speaker's point of view.

Speaking: Organizing information into coherent structure; Narrating events in structured way; Effective presentation; Participation in debate and dialogue.

Recommended Text(s)

1. Communication Skills (Book 1) - S. R. Inthira & V. Saraswati
2. Communication Skills workbook - S. R. Inthira & V. Saraswati
3. Spoken English for Indian - R. K. Bansal & B. Harrison
4. English language Books 1 & 2 - L. A. Hill, C. J. Daswani & C. T. Daswani (Oxford University Press 1975)
5. Writing Communication - Freeman & Sarah
6. Note Marking & Composition Exercises 1979 - ELT Cell, Bombay University
7. Business Correspondence & Report Writing - R. C. Sharma & Krishnamohan
8. Academic Skills - CIEFL, Hyderabad
9. Academic Skills Workbook - CIEFL, Hyderabad
10. Supplementary Reader - CIEFL, Hyderabad
11. Sea Speak Manual - International Maritime Organisation

Course Title : Computer Fundamentals and Application



Course Code : BNS1122
Credit : 1
Contact Hours : 28
Assessment : Attendance, Laboratory report, note book, Quiz, Viva voce
Faculty in charge :

Learning Outcome: Enable the students to be familiar with computer operations and various applications including the hardware and software.

SYLLABUS CONTENT:

- **Introduction to computer:** What is Computer, Computer types, History and generation of computer, Specification of computer
- **Hardware Components:** Basis organization and functional units of computer- input devices, central processing unit, memory unit, basics of microprocessor
- **Number system and Code:** binary , octal, decimal and hexa decimal numbers, conversion between different number system, Binary arithmetic, BCD and ASCII codes, integers and floating number representation.
- **Logic gates and Boolean algebra:** Different types of gates and their truth tables, Boolean algebra, de- morgan's theorem
- **Software components:** Types of software, system software, introducing computer languages, machine language, assembly language, system utilities, Application software
- **Operating system:** Introduction, function and types of operating system, examples operating system DOS, Windows, Windown NT, LINAX etc.
- **Office automation:** Goals of office automation, characteristics of office and office automation system, obstacle to the growth of office automation, trends in office automation, Office automation tools and technology.
- **Word processing and Excel**
- **GNU PLOT**

RECOMMENDED TEXT BOOK:

- C.S. Frence : Computer Science
- Warford : Computer Science
- Norton: Inside PC.



Year-1 Term- 2

Course Contents of

B.Sc Honors, Nautical Science

Bangladesh Marine Academy

Under the Recognition of

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Course Title : Applied Physics: Paper-II

Course Code : BNS 1201
Credits : 2
Contact Hours : 28
Assessment : Term end written examination, Class test
Faculty in Charge :

Learning outcomes: To understand the physical properties of various materials used to build the ship. Also to enable the students to understand the magnetic compass and electro-magnetic induction used in various equipment and machineries on board. Also to understand the properties of various cargo carried on board specially hazardous and dangerous cargo.

Syllabus Contents:

Waves & Oscillations:

Differential equation of a simple harmonic oscillator, Total energy and average energy, Combination of simple harmonic oscillations, Lissajous figures, Spring-mass system, Calculation of time period of torsional pendulum, Damped oscillation, Determination of damping coefficient, Forced oscillation, Resonance, Two-body oscillations, reduced mass, Differential equation of a progressive wave, Power and intensity of wave motion, Stationary wave, Group velocity and phase velocity, Architectural acoustics, Reverberation and Sabine's formula.

Geometrical Optics:

Combination of lenses: Equivalent lens and equivalent focus length, Cardinal points of a lens, Power of a lens; Defects of images: Spherical aberration, Astigmatism, Coma, Distortion, Curvature, Chromatic aberration; Optical Instruments: Compound microscope, Polarizing microscope, Resolving power of a microscope, Camera and photographic techniques.



Wave Mechanics:

Principles of statistical physics, Probabilities, Classical statistics, Quantum statistics, Bose-Einstein statistics, Fermi-Dirac statistics and their applications, Fundamental postulates of wave mechanics, Time dependent Schrodinger equation, Schrodinger equation for one-electron atom and its solution.

Recommended Text(s):

1. Applied Physics - J.H. Clough - Smith
2. Fundamental of Physics - M.Nelkon
3. Principles of Physics - Fredrick J. Bueche
4. Physics: Classical & Modern - Gettys , Keller , Skove
5. University Physics - Young , Sears and Zemansky

Course Title : Applied Mathematics: Paper- II

Course Code : BNS1203
Credits : 2
Contact Hours : 28
Assessment : Term end written examination, Class tests
Faculty in Charge :

Learning outcomes:To understand the mathematical calculation used in entire degree programme.

Syllabus Contents:

Differential Calculus:

1. Differential Co-efficient
2. Successive differentiation
3. Partial Differentiation
4. Curve Tracing
5. Maxima and Minima
6. Tangent and Normal

Integral Calculus:

1. Indefinite Integrals
2. Definite Integrals

Differential Equations:

1. Ordinary differential equations of first order and first degree: Variables separable, Homogenous equations, Equation reducible to homogeneous form, exact differential equations, the linear equations
2. Linear differential equations with constant co-efficient, and Inverse Operator



Co-ordinate Geometry:

1. Pair of Straight Lines; General equations of second degree; the tangents and normal on the curves.
2. Co-ordinates of three dimensions; Direction cosines and ratios, plane.

Recommended Text(s):

1. Elements of Applied Mathematics – Vol: I - Wartikar P.N. & Wartikar J.N.
2. Text book of Applied Mathematics – Vol: II - Wartikar P.N. & Wartikar J.N.
3. Vector Algebra - Shanti Narayan
4. Vector Calculus - Shanti Narayan
5. Differential Calculus - Shanti Narayan
6. Engineering Mathematics - Bali Saxena Iyengar
7. Plane Trigonometry - Loney S.L.
8. Higher Engineering Mathematics - Dr. Grewal B.S.

Course Title : Accounting and Finance

Course Code	: BNS1205
Credits	: 2
Contact Hours	: 28
Assessment	: Term end written examination, Class tests
Faculty in Charge	:

Learning outcomes : To familiarize the students with the theoretical concepts, principles, guidelines, accounting standards and their practices in the business and non-business organizations and focus on the basics of financial management.

Syllabus Contents:

Accounting:

1. **Accounting and its environment:** introduction, definition, activities use and users of accounting information; and generally accepted accounting principles, accounting system, challenges of accounting, principles of accounting: Transaction, accounts and its classification.
2. **Recording process:** Identification of debit and credit sides of transaction, and features of double entry accounting system. Accounting equation and transaction analysis in accounting equation. Journal: definition and classification of journal, recording transaction in the journal; Ledger: Definition, classification and preparation of journal; Trial balance: Definition, features, methods of preparation.



3. **Measuring business income:** Basis of accounting: Cash basis and accrual basis, importance of measuring and reporting income, and nature of income different approaches; reporting income-the income statement and reporting changes in retained earnings.
4. **Completing the accounting cycle:** Accounting cycle, worksheet: definition, steps in preparing worksheet, preparing financial statement from a worksheet; closing the books: closing entries, posting closing entries, and preparing post closing trial balance; Summary of accounting cycle: revising entries, and correcting entries, and preparation of worksheet.
5. **Accounting for merchandising operations:** Definition and operating cycle, and recording the purchases and sales of merchandise; forms of financial statement and preparation of financial statements.
6. **Accounting for inventories:** Definition and classification, and determining different inventory levels/quantities; inventory costing: methods of pricing and practice; financial statement effects; income statement effects, balance sheet effects and tax effects.
7. **Accounting for plant assets:** Definition and class of plant assets, and determination of cost of plant assets; Depreciation: definition and methods of charging depreciation; accounting for depreciation.
8. **Bank reconciliation statement:** Definition, needs, causes of differences and reconciliation procedure; Practice: Preparation of reconciliation statement and adjusting entries.
9. **Accounting for temporary investments:** Definition and reporting criteria, recording purchase and sale of marketable securities, and valuation of marketable securities; Practice: Valuation and accounting for marketable and debt securities.

Finance:

1. **Financial Environment:** Institution, markets, and interest rates; money market; capital market; investment banks, financial intermediaries; determinants of interest rate, term structure of interest rates.
2. **Source of Finance:** Short, medium and long term sources of finance.
3. **Risk and return:** Concept, risk and rate of return, stand alone risk, portfolio risk, the concept of beta, security market line.
4. **Managing current assets:** Alternative working capital policies, cash management, inventory management, accounts receivable management.
5. **Time value of money:** Present value, future value, annuities, ordinary annuities, annuities due, present value of annuities, future value of annuities.
6. **Capital Structure theories:** Concept, determinant, theories-net income approach, net operating income approach.
7. **Cost of capital:** Concept, component costs, cost of debt, cost of preferred stock, cost of retained earnings, cost of new equity.



8. **The basics of capital budgeting:** Types of capital projects, evaluation of capital projects, pay-back period, discounted pay back, NPV-IRR-MIRR-issues in capital budgeting.
9. **Dividend policy:** Concept, determinant factor, theories, bird in the hand theory-tax preference theory, middle of the road theory, clientele effects.

Text Books:

1. Accounting principles, 9th edition, Wwygandt, Keiso and Kismel
2. Intermediate accounting-8th edition, with manual, Smith and Skousen.
3. Fundamentals of Financial management- Eugene F. Brigham and Joel F. Houston.
4. Principle of managerial Finance, Lawrence J. Gitman

Course Title : Basic Maritime Safety and Security

Course Code : BNS1207
Credits : 3
Contact Hours : 42
Assessment : Term end written examination, Class test
Faculty in Charge :

Learning Outcomes : After attending the course students will enable to understand the basic safety procedure and medical first aid including the security precautions taken on board. The course is mandatory minimum requirements to join ocean going vessel.

Syllabus Contents:

Theoretical part of the IMO model courses

1. Fire Prevention and Fire Fighting
2. Personal Survival Technique
3. Personal Safety and Social Responsibility
4. Elementary First Aid
5. Security Awareness Training
6. Designated Security Duties

A) Personal Survival Technique

- 1 Introduction, safety and survival
- 1.1 Safety guidance
- 1.2 Principles of survival at sea
- 1.3 Definitions, survival craft and appliances



- 1.4 SOLAS training manual
- 1.5 Safety symbols
- 2 Emergency situations
 - 2.1 Types of emergencies
 - 2.2 precautions
 - 2.3 Fire provisions
 - 2.4 Foundering
 - 2.5 Crew expertise
 - 2.6 Muster list and emergency signals
 - 2.7 Crew and emergency instructions
 - 2.8 Extra equipment and survival
- 3 Evacuation
 - 3.1 Abandoning ship – last resort
 - 3.2 Personal preparation for abandoning ship
 - 3.3 Need to prevent panic
 - 3.4 Crew duties to passengers
 - 3.5 Crew duties – launching survival craft
 - 3.6 Master's orders to abandon ship
 - 3.7 Means of survival
 - 4 Survival craft and rescue boats
 - 4.2 Liferafts
 - 4.3 Rescue boats
 - 5 Personal life- saving appliances
 - 5.1 Lifebuoys
 - 5.2 Lifejackets
 - 5.3 Immersion suits/anti- exposure suit (AES)
 - 5.4 Thermal protective aids
 - 6.1 Personal survival without a lifejacket
 - 6.2 Boarding survival craft
- 7 Survival at sea
 - 7.1 Dangers to survivors
 - 7.2 Best use of survival craft facilities
- 8 Emergency radio equipment
 - 8.1 Portable radio apparatus for survival craft
 - 8.2 Emergency position-indicating radio beacons (EPIRBs)
 - 8.3 Search and rescue transponders (SARTs)
- 9 Helicopter assistance
 - 9.1 Communication with the helicopter
 - 9.2 Evacuation from ship and survival craft
 - 9.3 Helicopter pick-up
 - 9.4 Correct use of helicopter harness

Elementary First Aid :



- Basic Life support
- Artificial respiration and technique of heart compression
- Standard dressing
- Shock & Treatment
- Burn treatment
- Various injuries bandage
- Electric burns treatment
- Hypothermia

Fire Prevention and Fire fighting :

- Minimising the risk of fire
- Maintaining a state of readiness to respond to emergency situations involving fire
- Fighting and extinguishing a fire
- Shipboard fire-fighting organisation
- Location of fire-fighting appliances and emergency escape routes
- The elements of fire and explosion (the fire triangle)
- Types and sources of ignition
- Flammable material, fire hazards and spread of fire
- Fire and smoke detection and automatic alarm systems
- Classification of fire and applicable extinguishing agents

Security Awareness Training and Designated Security Duties :

- Recognize the importance of awareness of all members on board in relation to protection.
- Mention skills to be obtained (Section A-VI/6 & 1 of the STCW Code).
- Mention definitions, terms and factors relating to maritime security.
- Present maritime security policy and the national and international legislation.
- Mention the maritime security levels and procedures on board and in port for each of them.
- Describe the ship security plan and contingency plans.



- Quote responsibilities of the Government, the Company (CSO), the ship (SSO and his team) and Port Facility (PFSO) related to protection.

Threats to Ship Security

- Mention today's threats and the techniques used to circumvent security measures.
- Recognize possible material threats to ship security such as weapons, bombs, dangerous substances and devices.
- Recognize a non-discriminatory assessment, people who present potential security risks to the ship.
- Mention the procedures to be followed when a threat to the security of the ship is recognized.
- Mention the correct way to handle sensitive information and communications related to security, such as in security incident reports.
- Mention requirements relating to the education and periodic training exercises provided by the conventions, codes and notices from the IMO
- knowledge of current security threats and patterns;
- recognition and detection of weapons, dangerous substances and devices;
- recognition, on a non-discriminatory basis, of characteristics and behavioural patterns of persons who likely to threaten security;
- techniques used to circumvent security measures
- crowd management and control techniques;
- security related communications;
- knowledge of emergency procedures and contingency plans;
- operation of security equipment and systems;
- testing, calibration and at-sea maintenance of security equipment and systems;
- inspection, control, and monitoring techniques; and
- methods of physical searches of persons, personal effect, baggage, cargo, and ship stores.

Personal Safety and Social Responsibility :

- Comply with emergency procedures.



- Take precautions to prevent pollution of the marine environment.
- Observe safe working practices.
- Contribute to effective communication on board ship.
- Contribute to effective human relationships on board ship.
- Understand and take necessary actions to control fatigue.

Text Books:

1. Seamanship Technique- DJ House
2. Illustrated Seamanship- Dedekam
3. Nocholl's Seamanship & Nautical Knowledge- A.N.Cockroft
4. Seamanship notes – Angus Ferguson
5. American Merchant Seaman's manual – William B.Hayler
6. Basic Seamanship – Clossold revised by Miller
7. Theory and Practice of seamanship – Graham Danton
8. Knight's modern seamanship- John Noel
9. IMO Model Course : 1.20, 1.13, 1.19, 3.26, 3.27, 1.21
10. Seamanship notes – Kemp & Young
11. Lifeboat and Life Raft – S.K. Puri
12. Survival at Sea – C.H.Wright

Course Title : Maritime Legislation

Course Code	: 1209
Credits	: 2
Lecture Hours	: 28
Assessment	: Term end written examination and class tests
Faculty in Charge	:

Aims: This course aims to provide a foundation for the appreciation of the complex body of maritime law, and knowledge of the major international conventions.

Learning Outcomes: The student will be able to understand :

1. The basic principles of maritime law within the wider context of law and legal systems
2. The basics of public international law, including law of the sea and the law of treaties
3. Various IMO conventions
4. Bangladesh local law on maritime administration.



Syllabus Contents:

1. **Introduction to Maritime Law:** Law and legal systems; Principles of public international law, International Maritime Organization; Maritime administration.
2. **Law of the Sea:** Conventions on the Law of the Sea, Territorial Sea and the Contiguous Zone, International Straits, Exclusive Economic Zone and Continental Shelf, High Seas, Protection and Preservation of the Marine Environment
3. International Convention on Load Lines, 1966 (LL1966), as amended;
4. International Convention on Standards of Training, Certification and Watch-keeping for Seafarers, 1978 as amended.
5. Special Trade Passenger Ships Agreement, 1971, and Rules, 1971 (STP1971)
6. Protocol and Rules on Space Requirements for Special Trade Passenger Ships, 1973 (SPACESTP1973)
7. Athens Convention relating to the Carriage of Passengers and their Luggage by Sea (PAL1974).
8. International Convention on Tonnage Measurement of Ships, 1969
9. A brief Discussion on all Safety and Liability related conventions by IMO.
10. Bangladesh Merchant Shipping Ordinance 1983

Recommended Text(s):

1. Grime, R. (1991). *Shipping Law* (2nd ed.). London: Sweet & Maxwell Ltd.
- Hill, C. *Maritime Law*, (6th ed.) LLP, London
2. IMO: SOLAS Consolidated Edition 2009. London: IMO
3. IMO: STCW 1978 Edition 2011. London: IMO
4. UNCLOS (1982), UN, New York

Course Title : Basic Ship's Stability

Course Code : BNS 1211
Credits : 2
Contact Hours : 28
Assessment : Term end written examination, Class test
Faculty in Charge :

Learning outcomes: After completion of the course student will enable to understand the basic stability criteria of a ship including how the stability will be changed with the static load.



Syllabus Contents:

1. Displacement

- states that, for a ship to float, it must displace a mass of water equal to its own mass
- explains how, when the mass of a ship changes, the mass of water displaced changes by an equal amount
- defines the displacement of a vessel as its mass measured in tonnes
- states that displacement is represented by the symbol Δ
- explains that a graph or scale can be drawn to show the relationship between the displacement and mean draught of a ship
- given a displacement/draught curve, finds:
 - * displacements for given mean draughts
 - * mean draughts for given displacements
 - * the change in mean draught when given masses are loaded or discharged
 - * the mass of cargo to be loaded or discharged to produce a required change of draught
- defines 'light displacement' and 'load displacement'
- defines 'deadweight'
- uses a deadweight scale to find the deadweight and displacement of a ship at various draughts in seawater
- defines 'tonnes per centimetre immersion' (TPC)
- explains why TPC varies with different draughts of a ship
- given a displacement/draught curve, finds:
 - * displacements for given mean draughts
 - * mean draughts for given displacements
 - * the change in mean draught when given masses are loaded or discharged
 - * the mass of cargo to be loaded or discharged to produce a required change of draught
- uses a deadweight scale to find the deadweight and displacement of a ship at various draughts in seawater
- defines 'tonnes per centimetre immersion' (TPC)
- explains why TPC varies with different draughts uses a deadweight scale to obtain TPC at given draughts
- uses TPC obtained from a deadweight to find:
 - * the change of mean draught when given masses are loaded or discharged
 - * the mass of cargo to be loaded or discharged to produce a required change of draught
- defines 'block coefficient' (C_b)
- calculates C_b from given displacement and dimensions
- calculates displacement from given C_b and dimensions

2. Buoyancy

- explains what is meant by 'buoyancy'



- defines the force of buoyancy as an upward force on a floating object created by pressure of liquid on the object
- states that the buoyancy force is equal to the displacement of a floating objecties
- explains what is meant by reserve buoyancy
- explains the importance of reserve buoyancy
- explains how freeboard is related to reserve buoyancy
- explains the purpose of load lines
- explains the requirements for maintaining water tight integrity
- demonstrates and understanding of damage stability requirements for certain vessels
- explains reasons for damage stability requirements
- identifies damage stability requirements for Type A vessels, Type (B-60) and Type (B-100) vessels
- identifies equilibrium condition after flooding for Type A, and all Type B vessels identifies damage stability requirements for passenger vessels

3. Fresh Water Allowance

- explains why the draught of a ship decreases when it passes from fresh water to seawater and vice versa
 - states that when loading in fresh water before proceeding into seawater, a ship is allowed a deeper maximum draught
 - states that the additional draught is called the fresh water allowance (FWA)
- give the FW A and TPC for fresh water, calculates the amount which can be loaded after reaching the summer load line when loading in fresh water before sailing into seawater
- uses a hydrometer to find the density of dock water
 - describes the effect of changes of tide and rain on dock water density
 - explains how to obtain the correct dock water density
 - given the density of dock water and TPC for seawater, calculates the TPC for dock water
 - given the density of dock water and FWA, calculates the amount by which the appropriate load line may be submerged given the present draught amidships and the density of dock water, calculates the amount to load to bring the ship to the appropriate load line in seawater

4. Movement of the Centre of Gravity

- states that the centre of gravity (G) of a ship can move only when masses are moved within, added to, or removed from the ship
- states that:
 - G moves directly towards the centre of gravity of added masses
 - G moves directly away from the centre of gravity of removed masses
 - G moves parallel to the path of movement of masses already on board
- calculates the movement of G (GG1) from:
$$GG1 = \frac{\text{mass added or removed} \times \text{distance of mass from G}}{\text{new displacement of the ship}}$$

$$GG1 = \frac{\text{mass moved} \times \text{distance mass is moved}}{\text{displacement of the ship}}$$
- performs calculations as in the above objective to find the vertical and horizontal shifts of the centre of gravity resulting from adding, removing or moving masses



- states that if a load is lifted by using a ship's derrick or crane, the weight is immediately transferred to the point of suspension
- states that if the point of suspension is moved horizontally, the centre of gravity of the ship also moves horizontally
- states that if the point of suspension is raised or lowered, the centre of gravity of the ship is raised or lowered
- calculates, by using moments about the keel, the position of G after loading or discharging given masses at stated positions
- calculates the change in KG during a passage resulting from:
 - consumption of fuel and stores
 - absorption of water by a deck cargo
 - accretion of ice on decks and superstructures given the masses and their Positions

5. Statical Stability

- states that weight is the force of gravity on a mass and always acts vertically downwards
- states that the total weight of a ship all its contents can be considered to act at a point called the centre of gravity (G)
- defines the centre of buoyancy (B) as being the centre of the underwater volume of the ship
- states that the force of buoyancy always acts vertically upwards
- explains that the total force of buoyancy can be considered as a single force acting through B
- explains that when the shape of the underwater volume of a ship changes the position of B also changes
- states that the position of B will change when the draught changes and when heeling occurs
- labels a diagram of a midship cross-section of an upright ship to show the weight acting through G and the buoyancy force acting through B
- states that the buoyancy force is equal to the weight of the ship
- labels a diagram of a midship cross-section of a ship heeled to a small angle to show the weight acting through G and the buoyancy force acting through B
- describes stability as the ability of the ship to return to an upright position after being heeled by an external force
- defines the lever GZ as the horizontal distance between the vertical forces acting through B and G
- states that the forces of weight and buoyancy form a couple
- states that the magnitude of the couple is displacement X lever, $\Delta \times GZ$
- explains how variations in displacement and GZ affect the stability of the ship
- on a diagram of a heeled ship, shows:
 - * the forces at B and G
 - * the lever GZ
- states that the length of GZ will be different at different angles of heel
- states that if the couple GZ tends to turn the ship toward the upright, the ship is stable
- states that for a stable ship:
 - * $\Delta \times GZ$ is called the righting moment
 - * GZ is called the righting lever



Recommended Text(s):

01. Merchant Ship Stability – H.J. Pursey
02. Ship Stability OOW – Martin Rhodes
03. Ship Stability for Masters and Mates – Bryan Barrass

Course Title : Celestial Navigation

Course Code : BNS 1213
Credits : 3
Contact Hours : 42
Assessment : Term end written examination, Class test
Faculty in Charge :

Learning outcomes: The course will enable the student to understand the celestial sphere and finding ship's position by celestial object.

Syllabus Contents:

Celestial Sphere and Equinoctial System of Co-ordinates

- describes the celestial sphere
- explains the apparent annual motion of the sun and the concept of the ecliptic
- defines 'celestial poles', 'celestial meridians', 'equinoctial' and the 'obliquity of the ecliptic
- states that equinoctial as a fixed reference plane and the direction of the First Point of Aries as a reference direction (ignoring the effect of precession)
- describes the equinoctial system of co-ordinates and define sidereal hour angle, declination and polar distance extracts information from the star diagrams in the Nautical Almanac.

Hour Angle

- describes the concept of the earth's axial rotation causing change in the hour angle of bodies
- defines 'Greenwich Hour Angle (GHA)', 'Local Hour Angle (LHA) ' and longitude, and explain their relationship
- describe the rate of change of GHA of the sun and Aries
- identifies the tabulation of SHA, GHA and declination (and 'd' and 'v' corrections) in the Nautical Almanac for all celestial bodies determines the geographical position of a body for any given GMT

Daily Motion and Horizontal System of Co-ordinates

- defines 'rational horizon', 'zenith' and 'nadir'
- defines 'vertical circle' and 'prime vertical circle'
- defines 'elevated pole, and 'depressed pole'



- prove that the altitude of the elevated pole is equal to the observers latitude
- defines the observer's upper and lower celestial meridian
- identifies the apparent daily path of all bodies
- defines 'true altitude', 'azimuth', and 'true zenith distance'
- explains the relationship between azimuth, quadrantal bearings and 360° notation bearing
- recognizes rising and setting points and define amplitude
- explains the meaning of the term circumpolar and describe the conditions necessary for a body to be circumpolar
- describes the condition necessary for a body to cross the prime vertical
- recognizes the parts of the PZX triangle draws figures on the plane of the rational horizon and of the observer's celestial meridian, using the equidistant projection to illustrate navigational problems and principles

Time and Equation of Time

- describes the apparent solar day and states the relationship between LHA (sun) and LAT
- defines the sidereal day and state that it is a fixed time interval
- explains the reasons for the sun's irregular rate of change of SHA and hence the necessity to adopt the astronomical mean sun for timekeeping purposes
- describes the equation of time (ET) and its components
- determines the ET from the Almanac and its sign of application
- defines GMT, LMT and longitude
- defines zone times and standard times
- explains how to alter the ship's time during a passage with increasing or decreasing longitude determines the use of time signals calculates the error of a chronometer or watch

Recommended Text(s):

1. Practical Navigation - Capt. H. Subramaniam
2. Principles of Navigation - Capt. P.M. Sharma
3. Principles of Navigation - Capt. T.K. Joseph and Capt. S.S.S. Rewari
4. Admiralty Manual of Navigation Vol:I and Vol:II - HMSO
5. Principles of Navigation - A. Frost
6. Nicholl's Concise Guide Vol:I and Vol:II - Brown, Son and Ferguson Ltd.
7. Elements of Navigation and Nautical Astronomy – C.H.Cotter
8. Navigation for Master – D.J.House
9. Navigation Advanced for Mates & Master – Nadeem Anwar

Course Title : Navigational Instrument

Course Code : BNS 1215
Credits : 3



Contact Hours : 42
Assessment : Term end written examination, Class test
Faculty in Charge :

Learning outcomes: To enable the student to understand the principle, operation and limitation of various navigational instrument on board at Bridge. Also enable the student to use the instrument as best navigational aids.

Syllabus Contents:

The Magnetic Compass

- describes the construction of a liquid card magnetic compass
- sketches a section through the compass to show the float chamber, the pivot support and the arrangement of magnets
- explains how the card is kept practically horizontal in all latitudes
- states the composition of the liquid and explain how allowance is made for changes in volume of the liquid
- describes how to remove an air bubble from the compass bowl
- describes how to check that the card is turning freely on its pivot explains how the compass bowl is supported in the binnacle
- describes the marking of the lubber line and its purpose
- describes a binnacle and the arrangement of correcting devices provide
- defines 'deviation' and state how it is named
- illustrates with sketches the deviations on various headings produced by permanent magnetism with a pole or poles lying in the plane of the compass card
- illustrates with sketches the deviation on various headings resulting from induction in a notional soft iron rod lying in the plane of the compass card
- explains the need for care in the placing of portable items of magnetic material including spare corrector magnets, or electrical equipment in the vicinity of compasses
- explains the need for regular checking of the compass error
- explains why compass error should be checked after a major alteration of course
- explains why regular comparisons of standard compass, steering compass and gyro-compass should be made
- explains that the approximate error of the standard compass can be obtained by comparison with the gyro-compass if no other means is available demonstrates taking bearings of celestial bodies and landmarks

The Gyro-Compass

- describes a free gyroscope and its gimbal mountings

states that in the absence of disturbing forces the spin axis of a free gyroscope maintains its direction in space

- explains what is meant by gyroscopic inertia and precession
- describes the precession resulting from a torque about axes perpendicular to the spin axis
- explains that friction at gimbal pivots produces torques which give rise to precession
- states that the rate of precession is proportional to the applied torque
- defines 'tilt' is movement of the spin axis in the vertical plane



- defines 'drift' as the apparent movement of the gyroscope in azimuth resulting from the earth's rotation
- describes non-mathematically the apparent movement of a free gyroscope on the earth's surface, given its position and initial attitude
- uses the apparent motion of a celestial body in the direction of the gyro axis to aid the description in the above objective
- explains how a free gyroscope can be made north-seeking by the use of gravity control and describes the resulting oscillations of the axis
- describes the use of damping in azimuth and damping in tilt to cause settling of the axis and thus produce a gyro-compass
- explains that control and damping can be achieved by replacing the ballistic elements with electrical signals, provided by tilt sensors, to produce torques about the vertical and horizontal axes
- describes a familiar gyro-compass with particular reference to:
 - * the method of support
 - * control and damping arrangements
 - * the method of maintaining the heading indication in the with the axis of the gyro
- demonstrates the starting of the gyro-compass and explain how to minimize setting time by slewing and leveling it to the correct heading
- states the necessary time for the compass to settle after switching on prior to sailing
- lists the settings to be made or adjusted while the compass is in use
- explains how the repeater system is switched on and aligned with the master gyro-compass
- describes the use of gyro input to the direction –finder
- describes how gyro heading input is supplied to a radar installation describes the alarms fitted to a gyro-compass

Speed Logs

- states the different between ground-reference speed and water-reference speed
- describes the basic principles of the electromagnetic speed log describes the basic principles of the acoustic-correlation log
- describes the basic principles of the Doppler speed log
- explains the "Janus" configuration to counteract the effect of ship's trim
- explains the dual-axis configuration and its use during docking operations
- lists the main error sources on the various types of logs
- states the accuracies of the various systems
- explains calibration of the log
- describes how ship's speed is transmitted to remote displays draws a schematic diagram showing how an indication of distance run is derived from a speed log

Echo-Sounders

- describes the basic principles of marine echo-sounding equipment
- identifies the main components on a simple block diagram of an echo-sounder, and states the function of each
- states the accepted value of the velocity of sound in seawater and the limits within which the true value may lie
- states the physical factors which affect the velocity of sound in seawater



- operates a typical echo-sounder and demonstrates basic user maintenance, e.g. clean platen, change paper, change and adjust stylus
- distinguishes between range and phase, and demonstrates an awareness of the dangers of using the wrong phase
- distinguishes between inaccuracies caused by instrument and scale error and those caused by false echoes
- explains the causes of inaccuracies due to instrument or scale error and states their likely magnitude and measure that may be taken to eliminate them
- recognizes the various types of 'false' echo that may be recorded, describes their formation and state the possible action to remove them from the trace describes the potential error due to trim, heel and transducer separation

Recommended Text(s) :

1. The Navigation control Manual – Bole, Dinely & Nocholis
2. Marine Electronic Navigation – S. Appleyard
3. Practical Electronics Handbook – L.Sinclair & J Dunton
4. Electronics Navigation System – L Tettly & D Calcut
5. Use of visual Aids to navigation – ND Squire

Course Title : Meteorology and Instrumentation

Course Code	: BNS 1217
Credits	: 3
Contact Hours	: 42
Assessment	: Term end written examination, Class test
Faculty in Charge	:

Learning outcomes: The course will enable the student to understand the meteorological observation and pattern at sea. Also enable the student to use the meteorological information for safe navigation.

Syllabus Contents:

Shipborne Meteorological Instruments

- describes the basic principle of an aneroid barometer
- reads the atmospheric pressure from an ordinary aneroid barometer
- reads the temperature from a thermometer
- states the function of a hygrometer states the basic principles of wind sensors, takes and logs ordinary readings of speed

The Atmosphere, its Composition and Physical Properties



- describes the composition of the earth's atmosphere, mentioning dry air and its constituents, water vapour and aerosols
- draws and label a typical vertical temperature profile through the lower 100 km of the earth's atmosphere
- defines 'troposphere', 'troposphere', 'stratosphere', 'stratopause', 'mesosphere', 'mesosphere' and 'thermosphere'
- describes the main features of the troposphere
- states the importance of the sun as the principal energy source for atmospheric processes
- describes the nature of solar radiation, (scattering, reflection and absorption)
- explains the effect on insolation of a variation in latitude
- explains the effect on insolation of a variation in the sun's declination
- explains the effect on insolation of a variation in the length of daylight
- defines 'water vapour'
- describes the properties of water vapour in the stmosphere
- defines 'evaporation', 'condensation', "latent heat of vaporization,
- describes the processes of mixing , cooling and the evaporation of water vapour, by which a sample of air may be brought to saturation,defines 'dewpoint', 'absolute humidity', 'relative humidity', vapour pressure'

Atmospheric Pressure

- states that pressure equals force per unit area
- states that the atmosphere exerts a pressure on any surface placed within it
- states that the atmosphere pressure on a unit area of a surface is equal to the weight of the "air column" extending form that surface to the outer fringes of the atmosphere
- explains that atmospheric pressure decreases with height above sea level
- states that atmospheric pressure acts in all directions
- states that the basic unit pressure is N/m^2
- states that $1 \text{ millibar} = 10^{-3} = 10^2 \text{ N/m}^2$
- states that 1 hectoPascal (hPa)-1 millibar
- states that the atmospheric pressure at sea level normally varies between about 940 hPa and 1050 hPa
- states that the average pressure at sea level is 1013.2 hPa
- explains that the surface pressure rises it air is added to the 'column' above the surface, and vice versa, defines isobar

Wind

- defines 'wind'
- describes the Beaufort scale of wind force
- explains qualitatively the pressure gradient force
- explains qualitatively the Coriolis (geostrophic) force
- explains the surface wind circulation around high and low-pressure centres



- inserts surface wind directions on a map showing pressure distribution and indicates relative wind speeds at various places within the pressure field
- states Buys Ballot's law
- explains the method of estimating the strength of the wind from the appearance of the sea surface, using the Beaufort wind scale
- states the factors, other than the wind speed, which affect the appearance of the sea surface
- explains the difference between apparent wind and true wind
- determines the true wind velocity by using a vector diagram, given the apparent wind and the ship's course and speed, describes the method of estimating the wind direction from the appearance of the sea surface

Cloud and Precipitation

- explains that clouds form when air containing water vapour rises, cools adiabatically and becomes saturated
- states the need for and define condensation nuclei
- states that a cloud can consist of ice crystals, supercooled water droplets, water droplets or any combination of these
- names and describe the ten basic cloud types
- states the probable base heights of the ten principal cloud types
- defines 'precipitation' defines 'rain', 'drizzle' 'hail' 'snow' and 'sleet'

Visibility

- state the visibility is reduced by the presence of particles in the atmosphere, near the earth's surface
- defines 'fog', 'mist', 'haze'
- applies the concept of processes leading to supersaturation to classification of fogs as mixing, cooling or evaporation fogs
- explains qualitatively the formation of radiation fog, mentioning areas, seasons and reasons for its dispersal
- states the effect of pollution on the formation of radiation fog
- explains qualitatively the formation of advection fog, mentioning areas, seasons and reasons for dispersal
- explains qualitatively the conditions leading to the formation of sea smoke, and typical areas where sea smoke may be encountered describes methods of estimating the visibility at sea, by day and by night, and the difficulties involved

Recommended Text(s) :

1. Marine Meteorology - Capt. H. Subramaniam
2. Atmosphere and Weather - Barry R.G., Chorley R.J.
3. Introduction to theoretical Meteorology - HESS
4. Meteorology for Mariners - HMSO



5. Marine Observer's Handbook - HMSO
6. Elementary Meteorology - HMSO
7. An introduction to Meteorology - James R. Holton
8. Introduction to Meteorology - Petterson B.

Course Title : Physics Sessional

Course Code	: 1202
Credit	: 1
Lecture Hours	: 28
Assessment	: Attendance, Laboratory report, note book, Quiz, Viva voce
Faculty in Charge	:

Learning outcomes: To understand the physical properties of various materials used to build the ship. Also to enable the students to understand the magnetic compass and electro-magnetic induction used in various equipment and machineries on board. Also to understand the properties of various cargo carried on board specially hazardous and dangerous cargo.

Syllabus Contents:

Group A:

1. Determination of 'g' by a compound pendulum
2. Determination of Young's modulus of elasticity of a string by Searle's apparatus.
3. Determination of rigidity modulus by static method.
4. Determination of surface tension of water by capillary tube method.
5. Determination of surface tension and angle of contact of Mercury by Quinke's method.
6. Determination of moment of inertia by fly-wheel about its axis of rotation.
7. Determination of co-efficient of viscosity of water by its flow through a capillary tube.
8. Determination of the thermal conductivity of a bad conductor by Lee's method.
9. To verify the laws of transverse vibration of stretched string with a sono-meter.
10. To find the frequency of tuning fork by Melde's experiment.

Group B:

1. Comparison of EMF of two cells.
2. Verification of the laws of combination of resistances by P.O box
3. Calibration of a meter bridge wire.
4. Determination of galvanometer resistance by half deflection method.
5. To determine electro-chemical equivalent of Copper/Silver.
6. Determination of the refractive index of prism material by spectrometer.



7. Determination of wave length of light by Newton's rings experiment.
8. Plotting the I-V characteristic curves for the forward biased and reverse biased P-N junction diode.
9. Plotting the input characteristic and output characteristic curves of a CE transistor circuit.
10. Construction of A.M radio transmitter and receiver
11. Construction of OR, AND, NOT gates and prove their truth table.

Recommended Text(s)

1. Applied Physics - J.H. Clough - Smith
2. Fundamental of Physics - M.Nelkon
3. Principles of Physics - Fredrick J. Bueche
4. Physics: Classical & Modern - Gettys , Keller , Skove
5. University Physics - Young , Sears and Zemansky
6. Advanced level practical Physics – M. Nelkon

Course Title : Principles of Chart Work

Course Code	: BNS1222
Credit	: 1
Contact Hours	: 28
Assessment	: Attendance, Laboratory report, note book, Quiz, Viva voce
Faculty in charge	:

Learning Outcome: The students will enable to understand the various information available from chart also how to find the correct chart for passage plan and execution. The course will also help to draw the correct position and course line for different situations.

Syllabus Contents

1. Chart and Chart catalogue
2. Chart Datum
3. Position and Position Lines
4. Course and Distance
5. Set, rates, drift and leeway.

Position Lines and Positions

- defines a position



- given the radar distance off a charted object, plots the position circle on a chart
- plots a position on the chart from simultaneous cross bearings and from a bearing and distance off
- explains the methods used to obtain simultaneous cross bearings with least error
- defines 'dead reckoning position (DR)', 'estimated position and' fixed position'
- plots a dead reckoning position on the chart
- plots an estimated position on the chart
- plots position lines –straight line, circle, hyperbola
- finds a position line by bearing, horizontal angle, vertical sextant angle, transit line and radio aids
- determines a position by a combination of bearing distance and the methods in the above objective
- finds a position by simultaneous bearings of two objects
- finds the distance that the ship will pass off a given point when abeam
- constructs a position line to clear a navigational danger by a given distance
- 4 point Bearing

Compass Corrections

- defines true, magnetic and compass north
- finds deviation and variation from tables and charts
- calculates true course from compass course
- calculates compass course from true course
- measures compass error, using a transit bearing
- applies compass error to the ship's head and compass bearings to convert to true
- takes a compass bearing of a charted object and lay the true bearing off on the chart

Chartwork Exercises

- defines 'course', and 'distance'
- lays off true course between two positions
- finds the distance between two positions
- calculates the speed between two positions
- defines 'set', 'rates', and 'leeway' due to wind
- defines 'ship's speed', 'effective speed', 'course and distance made good', 'applied leeway'
- finds the course and distance made good with a tidal stream or current
- finds the course to steer, allowing for tidal stream or current
- finds the set and rate of tidal stream or current from charts or tables
- explains the term 'running fix' and use the method to plot a position
- finds positions by running fix in a tidal stream or current calculates the actual set and rate of tidal stream or current from DR and fixed positions

Recommended Text(s):

01. Introduction to charts and their use- M.Chris & GR Hayes
02. Seaman's guide to basic chart work
03. Introduction to coastal navigation- a seaman's guide
04. Chart Work for mariners- Capt S.K.Puri



05. Marine Chart Work – D.A.Moore

06. Voyage Planning and Chart work – Capt M.V.Naik and Capt Varty

Course Title : Maritime English & Communication Skill

Course Code : 1220

Credit : 1

Lecture Hours : 28

Assessment : Attendance, Laboratory report, note book, Quiz, Viva voce

Faculty in Charge :

Learning outcomes: Developing the listening and speaking skill of on board communications. Enable to understand the marine phrases.

Syllabus Contents:

1. Ask and Give Personal Data

2. Describe Crew role and routines

3. Name, types of vessel and describe parts of vessel

4. Describe the location and purpose of the safety equipment

5. Describe Navigational Route and geographical locations

6. Understand standard helm order

7. Name, positions on board

8. Ask for and give directions on board and ashore

9. Express personal likes and dislikes.

10. Comprehension

a) Study of the prescribed course book for seen comprehension.

b) Reading and comprehension of unseen passages of modern Prose.

11. Written Communication

a) Formal and ordinary letters, formal invitations, letters to friends and relatives.

b) Official and semi-official letters. Application for appointment. Commercial letters, Letter to influence public opinion.

c) Notices, agenda & minutes writing.

d) Project writing, forecasting dangers, seminar reporting.

e) Writing factual reports, accidents and maintaining a diary and a log book.

f) Summarizing/ abstracting the main ideas of an unseen passage, given a working outline.

g) Stress marking.

h) Transformation of sentences, narration, voice change.

i) Synonyms, Antonyms, Substitution of word for phrase or clause.

12. Skills of oral communication

a) Speech training: Elocution, debating & extempore speech.



- b) Group discussions & interviews.
- c) Delivery of welcome address.
- d) Sea Speak.

13. Notice of meeting, agenda & minutes writing.

14. Writing factual reports, maintaining a diary/log book

15. All items under skills of oral communication, i.e. item 3 under course content.

16. Stress marking.

Recommended Text(s) :

1. English language Books 1 & 2 - L. A. Hill, C. J. Daswani & C. T. Daswani
(Oxford University Press 1975)
2. Writing Communication - Freeman & Sarah
3. Note Marking & Composition
Exercises 1979 - ELT Cell, Bombay University
4. Business Correspondence
& Report Writing - R. C. Sharma & Krishnamohan
5. Academic Skills - CIEFL, Hyderabad
6. Academic Skills Workbook - CIEFL, Hyderabad
7. Supplementary Reader - CIEFL, Hyderabad
8. Sea Speak Manual - International Maritime Organisation
9. Maritime English – IMO Model Course
10. Communication Skills (Book 1) - S. R. Inthira & V. Saraswati
11. Communication Skills workbook - S. R. Inthira & V. Saraswati
12. Spoken English for Indian - R. K. Bansal & B. Harrison

Course Title : Basic Maritime Safety & Security Sessional

Course Code	: 1208
Credit	: 1
Lecture Hours	: 28
Assessment	: Attendance, Laboratory report, note book, Quiz, Viva voce
Faculty in Charge	:

Learning outcomes: After attending the course students will enable to understand the basic safety procedure and medical first aid including the security precautions taken on board. The course is mandatory minimum requirements to join ocean going vessel.

Syllabus Contents:

Practical part of the IMO model courses

1. Fire Prevention and Fire Fighting



2. Personal Survival Technique
3. Personal Safety and Social Responsibility
4. Elementary First Aid
5. Security Awareness Training
6. Designated Security Duties
 - a. Various types of Portable Fire extinguisher
 - b. Fire main system fixed fire fighting installation
 - c. Fire detection
 - d. CO2 fire extinguishing system
 - e. Breathing apparatus
 - f. Fireman's Outfit
 - g. International Shore Connection
 - h. Lifejacket
 - i. Lifebuoy
 - j. Lifeboat
 - k. Liferaft
 - l. Rescue boat
 - m. Thermal Protective Aids
 - n. Immersion suits
 - o. Rescue with stretcher
 - p. Pyrotechnics
 - q. Line throwing apparatus
 - r. GMDSS walkie talkie, EPIRB, SART
 - s. Drills
 - t. Basic Life support
 - u. Artificial respiration and technique of heart compression
 - v. Standard dressing
 - w. Shock & Treatment
 - x. Burn treatment
 - y. Various injuries bandage
 - z. Electric burns treatment
 - aa. Hypothermia
 - bb. Minimising the risk of fire
 - cc. Maintaining a state of readiness to respond to emergency situations involving fire
 - dd. Fighting and extinguishing a fire
 - ee. Shipboard fire-fighting organisation
 - ff. Location of fire-fighting appliances and emergency escape routes
 - gg. The elements of fire and explosion (the fire triangle)
 - hh. Types and sources of ignition
 - ii. Flammable material, fire hazards and spread of fire
 - jj. Fire and smoke detection and automatic alarm systems



kk. Classification of fire and applicable extinguishing agents

Recommended Text(s) :

1. Seamanship Technique- DJ House
2. Illustrated Seamanship- Dedekam
3. Nocholl's Seamanship & Nautical Knowledge- A.N.Cockcroft
4. Seamanship notes – Angus Ferguson
5. American Merchant Seaman's manual – William B.Hayler
6. Basic Seamanship – Clossold revised by Miller
7. Theory and Practice of seamanship – Graham Danton
8. Knight's modern seamanship- John Noel
9. IMO Model Course : 1.20, 1.13, 1.19, 3.26, 3.27, 1.21
10. Seamanship notes – Kemp & Young
11. Lifeboat and Life Raft – S.K. Puri
12. Survival at Sea – C.H.Wright

Year-2 Term- 1

Course Contents of

B.Sc Honors, Nautical Science

Bangladesh Marine Academy

Under the Recognition of

Bangabandhu Shiekh Mujibur Rahman Maritime University





Course Title : Leadership and Principles of Management

Course Code : BNS 2101
Credits : 2
Contact Hours : 28
Assessment : Term end written examination, Class test
Faculty in Charge :

Aims: This model course is intended to provide a person with the knowledge, skill and understanding of leadership and teamwork at the operational level on board a ship. The course is designed to meet STCW requirements for the application of leadership and team working skills, in accordance with the 2010 Manila Amendments, specifically as stated in table A-II/1, A-III/1 and A-III/6.

Learning outcome: On completion of this course the participants should be able to demonstrate sufficient understanding and knowledge of leadership and management skills to competently carry out the duties of officer in charge of a navigational or engineering watch. The knowledge, understanding and proficiency should include, but not be limited to those listed below:

1. Working knowledge of shipboard personnel management and training
2. A knowledge of related international maritime conventions and recommendations, and national legislation
3. Ability to apply task and workload management
4. Knowledge and ability to apply effective resource management
5. Knowledge and ability to apply decision-making techniques



Syllabus contents:

1. **Introduction to Management Principles & Practice:** Need for sound Management principles and Practice & growth of modern management through, various Managerial Functions, Planning, Organizing, staffing, Directing, controlling & Co-ordination; Principles of locating a Plant & Developing Organization Structure. Various types of organizational structures; Authority & Responsibility. Boundaries of Authority.
2. **Working knowledge of shipboard personnel management and training:** Organization of crew, authority structure, responsibilities, cultural awareness, inherent traits, attitudes, behaviour, cross-cultural communication; shipboard situation, informal social structures on board; human error, situation awareness, automation awareness, complacency, boredom; leadership and team working; training, structured shipboard training programs; knowledge of personal abilities and behavioural characteristics.
3. **Need for international maritime conventions, recommendations and national legislation:** International maritime conventions – SOLAS, MARPOL, STCW, and MLC, role of IMO, ILO; Recommendations and national legislation.
4. **Ability to apply task and workload management:** Planning and coordination; personnel assignment; human limitations; personal abilities; time and resource constraints; prioritization; workloads, rest and fatigue; management (leadership) styles; challenges and responses.
5. **Knowledge and ability to apply effective resource management** : effective communication on board and ashore; allocation, assignment and prioritization of resources; decision making reflecting team experience; assertiveness and leadership, including motivation; obtaining and maintaining situational awareness; appraisal of work performance; short and long term strategies.
6. **Knowledge and ability to apply decision-making techniques:** situation and risk assessment; identify and consider generated options; selecting course of action; evaluation of outcome effectiveness; decision making and problem solving techniques; authority and assertiveness; judgement; emergencies and crowd management.
7. **Personnel Management:** The personnel function Requirement & role of psychological tests in recruitments; Training, performance appraisal and reward system, Legal requirements and regulation of working Condition, Employer's liabilities for health and safety, Leadership and Discipline, Motivation and incentives, Problems of Accident, Fatigue, etc., Relationship with Trade union and workers participation in management.

Recommended text(s):

01. Commercial Management for Ship masters – Tallack Robert L
02. Commercial Shipping Handbook – Brodie
03. Fundamentals of Management, Author: Ricky W. Griffin

Course Title : Computer Programming Language



Course Code : BNS 2103
Credits : 2
Contact Hours : 28
Assessment : Term end written examination, Class test
Faculty in Charge :

Aims:The objective is to provide the students with an overview and training in C++ such that they can efficiently do programming related to scientific simulation in their master-degree projects.

Learning outcomes: After successful completion of this course, the students will achieve the following competences:

1. Familiarization with the universal concepts of computer programming.
2. To present the syntax and semantics of the “C”, “C++” language as well as basic data types offered by the language
3. Understanding the principles of the object-oriented model and its implementation in the C”, “C++” language
4. Understanding the means in resolving typical implementation problems with the help of standard C”, “C++” language libraries

Syllabus contents:

1. Introduction to C and C++ programming languages.
2. C and C++ fundamentals – data types and expressions.
3. Operators. Libraries. Statements
4. Arrays and strings. Functions
5. Function overloading
6. Control statements. Pointers
7. Input and output systems
8. Oriented programming (OOP).
9. Application to the computations of stability, trim and structural strength of marine vehicles.

Recommended Text(s):

1. Teach Yourself C; Herbert Schildt
2. Teach Yourself C++; Herbert Schildt

Course Title : General Cargo Operation

Course Code : BNS 2105



Credits : 3
Contact Hours : 42
Assessment : Term end written examination, Class test
Faculty in Charge :

Learning outcomes: This course will enable the students to understand the general precautions of loading, stowing, securing, carrying and discharging of cargo. Also the course will enable to understand the handling, securing of container cargo.

Syllabus Contents:

General Cargo Care
Sweating and Ventilation
Cargo Calculation and Cargo plan
Cargo Securing
Container cargo
Thomas Stowage

Cargo Care Inspection and Preparation of Holds

- outlines the reasons for a general inspection of holds
- lists items to be inspected
- explains the importance of cleaning holds before loading
- describes how to clean holds after discharge of a general cargo
- states the reasons for using dunnage
- describes the types and sizes of material and used for dunnage
- states the methods of dunnaging a hold for various cargoes and how to dispose of old dunnage
- describes the use of port marking to separate parcels for discharge at different ports

INSPECT AND REPORT DEFECTS AND DAMAGE TO CARGO SPACES, HATCH COVERS AND BALLAST TANKS

Cargo Space Inspections

- Describes the possible causes of damage to the cargo space during cargo operation
- Describes the general layout of a cargo space for a bulk carrier
- Describes the general layout of the cargo space for an oil tanker
- Describes the general layout of the cargo space for a container vessel
- Describes the general layout of a general cargo ship
- Describes the defects that could arise due to the nature of cargo carried
- Describes the corrosion effect that could arise due to structural stress, uneven distribution of cargo, chemical reactions on the ship structure
- Lists the methods in use to prevent the occurrence of corrosion in cargo spaces
- Describes the damage to cargo space due to severe weather condition
- Identifies structural or parts to be inspected each time in order to cover all parts within a given period of time
- Describes the safety procedures before entry into the cargo tank for inspection



Segregation and Separation of Cargoes

- explains the need for the segregation of different cargoes with reference to:
 - * dangerous goods
 - * dry cargo
 - * wet cargo
 - * clean cargo
 - * dirty cargo
 - * delicate cargo
 - * valuable cargo, e.g. bank notes, personal effects
- describes how the cargoes in the above objectives can be segregated
- explains that separation between parcels of cargo for different consignees or different ports of discharge is required
- describes the use of port marking to separate parcels for discharge at different ports

Ventilation and Control

- lists the factors involved in the control of sweat by ventilation
- distinguishes between ship's sweat and cargo sweat and explain the conditions in which each is experienced
- describes the system of natural ventilation and how it should be controlled to minimize the formation of sweat
- describes forced ventilation and humidity control for cargo holds and states the properties measured and recorded at the control panel
- explains how to operate the ventilation system described in the above objective
- states that ventilation is also required for the removal of heat, gases and odours, give examples of cargoes requiring special ventilation

Securing Cargoes

- explains the need for solid stow and securing of all cargoes
- states that cargo liable to the slide during rolling, such as steel rails, should be stowed fore and aft
- describes methods of blocking, lashing, shoring and tombing cargo
- describes methods of securing cargo faces resulting from part discharge before making a sea passage
- describes methods of securing heavy loads and heavy lifts
- describes methods of stowing and securing vehicles and trailers
- states that containers, trailers, portable tanks and other cargo units should be secured in accordance with the ship's cargo securing arrangements manual
- describes passenger operations including passenger cargo, passenger comfort and safety

Cargo Calculations and Cargo Plans

- distinguishes between bale capacity and grain capacity
- defines 'stowage factor'
- explains 'broken stowage' and state how an allowance for it is made
- given the capacity to hold and the stowage factor of the cargo, calculates the weight that the holds will contain
- given the weights and stowage factors of one or more cargoes, calculates the space required



- calculates the number of packages of given dimensions a state space, making allowance for broken stowage given the maximum permissible loading of a tween-deck, calculates the maximum height to which cargo of stated stowage factor can be loaded

Recommended Text(s) :

01. Cargo Work – Kemp & Young
02. Cargo Work – Capt Errol Fernandes
03. Cargo Stowage and Securing – A guide to good practice – Charles Bliault
04. Cargo Work For Maritime Operation – D.J.House
05. Cargo Matters – Marisec
06. Cargo ventilation – a guide to good practice – David Anderson
07. Marine cargo operations- a guide to good practice – Robert Merun

Course Title : Marine Environment and Sustainability

Course Code : BNS 2107
Credits : 3
Contact Hours : 42
Assessment : Term end written examination, Class test
Faculty in Charge :

Learning Outcomes: The students will enable to understand the pollution prevention regulation by ships at sea. Also the students will learn the civil and criminal liability of environmental pollution including the impact of sea environment by marine pollution.

Syllabus Content:

1. **International Convention for the Prevention of Pollution from Ships, 1973:** Annex I: Regulations for the Prevention of Pollution by Oil, Annex II: Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk, Annex III: Regulations for the Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form, Annex IV: Regulations for the Prevention of Pollution by Sewage from Ships; Annex V: Regulations for the prevention of pollution by garbage from ships; Annex-VI: Regulations for the prevention of pollution of air from ships.
2. Convention of the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Dumping Convention).
3. International Convention relating to intervention on the high seas in cases of oil pollution casualties, 1969.
4. International Convention on civil liability for oil pollution damage, 1969.



5. Anti-pollution procedures and associated equipment: Basic knowledge of regulation 26 Annex 1 MARPOL 73/78; Basic knowledge of anti-pollution equipment required by national legislation.
6. Description of the living species and plants under sea, Short and long term effect of marine lives due to pollution. Clearing process and materials used to recover the pollution damage. Shore reception facility. Emergency oil pollution preparedness and response.

Recommended Text(s):

1. IMO: MARPOL 73/78 Consolidated Edition 2011. London: IMO
2. Jackson, Land Morton, T.D. General Engineering Knowledge for Marine Engineers. 5th ed. London, Thomas Reed Publications Ltd 1990. (ISBN 09-47-63776-1)

Course Title : Applied Navigation

Course Code : BNS 2109
Credits : 3
Contact Hours : 42
Assessment : Term end written examination, Class test
Faculty in Charge :

Learning Outcomes : The course will enable the student to understand the celestial sphere and finding ship's position by celestial object

Syllabus Content:

Nautical Almanac

- describes the information contained in general in the Nautical Almanac and in detail in the daily pages
- uses the tables of corrections and incremental corrections in the Nautical Almanac
- explains the importance of the First Point of Aries explains what is meant by the sidereal hour angle of a star and obtain it from the Nautical Almanac
- find the LHA of a body, given the date, GMT and longitude of the observer
- find the LHA of Aries, given the date, GMT and longitude of the observer
- derives the LHA of a star from the LHA of Aries and the SHA of the star use the information in the Nautical Almanac to obtain the LMT of the meridian passage of a body to the nearest minute and interpolates for the observer's longitude when necessary.

Sextant and Altitude Corrections

- demonstrate how to read a sextant
- show how to correct a sextant into which has been introduced one or more of error of perpendicularity, side error or index error



- demonstrates how to find the index error of the sextant by the horizon
- describes how to find the index error of the sextant by the sun and stars
- use the sextant for taking vertical and horizontal angles
- correct an altitude using tables in the Nautical Almanac, including reference to critical tables, interpolation tables and low-altitude correction tables obtain the true zenith distance from the true altitude of the body
- defines 'sextant altitude'
- describes the parts of a sextant
- demonstrate how to retrieve and return a sextant into the storage box
- describes the purpose of altitude correction
- defines 'visible', 'sensible' and 'rational' horizons
- defines 'observed altitude' and 'true altitude'
- defines 'dip', 'refraction', 'semi-diameter' and 'parallax', and explains their causes
- applies index error
- applies the corrections for the items listed in the above objectives and explains the factors determining their magnitude illustrates the effect of terrestrial refraction on the dip and distance of the sea horizon

Amplitude

- determines the observed altitude of the sun when the true altitude is zero
- explains the effect of latitude on the accuracy of amplitude observations
- calculates the LAT and LMT of the theoretical and visible rising and setting of the sun
- extracts information from the tabulation of the rising and setting of the sun in the Nautical Almanac

Latitude by Meridian Altitude

- states the relationship between the altitude of the elevated pole and the latitude of the observer explains what a circumpolar star means, and the terms upper and lower transit
- applies the true zenith distance of a body when it is on the observer's meridian to the declination of the body, to obtain the observer's latitude
- applies these correctly when the declination and latitude have the same names
- applies these correctly when the declination and latitude have different names
- find the value of polar distance of the body, using its declination
- applies the polar distance to the true altitude of a body at a lower transit to find the altitude of the elevated pole and the latitude calculates the direction of the position line and the latitude of the observer by meridian altitude

Pole star Observations

- identifies certain major stellar constellations and navigational stars describe their movement relative to Polaris and the movement of Polaris with change of latitude
- identifies Polaris
- identifies some major constellations
- describes the motion of the about Polaris
- describes the relationship between the altitude of Polaris and the observer's latitude deduces from the above objective that the true altitude of Polaris can be used to find the latitude of the observer
- obtains the corrections, -1^0 , $+a_0$, $+a_1$, $+a_2$, from Pole Star tables in the Nautical Almanac and applies them to the altitude of Polaris to find the latitude of the observer finds the true azimuth of Polaris from the tables and the direction of the position line



Errors of the Compass and Azimuths

- obtain the error of the magnetic compass or gyro-compass by comparing the compass bearing of the body with the true azimuth of the body obtained at the time of observation
- obtain the azimuth of the body from tables, using GMT of observation, information from the Nautical Almanac, LHA of the body and the observer's DR position obtained from tables or by calculation, using the observer's DR position and information from the Nautical Almanac, the true bearing of a heavenly body on rising or setting, i.e. solves an amplitude problem
- obtains the magnetic variation for the observer's position, using isogon lines or other information on the chart
- applies variations to the error of the magnetic compass to find the deviations for the direction of the ship's head
- calculates compass error and gyro error, from transit bearings and bearings to distant fixed objects

Recommended Text(s) :

1. Practical Navigation - Capt. H. Subramaniam
2. Principles of Navigation - Capt. P.M. Sharma
3. Principles of Navigation - Capt. T.K. Joseph and Capt. S.S.S. Rewari
4. Admiralty Manual of Navigation Vol:I and Vol:II - HMSO
5. Principles of Navigation - A. Frost
6. Nicholl's Concise Guide Vol:I and Vol:II - Brown, Son and Ferguson Ltd.
7. Elements of Navigation and Nautical Astronomy – C.H.Cotter
8. Navigation for Master – D.J.House
9. Navigation Advanced for Mates & Master – Nadeem Anwar

Course Title : Collision Prevention Regulation

Course Code : BNS 2111
Credits : 3
Contact Hours : 42
Assessment : Term end written examination, Class test
Faculty in Charge :

Learning Outcomes: This course will enable the student to understand the light and shapes to be shown by various types of vessel as per COLREG including the conduct of vessel in any condition of visibility.

Syllabus Content:

Introduction, application and History of COLREG 71

Lights and shapes

states the application of the rules concerning lights and shapes

- states the definitions in Rule 21



- states the visibility of lights as prescribed by Rule 22
- identifies the lights and shapes carried by any type of vessel and the operation or circumstances signified by them, including the additional signals for fishing vessels fishing in close proximity
- describes the positioning, spacing and screening of lights
- describes the shapes required by the rules
- describes the sound signals to be used by vessels in sight of one another
- describes the sound signals to be used by vessels in or near an area of restricted visibility
- describes the use of signals to attract attention

Distress Signals

- lists the distress signals set out in Annex IV of COLREG 72

The Content, Application and Intent of COLREG 72

- explains the application of the rules as set out in Rule 1
- defines the term 'traffic separation scheme'
- states the responsibility to comply with the rules as set out in Rule 2
- describes and cite examples of precautions which may be required by the ordinary practice of seamen or by the special circumstances of the case
- gives examples of circumstances which may make a departure from the rules necessary
- states the general definitions which apply throughout the rules
- explains the term 'vessel constrained by her draught'
- distinguishes between 'under way' and 'making way'
- explains 'a proper look-out' and interpret the intent of 'full appraisal of the situation and the risk of collision'
- explains the use of radar in the context of Rule 5
- explains what is meant by a safe speed
- describes, with reference to court cases, how 'proper and effective action' and 'within a distance appropriate to the prevailing circumstances and conditions' may be interpreted
- states the factors to be taken into account in determining a safe speed
- explains how the use of radar affects the determination of safe speed
- explains what is meant by risk of collision
- describes the proper use of radar equipment in determining whether a risk of collision exists
- explains the dangers of making assumptions on the basis of scanty information, citing examples from clear weather as well as the use of radar
- illustrates, using examples from court cases, how failure to plot may lead to a lack of appreciation of a developing situation
- illustrates, using examples from court decisions, the following actions to avoid collision referred to in Rule 8:



- positive action in ample time large enough to be readily apparent
- alteration of course alone
- passing at a safe distance
- checking the effectiveness of action taken
- reduction of speed
- taking all way off
- demonstrates an understanding of Rule 9 by:
 - defining the terms 'narrow channel' and 'fairway'
 - describing how to proceed along the course of a narrow channel
 - describing the navigation of small craft and sailing vessels in a narrow channel
 - stating the restrictions on crossing the channel or fairway
 - describing the conduct of vessels engaged in fishing
 - stating the procedure for overtaking in a narrow channel
 - describing the actions to be taken on nearing a bend in a narrow channel or fairway
- defines 'traffic lane', 'separation lane', 'separation zone', 'inshore traffic zone'
- describes how to navigate in a traffic separation scheme with reference to:
 - entering and leaving the traffic separation scheme
 - entering and leaving traffic lanes
 - crossing lanes
 - the use of inshore traffic zones
 - crossing separation lines or entering separation zones other than when crossing, joining or leaving a lane
- states the requirements for vessels:
 - navigating in areas near the terminations of traffic separation schemes
 - anchoring
 - not using a traffic separation scheme
 - engaged in fishing
- states that a vessel of less than 20 meters in length or a sailing vessel must not impede the safe passage of a power-driven vessel following a traffic lane
- states the exemptions for vessels restricted in their ability to manoeuvre when engaged in an operation for the:
 - maintenance of safety of navigation
 - laying, servicing or picking up of a submarine cable
- explains the meaning of 'precautionary area'
- defines 'deep water route' and state for whom such a route is intended
- explains what is meant by 'vessels in sight of one another'
- demonstrates, with the use of models displaying proper signals or lights, a navigation light simulator or otherwise, the proper action to take to avoid collision with other vessels in sight.



Recommended Text(s) :

01. A guide to collision avoidance rule – A.N. Cockraft
02. Browns Rules of the road manual – HH Brown
03. The collision regulation fully explained – Capt P Wailwood
04. Collision at Sea – How – Cdr Md Dewar

Course Title : Satellite and Hyperbolic Navigation

Course Code	: BNS 2113
Credits	: 3
Contact Hours	: 42
Assessment	: Term end written examination, Class test
Faculty in Charge	:

Learning Outcomes : The course will enable the student to understand the satellite and Hyperbolic navigational equipment including their principles, function, operation, and limitation. Also the course will enable the student to understand the electronic chart display and information system.

Syllabus Content:

Basic Principles of Hyperbolic Navigation Systems

- describes, with reference to position fixing, the nature of a hyperbola
- draws a hyperbolic pattern associated with two foci, with the baseline divided into an exact number of equal divisions
- explains the principles of the hyperbolae being position lines
- describes the causes of ambiguity and reduced accuracy in the baseline extension area
- combines two hyperbolic patterns to illustrate the method of ascertaining position

Loran-C & Enhanced Loran (e-Loran)

- describes the basic Loran-C and eLoran system
- draws a block diagram of a Loran-C receiver, showing how time differences are measured
- describes how ambiguity in a position line is resolved
- identifies the Loran chart and the additional information printed thereon
- describes the basic operating principles of eLoran
- describes the principal difference between eLoran and traditional Loran-C system.
- explains the use of eLoran when satellite services are disrupted.
- states that each user"s eLoran receiver will be operable in all regions where an eLoran service is provided .
- describes the control, operating and monitoring systems of eLoran.

ECDIS

- Introduction on ECDIS (Electronic Chart Display and information System)
- Use of ECDIC Advantage and disadvantage of ECDIS



Global Navigation Satellite Systems & GPS System

- describes the principles of operation of global navigation satellite systems
- describes the basic principles of the Global Positioning System (GPS)
- describes the system configuration
- states the frequencies that are used describes the C/A & P codes
- describes how the basic line measurement is obtained
- describes the Dilution of Precision (DOP)
- states the various DOP's that are used
- describes the various errors of GPS
- describes the reasons for selective availability and the effect it has on the accuracy of a fix
- describes differential GPS
- states the accuracy obtainable with GPS and how the accuracy can be downgraded
- explains WGS 84
- explains why a fix obtained from the GPS receiver cannot be plotted direct onto a navigational chart
- explains datum shifts describes the advantages and limitations of GPS

Differential GPS

- describes the basic principle of Differential GPS
- describes how DGPS stations can transmit the corrections
- describes the Regional Satellite Navigation Systems such as China's BeiDou (COMPASS) Navigation Satellite System, India's Indian Regional Navigational Satellite System (IRNSS), Japan's Quasi-Zenith Satellite System (QZSS) and France's Doppler Orbitography and Radiopositioning Integrated by Satellite (DORIS). the limitation of the DGPS receiver

GLONASS

- describes the principle on which the GLONASS works
- explains the different satellite constellation configurations under GLONASS and GPS respectively
- describe the advantage of the receiver capable of operating both GLONASS and GPS "combined GPS/GLONASS receiver equipment" describes the limitation of the GLONASS system receiver

GALILEO

- explains the principle of Galileo as the European satellite navigation system.
- describes that Galileo comprises 30 medium earth orbit (MEO) satellites in 3 circular orbits.
- states the satellite geometry and dual atomic clocks in the Galileo system.
- states that atomic clock signal information is used to calculate the position of the receiver by triangulating the difference in received signals from multiple satellites.
- describes the limitations of the Galileo system receiver



The Automatic Pilot

- explains the principle of an automatic system
- lists and explains the functions of the manual settings
- describes the procedures for change-over from automatic to manual steering and vice versa
- explains what is meant by an adaptive automatic pilot and briefly explain how it functions
- describes the course monitor and the off-course alarm
- lists the other alarms fitted to the system
- states that the automatic pilot should be included in the steering gear testing prior to the ship's departure
- explains the regulation regarding the use of the automatic pilot
- explains in the recommendation on performance, standards for automatic pilots
- explains the need for regular checking of the automatic pilot to ensure that it is steering the correct course
- states that the automatic pilot should be tested manually at least once per watch states the factors to take into account regarding the change-over to manual control of steering in order to deal with a potentially hazardous situation

AIS

- Introduction on AIS. (Automatic Identification system)
- How does AIS works.
- Explain Type –A and Type –B AIS
- What information is broadcast by the AIS
- Operating procedure of AIS. Use of AIS in Maritime industry.

VDR and SVDR

- Introduction on VDR, SVDR
- How does VDR works.
- Operating procedure of VDR. Use of VDR in Maritime industry.

Recommended Text(s):

1. The Navigation control Manual – Bole, Dinely & Nocholis
2. Marine Electronic Navigation – S. Appleyard
3. Practical Electronics Handbook – L.Sinclair & J Dunton
4. Electronics Navigation System – L Tettly & D Calcut
5. Use of visual Aids to navigation – ND Squire
6. Electronic Chart Display and Information system-An operation Handbook- Taylor
7. Understanding GPS Principles and Applications- Elliott Kaplan
8. GPS theory and Practice – Collins and Hofmann

Course Title : Marine Engineering and Control System



Course Code : BNS 2115
Credits : 3
Contact Hours : 42
Assessment : Term end written examination, Class test
Faculty in Charge :

Learning Outcomes: The course will enable the student to understand the principles and operation of diesel engine and various machineries of the engine room and on deck including the electrical installation on board the ship.

Syllabus Content:

SOLAS Chapter II/1 Machinery and Electrical Installation

Diesel Engines

- uses generally accepted engineering terms
- describes the 2-stroke diesel cycle
- describes the 4-stroke diesel cycle
- describes the advantages and disadvantages of a slow-speed diesel engine
- explains the cause of scavenge fires and how they are dealt with
- describes methods of supercharging
- describes the fuel oil system from bunker tank to injection
- describes the lubrication system
- describes the engine cooling-water systems
- describes the advantages and disadvantages of a medium speed diesel
- explain the need for gearing with medium-speed diesels
- describes the arrangement of clutch and gears
- describes how a diesel engine is prepared for stand-by
- describes the method of starting and reversing diesel engine
- states that the number of starts is limited by the capacity of the starting air reservoir
- sets up, starts and stops a small diesel engine

Steam Turbine Systems

- describes the turbine, the feed system and the boiler as a system
- explains the working of an impulse turbine
- explains the working of a reaction turbine
- describes a steam turbine installation and its gearing
- distinguishes between and describes open and closed feed systems
- states that steam turbine needs a large water-tube boiler
- describes the main features of a water-tube boiler
- describes in outline the procedure for raising steam
- lists the principal boiler mountings and explains their purpose
- describes the procedure for warming through a steam turbine ready for manoeuvring
- describes the procedures for manoeuvring when using a steam turbine

Propeller and Propeller Shaft



- describes the arrangement of thrust shaft, intermediate shafts and tail shaft
- explains how propeller thrust is transmitted to the hull
- describes how the propeller shaft is supported between the thrust block and the stern tube
- sketches and describes an oil-lubricated stern-tube bearing
- describes how the propeller is secured to the tail shaft
- sketches a propeller and indicates the following on it:
 - boss
 - cone
 - face
 - back
 - rake
 - skew
- defines pitch, slip and efficiency of a propeller
- calculates the percentage apparent slip from given data
- calculates the ship' speed, given the engine revolutions per minute, mean pitch and percentage slip
- describes the arrangement and operation of a controllable-pitch propeller (CPP)
- states the precautions to take with a CPP before:
 - starting the main engine
 - going to sea
 - entering harbour or confined waters
- states that changing control positions and the use of emergency hand control pitch and engine revolutions should be exercised

Bridge Control

- describes a control system for the main engine, including control from bridge, machinery control room, engine control local and changeover controls
- describes bridge control or controllable-pitch propellers
- lists the indicators and alarms provided with bridge control
- describes the arrangement and operations of lateral thrusters
- describes the bridge control and indicators for lateral thrusters

Boilers

- distinguishes between water-tube and fire-tube boilers
- describes auxiliary boilers
- describes a waste-heat boiler
- describes exhaust-gas heat exchangers
- describes steam-to-steam generators and explains where and why they are used
- describes a boiler fuel-oil supply system
- describes the effect of dissolved salt in the feedwater and how it is treated
- explains what is meant by 'priming'
- states that carry-over of water may cause serious damage to turbine blading and to steam cylinders

Distillation and Fresh-water systems

- describes a distillation system
- explains the operation of a flash evaporator



- describes the treatment of fresh water intended for drinking
- describes a domestic water system

Pumps and Pumping Systems

- classifies pumps as displacement, axial-flow or centrifugal
- describes the operation of a reciprocating pump
- describes rotary displacement pumps and states typical applications
- describes a screw pump and states possible uses
- describes an axial-flow and states possible applications
- describes a centrifugal pump and states typical applications
- explains the need to prime a centrifugal pump
- describes the head losses in a pumping system and how they are expressed
- explains net positive suction head and its significance in pump operation
- describes a typical bilge system and ballast system for dry cargo vessel
- states that the engine-room emergency bilge suction is connected to the main circulating pump in the engine-room

Steering Gear

- describes ramp-type hydraulic steering gear
- describes rotary-vane steering gear
- explains how hydraulic power is provided by variable-delivery pumps
- describes the IMO requirements for auxiliary steering gear and how they are met by ram-type and rotary-vane steering gear
- describes a telemotor control system
- explains how the change from remote to local control in the steering gear- compartment is made
- describes the requirement for power supplies to electric and electrohydraulic steering gear
- describes the requirements for emergency control of the steering gear
- states the IMO requirements for testing steering gear and for drills

Generators, Alternators and Electrical Distribution

- describes the operation of a D.C. generator
- explains the functioning of shunt and compound-wound D.C. motors
- describes the operation of an alternator
- explains the functioning of induction motors
- explains the relative advantages and disadvantages of generation and distribution of D.C. and A.C.
- describes D.C. and A.C. distribution systems
- describes the use of circuit-breakers and fuses
- describes a navigation light circuit



- describes the use of rectifiers
- describes the characteristics of lead-acid batteries and of alkaline Batteries also describes the maintenance of batteries
- describes the safety precautions to be observed for battery compartments
- outlines the starting requirements for emergency generating sets
- lists the services to be supplied from the emergency generator
- describes the supplementary emergency lighting for ro-ro passenger Ships

Refrigeration, Air-conditioning and ventilation

- describes a vapour-compression-cycle refrigeration plant
- states desirable properties of a refrigerant
- states the properties of commonly used refrigerants
- describes the use of secondary refrigerants for cooling compartments
- explains the co-efficient of performance of a refrigeration plant
- describes an air-conditioning plant
- describes a ventilation system for accommodation
- describes a mechanical ventilation system for ships' holds

Oily-water Separators and Oil Filtering Equipment

- describes the construction and operation of an -oily-water separator (producing effluent that contains less than 100 ppm of oil)
- describes the construction and operation of oil filtering equipment (producing effluent that contains not more than 15 ppm of oil)
- explains why oily-water separators, even if well maintained and correctly operated, may not function properly
- describes how an oil-content meter functions
- describes an oil discharge monitoring and control system

Sewage Treatment Plants, Incinerators, Stabilizers

- describes the operation of a chemical sewage treatment plant
- describes the operation of a biological sewage treatment plant
- describes the functioning of a waste incinerator
- describes the construction and operation of fin stabilizers
- describes the arrangements and operation of a flume stabilizer

Deck Machinery

- states that the design and the performance of anchor windlasses is subject to approval by a classification society
- sketches and describes a windlass driving two de-clutchable cable lifters and warping drums
- explains the gearing necessary between the prime mover and cable lifters
- describes an arrangement that uses two mooring winches to drive windlass units
- states that both winches may be coupled mechanically to provide either a stand-by drive, in case one prime mover should fall, or the power of both prime movers on one windlass, if required



- describes the arrangement of vertical anchor capstans with driving machinery below deck
- describes a spooling device to distribute the wire evenly on the drum of a mooring winch
- explains the working of self-tensioning winches
- briefly explains the advantages and disadvantages of steam, electric and hydraulic drive for mooring winches and capstans
- describes a cargo winch
- sketches and describes a slewing deck crane, its motors and its controls
- describes the lubrication of deck machinery

Hydraulic Systems

- states that a hydraulic system consists of an oil tank, pumps, control valves, hydraulic motors and pipework
- distinguishes between open- and closed-loop systems
- describes a live-line circuit supplied by a centralized hydraulic power system
- describes radial-piston and axial-piston variable-stroke pumps
- explains how the variable-stroke pump can act as controller and power supply
- sketches and describes a simple spool valve with shutoff and control of flow direction
- describes ram and rotary-vane actuators
- states that hydraulic systems can provide stepless control of speed for winches, cranes and other lifting devices
- describes a hydraulic accumulator and explains its purpose
- states that cooling of the hydraulic oil is necessary during operation to maintain the correct viscosity of the oil
- states that the oil may need to be heated before starting from cold
- states that the cleanliness of the oil is essential for satisfactory operation and that all systems contain filters
- states that air in a system leads to erratic functioning

Marine Engineering Terms and Fuel Consumption

- uses the correct engineering terms when describing and explaining the operation of the machinery and equipment mentioned above
- defines mass, force, work, power, energy, pressure, stress, strain, and heat and states the units in which each is measured
- explains what is meant by the efficiency of machine
- describes an indicator diagram and the information obtainable from it
- defines indicated power, shaft power, propeller power and thrust
- calculates from given data:
 - the daily consumption at service speed
 - the bunker fuel required for a voyage



- the speed for a given daily consumption
- the reduced speed required to complete a voyage with a given consumption
- explains that, for fuel economy, the actual speed at any stage of a voyage should be as near as practicable to the required average speed
- explains how the condition of the hull affects the fuel coefficient and the fuel consumption
- explains that keeping the leading edges and tips of propeller blades dressed and polished improves propeller efficiency and reduces fuel consumption

Recommended Text(s) :

1. General Engineering Knowledge for Marine Engineers : L. Jackson and T. Morton
2. Reeds Engineering Knowledge for Deck Officers : W. Embleton and T. Morton
3. Basic Electro Technology for Engineers
4. Marine Engineering Series – Marine Boilers : GTH Flanogan
5. Marine Engineering Series Diesel Engines : Wharton A.S.
6. Marine Auxiliary Machinery : D.W. Smith
7. Marine Electrical Practice : G.O. Watson
8. Instrumentation and Control for engineers
9. Fire fighting equipment and its uses on ship. Marine Engineering Vol:I
10. Principles and Practice of Marine Diesel Engineers : D.K. Sanya

Course Title : Coastal Navigation

Course Code : 2120
Credit : 2
Lecture Hours : 56
Assessment : Attendance, Laboratory report, note book, Quiz, Viva voce
Faculty in Charge :

Learning outcomes: Students will enable to understand the tide effect during navigation also to find out the course and speed made good and to steer counteracting the wind and current.

Syllabus Contents:

- Tides:Explains the basic theory of tides.
- defines 'spring tide', 'neap tide', 'height of tide' 'high water' and 'low water'; 'mean high water springs' 'mean high water neaps', mean low water springs', 'mean low water neaps', 'range', 'chart datum'.
- calculates the spring and ranges for standard and secondary ports



- finds the predicted time and height of high and low water at standard and at secondary ports

1. Course and Distance made good with current:

- To find compass error by transit bearings.
- To find the position of a point on the chart by its latitude and longitude
- To find the position of a point on the chart by its bearing and distance from a navigational mark
- To plot ship's position given the compass bearings of two or more shore objects. The Cocked hat' and the reasons for its formation.
- To plot ship's position using three shore objects by horizontal sextant angles (given Horizontal sextant angle less than 90, equal to 90, or greater than 90).
- To plot a position line obtained by an astronomical observation
- To find compass course between two positions on the chart.
- To find the course and distance made good, given course steered, set and drift of current and leeway.
- To find the course and speed made good and the set and drift, given the course steered, speed, duration and the initial and final observed positions.
- To find the course from a given position so as to pass a lighthouse at a given position so as to pass a lighthouse at a given distance when abeam.
- To plot ship's position, given the rising or dipping bearing of a light. Caution during abnormal refraction.
- To plot ship's position, given vertical sextant angles and bearing of light house.
- To plot a position lines obtained by Radio Aids to navigation
- To find compass course to steer between two positions on the chart so as to counteract the given and drift of current and given leeway.

2. IALA Maritime Buoyage system

Recommended Text(s):

01. Introduction to charts and their use- M.Chris & GR Hayes
02. Seaman's guide to basic chart work
03. Introduction to coastal navigation- a seaman's guide
04. Chart Work for mariners- Capt S.K.Puri
05. Marine Chart Work – D.A.Moore
06. Voyage Planning and Chart work – Capt M.V.Naik and Capt Varty
07. Passage Planning Practice & Principles- Seamanship Int.
08. Passage Planning Guide Lines- Capt Dr. Salmon

Course Title : Computer Programming Language Sessional

Course Code : 2104



Credit : 1
Lecture Hours : 28
Assessment : Attendance, Laboratory report, note book, Quiz, Viva voce
Faculty in Charge :

Learning outcomes: After successful completion of this course, the students will achieve the following competences:

1. Familiarization with the universal concepts of computer programming.
2. To present the syntax and semantics of the “C”, “C++” language as well as basic data types offered by the language
3. Understanding the principles of the object-oriented model and its implementation in the C”, “C++” language
4. Understanding the means in resolving typical implementation problems with the help of standard C”, “C++” language libraries

Syllabus Contents:

1. Introduction to C and C++ programming languages.
2. C and C++ fundamentals – data types and expressions.
3. Operators. Libraries. Statements
4. Arrays and strings. Functions
5. Function overloading
6. Control statements. Pointers
7. Input and output systems
8. Oriented programming (OOP).
9. Application to the computations of stability, trim and structural strength of marine vehicles.

Recommended Text(s) :

1. Teach Yourself C; Herbert Schildt
2. Teach Yourself C++; Herbert Schildt

Course Title : Workshop Practice

Course Code : 2122
Credit : 1
Lecture Hours : 28
Assessment : Attendance, Laboratory report, note book, Quiz, Viva voce
Faculty in Charge :

Learning outcomes: Enable the students to familiarize with the marine workshop tools and practice.



Syllabus Contents:

- 1. Common workshop tools:** Description and uses of different types of calipers, Straight edges, try squares, vices, Hammers, chisels, Scrapers, files, Drills, reamers, Tapes, V-Blocks, face plate, Marking blocks, Carpentry tools, Patten maker's tools, smithy tools Molding tools.
- 2. Machine process & Machine Tools:** The geometry of cutting processes machines of cutting, chip formation, cutting forces and power, Friction of chip on tools Generation and dissipation of heat in cutting. Standard nomenclature for cutting tools. Cutting speeds and feeds, estimation of machining time. The fundamental Cutting process. Application in hand tools as chisel, file and saw , geometrical control of the cutting edge. Kinematic analysis, specification, operation and inspection of the more important types of metal cutting machine tools including Centre lathes, Capstan and turret lathes, Automatic lathes, drilling and boring machines Shaping slotting and planning machines, Milling and broaching machines. Turning, Screw cutting and taper turning processes on Centre lathe, Abrasive process, Grinding, honing and lapping by hand and machines Shears and punches. Wood working machines. Principles of jigs and fixtures Standardization.
- 3. Measuring Instruments & Inspection:** Description and use of steel rule, Vernier's scale, Micrometer, Dial gauge, Depth gauge, thread gauge, Feeler gauge, Wire Gauge, pattern maker's scale, Taper gauge, snap gauge, plug gauge, Optical methods of measurement, Principles of interchangeability, limit system. Use of limit gauge.
- 4. Fitting and Overhauling:** Types of packing and jointing materials and their uses. Design considerations and construction of various types of valves and cocks, Reducing valves for steam and air. Bedding of bearings, marking of engine parts for fitting, machining operations fitting of keys cotters, etc.

Recommended Text(s) :

1. General Engineering Knowledge for Marine Engineers : L. Jackson and T. Morton
2. Reeds Engineering Knowledge for Deck Officers : W. Embleton and T. Morton
3. Basic Electro Technology for Engineers
4. Marine Engineering Series – Marine Boilers : GTH Flanogan
5. Marine Engineering Series Diesel Engines : Wharton A.S.
6. Marine Auxiliary Machinery : D.W. Smith
7. Marine Electrical Practice : G.O. Watson
8. Instrumentation and Control for engineers
9. Fire fighting equipment and its uses on ship. Marine Engineering Vol:I
10. Principles and Practice of Marine Diesel Engineers : D.K. Sanya





Year-2 Term- 2

Course Contents of

B.Sc Honors, Nautical Science

Bangladesh Marine Academy

Under the Recognition of

Bangabandhu Shiekh Mujibur Rahman Maritime University





Course Title : Advance Maritime Safety and Security

Course Code : BNS 2201
Credits : 3
Contact Hours : 42
Assessment : Term end written examination, Class test
Faculty in Charge :

Syllabus Content:

1. Advance Fire fighting :

- Theory of combustion
- Fire behaviour, fire prevention & classification of fire
- Control & extinction of fires
- Fire Fighting organisation
- Incident command, control & communication techniques
- Confined space rescue
- Compartment fire fighting techniques
- The containment of fire
- Machinery space fire fighting
- Fixed fire fighting systems
- Classification of ship's structure
- Fire detection equipment and investigation
- Legislation
- Liaison with Fire & Rescue services
- Ship stability
- Search & rescue techniques
- Use & control of breathing apparatus
- Major incident involving multi-compartment fires
- Fighting and search and rescue scenarios
- Major focus on "command and control"

2. Survival craft and Rescue Boat

- Emergency equipment
- Operating emergency equipment safely
- Abandonment procedures

- Rescue procedures
- Provide leadership and knowledge during the survival phase following an abandonment
- Provide leadership and knowledge to coordinate the rescue of survivors to a safe place



- Understand the operation and safety procedures for operating an enclosed lifeboat's on load / no load release hook system

03. Medical First Aid

- 1. Immediate Action
- 2. First-aid Kit
- 3. Body Structure and Function
- 4. Toxicological Hazards aboard Ship
- 5. Examination of Patient
- 6. Spinal Injuries
- 7. Burns, Scalds and Effects of Heat and Cold
- 8. Fractures, Dislocations and Muscular Injuries
- 9. Medical Care of Rescued Persons, including Distress,
- 10. Hypothermia and Cold Exposure
- 11. Radio Medical Advice
- 12. Pharmacology
- 13. Sterilization
- 14. Cardiac Arrest, Drowning and Asphyxia
- 15. Psychological/Psychiatric Problems

04. Ship's Security Officer :

- Understanding the International Ship & Port Security (ISPS) Code
- Provide Knowledge for the Ship Security Officer (SSO)
- Construct and understand a Ship Security Assessment (SSA)
- Construct and understand a Ship Security Plan (SSP)
- The roles of the Company Security Officer (CSO), Ship Security Officer (SSO) and Port Facility Security Officer (PFSO)
- Relevant Security Equipment and understanding their use.

- Maritime Piracy and world Hotspots
- Knowledge of SOLAS (Safety of Life At Sea) legislation
- Search Plans and Techniques
- Threat Assessments, Recognition and Response
- Profile of a Terrorist and Terrorist Groups
- Weapons and Improvised Explosive Devices

Recommended Text(s) :

1. Seamanship Technique- DJ House
2. Illustrated Seamanship- Dedekam
3. Nocholl's Seamanship & Nautical Knowledge- A.N.Cockroft
4. Seamanship notes – Angus Ferguson



5. American Merchant Seaman's manual – William B. Hayler
6. Basic Seamanship – Clossold revised by Miller
7. Theory and Practice of seamanship – Graham Danton
8. Knight's modern seamanship- John Noel
9. IMO Model Course : 1.20, 1.13, 1.19, 3.26, 3.27, 1.21
10. Seamanship notes – Kemp & Young
11. Lifeboat and Life Raft – S.K. Puri
12. Survival at Sea – C.H. Wright

Course Title : Oil and Chemical Tanker Safety and Operation

Course Code : BNS 2203
Credits : 3
Contact Hours : 42
Assessment : Term end written examination, Class test
Faculty in Charge

Learning Outcomes : There are three outcomes to the training, The learner knows the properties of oil and chemicals and the hazards associated with them, the learner is able to apply health, safety and environmental precautions and measures in working on oil and chemical tankers and the learner is able to carry out safe oil and chemical tanker cargo operations.

Syllabus Content:

- Basic knowledge of tankers
- Physical and chemical properties of oil and chemicals
- Knowledge and understanding of tanker safety culture and safety management
- Hazards
- Safety
- Fire Safety and Firefighting operations
- Cargo operations
- Emergencies For Oil and Chemical Tankers
- Pollution Prevention for Oil and Chemical Tankers
- Case Studies on oil and NLS ship Emergencies
- Relevant symbols according to the types of oil and chemicals carried on board oil and chemical tankers
- Relationship between pressure and temperature, including vapour pressure/temperature
- How an electrostatic charge may be generated
- Hazards associated with oil and chemical cargoes



- inerting, drying agents and monitoring techniques
- hazard controls
- gas-measuring instruments
- safety equipment and protective devices
- safe working practices and procedures
- effects of oil chemical and liquefied gas pollution on human and marine life
- Loading, unloading, care in transit, tank cleaning, purging, gas-freeing and inerting cargo operations
- Different oil and chemical tanker types, including their general arrangement and construction

Recommended text(s) :

1. ISGOTT
2. Chemical Tanker Notes – Vladimir Kunichkin

Course Title : Naval Architecture and Metallurgy

Course Code : BNS 2205
Credits : 2
Contact Hours : 28
Assessment : Term end written examination, Class test
Faculty in Charge

Learning Outcomes : The student will enable to understand the ship's design and fittings also the construction of rudder and propeller. The students will also learn the construction material and various types of the metal including the workmanship during the shipbuilding stage.

Syllabus Content:

Load Line convention and Draught marks
Riveting and Welding
Role of Classification Society, safety construction certificate

Metallurgy

Engineering Materials – common Engineering materials.
Various metals & alloys, Properties & uses. Ceramics and their use.
Steels – Elementary metallurgy of steels, steel production – smelting & refining.
Iron-Carbon diagrams to show role of carbon in steels and effect on properties.
Diagram to show role of carbon in steels and effect on properties. Types of steel and use .
Heat treatment – Heat treatment of steels – obtaining desired properties from steel for use in different areas.



Bow and Stern

- describes the provisions of additional structural strength to withstand pounding
- describes and illustrate the structural arrangements forward to withstand panting
- describes the function of the sternframe
- describes and sketch a sternframe for a single-screw ship
- describes and illustrate the construction of a transom stern, showing the connections to the sternframe

Fittings

- describes the construction of derricks and deck cranes
- describes the bilge piping system of a cargo ship
- states that each section is fitted with a screw-down nonreturn suction valve
- describes and -sketches a bilge strum box
- describes a ballast system in a cargo ship
- describes the arrangement of a fire main and state what pumps may be used to pressurise it
- describes the provision of sounding pipes and sketch a sounding pipe arrangement
- describes the fitting of air pipes to ballast tanks or fuel oil tanks
- describes the arrangement of fittings and lashings for the carriage of containers on deck

Rudder and Propellers

- describes the action of the rudder in steering a ship
- produces drawings of modern rudders: semi balanced, balanced and spade
- explains the purpose of the rudder carrier and pintles
- explains how the weight of the rudder is supported by the rudder carrier
- describes the rudder trunk
- describes the arrangement of a watertight gland round the rudder stock
- explains the principle of screw propulsion
- describes a propeller and defines, with respect to it:
 - boss
 - rake
 - skew
 - face
 - back
 - tip
 - radius
 - pitch
- compares fixed-pitch with controllable-pitch propellers
- sketches the arrangement of an oil-lubricated sterntube and tailshaft
- states how the propeller is attached to the tailshaft
- sketches a cross-section of a shaft tube
- explains why the shaft tunnel must be of watertight construction and how water is prevented from entering the engine-room if the tunnel becomes flooded

Recommended Text(s) :

1. Ship Construction notes - Kemp and Young
2. Ship Construction for Engineers - Reid



3. Ship Construction – Pursey
4. Ship Construction - Eyres

Course Title : Radar Navigation

Course Code : BNS 2207
Credits : 3
Contact Hours : 42
Assessment : Term end written examination, Class test
Faculty in Charge

Learning Outcomes : The student will enable to understand the operations, principles, limitations of RADAR including the safe use of RADAR as navigational and collision avoidance aids.

Syllabus Content:

Basic Theory and operation of a Marine Radar System
Set Up and Operate radar
Radar As a Navigational Aids
Radar as a Collision avoidance aids
Radar Plotting
ARPA
Performance monitoring of RADAR & ARPA

Basic Theory and operation of a Marine Radar System

- describes fundamental principles of radar
- explains the principles of range and bearing measurement
- states the function and sitting of components
- explains the importance of not storing radar spares nearer to magnetic compasses than the specified safe distances
- states the safety precautions necessary in the vicinity of open equipment and the radiation hazard near antennae and open waveguides
- explains characteristics of radar sets and states factors affecting performance and accuracy with reference to detection of targets
- states the relationship between maximum range and pulse recurrence frequency
- states the relationship between detection range and transmitted energy (power and pulse length)
- states the relationship between minimum range and pulse length
- explains the effects on bearing and range accuracy of beam width, heading marker error, centring error, yawing, parallax, variable range marker, gyro error



- states the factors external to the radar set affecting radar detection
- uses the equation for the distance to the radar horizon and explains the relationship between antenna location and detection ranges
- explains the effect of variations in refraction on radar detection range (super refraction, sub refraction, surface duct, elevated duct)
- states the effect precipitation on radar detection ranges (rain, hail, snow, fog)
- identifies blind areas and shadow areas, permanent blind and shadow sectors and their relationships to the antenna location
- states how characteristics of targets influence their detection range (aspect, shape, composition, size)
- explains how clutter may mask targets (sea clutter, rain clutter)
- states the factors which might cause faulty interpretation of the radar picture
- explains the cause and effect of interference
- explains the cause and effect of side echoes
- explains the cause and effect of indirect echoes
- explains the cause and effect of multiple echoes
- explains the cause and effect of second trace echoes
- states the effect on radar performance of power lines and bridges crossing rivers and estuaries
- explains the effect of the ship in seaway
- lists the performance standards contained in Res A. 477 (XII)
- states required accuracy (range and bearing measurement) states required discrimination (range and bearing)

Set Up and Operate radar in Accordance with Manufacturer's Instructions

- operates main controls (power, antenna)
- operates transmitter controls (standby/transit, pulse length, PRF)
- adjusts receiver controls to give an optimal picture (tuning, gain, linear/logarithmic gain, sensitivity time control, fast time control)
- adjusts display controls controls (brilliance, illumination, focus, shift, range selector, range rings, VRM, EBM, mechanical sursor, heading marker, clearscan, anti-clutter)
- demonstrates correct order of making adjustments and states the criteria for optimum setting of the controls
- states that small or poor echoes may escape detection
- describes the effects of saturation by receiver noise
- states the importance of frequent changes in range scale
- identifies different types of display mode (true motion, relative motion-unstabilized, relative motion-stabilized, north up, course up, ship's head up)
- explains the advantages and limitations of the different types of display mode
- explains the need for compass input for relative stabilized display, and compass and log input for true motion display
- identifies effects of transmitting compass error on stabilized and true motion display



- identifies effects of transmitting log error on true motion display,
- manual display, manual, speed input error
- operations special controls (presentation, speed, re-set, course made good correction, compass repeater)
- identifies maladjusted controls and explains their effects and dangers
- detects and corrects maladjustments
- states effects of incorrect speed setting and CMG correction on true motion displays
- describes the purpose and use of the performance monitor
 - records radar data: (performance monitor readings, modifications,
- blind and shadow sector diagram)
- explains how propagation conditions can affect target detection
- states methods and accuracy of measuring ranges (fixed range markers, VRM)
- measures ranges with emphasis on accuracy
- explains the methods and accuracies of measuring bearings (rotatable courser, EBL)
- measures bearings with emphasis on accuracy checks and corrects error in range and bearing

Recommended Text(s) :

01. Radar and ARPA manual – Bole, Dineley & Wall
02. Target detection by marine radar – J Briggs
03. Parallel Indexing Technique – Smith & RA Mulrone

Course Title : Navigational Watch Keeping

Course Code : BNS 2209
Credits : 2
Contact Hours : 28
Assessment : Term end written examination, Class test
Faculty in Charge :

Learning Outcomes : The student will enable to conduct the safe navigational watch in any condition of the visibility and at any sea condition or at any situation such as coastal, near coastal, river, straits, or deep sea.

Syllabus Content:

Part B Section II and Section III

Annexes

Bridge Equipment Requirement as Per SOLAS

Watch keeping at Sea and Anchor



Collision liability case studies

explains how to decide when a vessel is an overtaking vessel

- compares and analyze the various avoiding actions which may be taken by an overtaking vessel
- explains the application of Rule 14, Head-on situation
- explains why the give-way vessel in a crossing situation shall, if the circumstances admit, avoid crossing ahead of the other vessel
- explains the application of Rule 15 when crossing narrow channels and traffic lanes
- explains how Rule 16 and Rule 8 relate regarding the action by a give-way vessel

explains the position of stand-on vessel in cases where a risk of collision exists between more than two vessels

- explains how to decide when to take avoiding action as stand-on vessel
- describes the actions which may be taken by the stand-on vessel
- states the avoiding action which must be taken by the stand-on vessel
- explains that a potential collision situation may be divided into the following four stages:
 - at long range, before risk of collision exists and both vessels are free to take any action
 - risk of collision applies, the give-way vessel is required to take action and the other vessel must keep her course and speed
 - the give-way vessel is not taking appropriate action
 - collision cannot be avoided by the action of the give-way vessel alone
- explains the responsibilities between vessels with reference to Rule 18 & 3
- explains the application of Rule 19
- compares Rule 6 and Rule 19 regarding the determination of safe speed
- explains how courts have interpreted 'a close-quarters situation'
- explains how courts have interpreted 'navigate with extreme caution'
- demonstrates, using a manoeuvring board or radar simulator, how to determine risk of collision and the proper action to take to avoid collision in restricted visibility

Keeping a Safe Navigational Watch

- states that the officer of the watch is responsible for navigating safely, with particular regard to avoiding collision and stranding
- describes the principles to be observed in keeping a navigational watch as set out in Section A-VIII of STCW, 1978 regarding:
 - navigation
- navigational equipment
 - navigational duties and responsibilities
 - handing over and taking over the watch
 - look-out
 - navigation with a pilot embarked
 - Bridge Navigation Watch Alarm System
 - protection of the marine environment



- describes the recommendations on operational guidance for officers in charge of a navigational watch as set out in Chapter VIII, Section A-VIII/2 of the International Conference on Training and Certification of Seafarers, 1978:
- maintenance of an efficient look-out
- the use of engines and sound signalling apparatus
- taking over the navigational watch
- periodic checks of navigational equipment
- compliance with SOLAS V/19 regarding the use of the automatic pilot and the change-over to manual steering and vice-versa
- electronic navigational aids
- the use of radar
- navigation in coastal waters
- conduct of the watch in clear weather
- actions to take in restricted visibility
- the circumstances in which the officer of the watch should call the master
 - navigation with a pilot embarked
 - briefing of watchkeeping personnel
 - describes the duties of the officer of the watch while at anchor
 - lists the entries which should be made in the log-book
 - demonstrates and describes the use, care and limitations of equipments/instruments:
 - navigational equipments (echo sounder, radar, VHF, etc.)
 - aneroid barometer
 - hygrometer
 - sextant
 - chronometer
 - magnetic compass
 - gyro compass
 - steering gear
 - azimuth mirror
 - pelorous
 - bridge telegraph
 - hydrometer
- explains the use of all nautical publications
- states the preparation of the vessel before approaching a port from sea
- states the preparation of the vessel prior berthing

Recommended Text(s) :

01. A guide to collision avoidance rule – A.N. Cockraft
02. Browns Rules of the road manual – HH Brown
03. The collision regulation fully explained – Capt P Wailwood



04. Collision at Sea – How – Cdr Md Dewar

Course Title : Applied Stability

Course Code : BNS 2211
Credits : 2
Contact Hours : 28
Assessment : Term end written examination, Class test
Faculty in Charge :

Learning Outcomes : The student will be able to understand the various stability criteria of the ship including the list, trim and other stability information during the cargo operation of the ship.

Syllabus Content:

Curves of Statical Stability
List and Its Correction
Effects of Slack tanks
Trim
Loss of Intact Buoyancy
Trim, Stability and cargo calculation of a given ship

1. Initial Stability

- states that it is common practice to describe the stability of a ship by its reaction to heeling to small angles (up to approximately 10^0)
- defines the transverse metacentre (M) as the point of intersection of successive buoyancy force vectors as the angle of heel increases by a small angle
- states that, for small angles of heel, M can be considered as a fixed point on the centre line
- on a diagram of a ship heeled to a small angle, indicates G, B, Z and M
- shows on a given diagram of a stable ship that M must be above G and states that the metacentric height GM is taken as positive
- shows that for small angles of heel (θ), $GZ = GM \times \sin \theta$
- states that the value of GM is a useful guide to the stability of a ship
- describes the effect on a ship's behaviour of of:
 - * a large GM (stiff ship)
 - * a small GM (tender ship)
- uses hydrostatic curves to find the heights of the metacentre above the keel (KM) at given draughts



- states that KM is only dependent on the draught of a given ship
- given the values of KG, uses the values of KM obtained from hydrostatic curves to find the metacentre heights, GM

states that, for a cargo ship, the recommended initial GM should not normally be less than 0.15m

2. Angle of Loll

- shows that if G is raised above M, the couple formed by the weight and buoyancy force will turn the ship further from the upright
- states that in this condition, GM is said to be negative and $\Delta \times GZ$ is called the upsetting moment or capsizing moment
- explains how B may move sufficiently to reduce the capsizing moment to zero at some angle of heel
- states that the angle at which the ship becomes stable is known as the angle of loll
- states that the ship will roll about the angle of loll instead of the upright
- states that an unstable ship may loll to either side

explains why the condition described in the above objective is potentially dangerous

3. Curves of Statical stability

- states that for any draught the lengths of GZ at various angles of heel can be drawn as a graph
- states that the graph described in the above objective is called a curve of statical stability
- states that different curves are obtained for different draughts with the same initial GM
- identifies cross curves (KN curves and MS curves)
- derives the formula $GZ = MS + GM \sin O$
- derives the formula $GZ = KN - KG \sin O$
- derives GZ curves for stable and initially unstable ships from KN curves
- from a given curve of statical stability, obtains:
 - the maximum righting lever and the angle at which it occurs
 - the angle of vanishing stability
 - the range of stability
- shows how lowering the position of G increases all values of the righting lever and vice versa
- states that angles of heel beyond approximately 40° are not normally of practical interest because of the probability of water entering the ship at larger

angles

4. List and its Correction

- shows on a diagram the forces which cause a ship to list when G is to one side of the centre line
- states that the listing moment is given by displacement \times transverse distance of G from the centre line
- shows on a diagram that the angle of list (θ) is given



by $\tan \theta = GG_1$ where GG_1 is the transverse shift of G from the GM centre line

- states that in a listed condition the range of stability is reduced
- given the displacement, KM and KG of a ship, calculates the angle of list resulting from loading or discharging a given mass at a stated position, or from moving a mass through a given transverse distance
- explains with reference to moments about the centre line how the list may be removed
- given the displacement, GM and the angle of list of a ship, calculates the mass to load or discharge at a given position to bring the ship upright
- given the displacement, GM and angle of list of a ship, calculates the mass to move through a given transverse distance to bring the ship upright
- given the draught, beam and rise of the floor, calculates the increase in draught resulting from a stated angle of list

5. Effect of Slack Tanks

- states that if a tank is full of liquid, its effect on the position of the ship's centre of gravity is the same as if the liquid were a solid of the same mass
- shows by means of diagrams how the centre of gravity of the liquid in a partly filled tank moves during rolling
- states that when the surface of a liquid is free to move, there is a virtual increase in KG, resulting in a corresponding decrease in GM
- states that the increase in KG is affected mainly by the breadth of the free surface and is not dependent upon the mass of liquid in the tank
- states that tanks are often constructed with a longitudinal subdivision to reduce the breadth of free surface

Recommended Text(s):

01. Merchant Ship Stability – H.J. Pursey
02. Ship Stability OOW – Martin Rhodes
03. Ship Stability for Masters and Mates – Bryan Barrass

Course Title : Advance Cargo and Shipboard Operation

Course Code : BNS 2213
Credits : 3
Contact Hours : 42
Assessment : Term end written examination, Class test
Faculty in Charge :



Learning Outcomes : The students will enable to understand the bulk cargo including grain cargo loading, stowing, securing, carrying and discharging procedure in safe manner also the advance level of ship board operation specially care, maintenance and operation of various types of cargo gear.

Syllabus Content:

Solid Bulk Cargo other than grain
Bulk grain cargo operation
Deck Cargo
Refrigerated Cargo
Dangerous Hazardous and Harmful cargoes
Care of cargo during voyage
Blocks, purchase, derrick and crane
Cargo handling equipments
Cargo gear register and ILO rules

Cargo Handling Equipment and Safety

- describes the care and maintenance of:
 - * standing rigging
 - * topping lifts, cargo runners, guys and preventers
 - * cargo blocks and topping lift blocks
 - * derrick heel fittings
- describes the rigging of derricks for loading and discharging cargo:
 - * using married falls (union purchase)
 - * by single swinging derrick
- explains how to set up guys and preventers for working with married falls
- states that gear should be set up in accordance with the ship's rigging plan and explains limitations and effect of angles between runners
- describes how to change the rig from single runners to gun tackles
- describes how to top and lower derricks safely
- describes means of securing derricks for sea
- describes the use of slings, snotters, canvas slings, trays, pallets, nets, chain, slings, cant hooks, bale hooks and vehicle slings
- states the precautions to take when lifting bales with hooks in the bale bands and damage caused by hooks generally
- describes the handling of common unitized and pre slung loads
- compares the advantages and disadvantages of ship's cranes and derricks for handling cargo –types of derricks-Hallen, Stulken, Thompson, Velle etc.
- states the precautions to be taken when fork-lift trucks or similar devices are used in the 'tween-decks or holds



Cargo Handling Safety

- states that all cargo gear should be visually inspected before the start of cargo operations each day and awareness of test certifications and registration
- states why the load on cargo gear should never exceed its safe working load
- states that ropes, wires, blocks and loose gear should be subject to frequent inspections while in use for cargo operations
- explains how to determine when a cargo runner needs replacing
- states that mechanically or hydraulically operated hatches should be opened or closed by the ship's crew under the supervision of a responsible person
- explains that hatch covers should be secured by locking devices to prevent them moving accidentally
- states that beams and covers of partially opened hatches should be secured to prevent their accidental displacement
- states that hatch openings should be securely fenced to a minimum height of 1 metre
- states that it is the ship's responsibility to cover hatches when notice of completion of work for the day is given by the stevedore in charge
- states that no person should use a ladder in the square of a hatch while cargo is being hoisted or lowered in that square
- states that no person should stand or pass under a suspended load
- describes the provision of adequate lighting for working spaces, portable lights and precaution with dangerous cargoes, e.g. juts
- states that portable lights should be removed from cargo spaces as soon as they are no longer required
- explains that unattended portable lights are potential fire hazards
- describes the importance of maintaining close communication with the shore during the loading and unloading stage
- describes the information that should be agreed between ship and shore before any loading or unloading operation

Container Cargo

- describes the arrangement of a container ship and explains how the position of a particular container is designated
- explains briefly the sequence of operations during discharging and loading at a terminal
- explains the factors involved in planning a container stow with reference to:
 - * stability, trim and list
 - * stresses
 - * stack height and weight
 - * dangerous goods
 - * special stowage restrictions
 - * out of gauge
- describes methods of securing containers on deck



- describes the types and sizes of container in use

Bulk Cargo (Other Than Grain)

- describes in outline the contents of the IMO International Maritime Solid Bulk Cargo (IMSBC) Code
- defines:
 - * angle of repose
 - * cargoes which may liquefy
 - * flow moisture point
 - * flow state
 - * transportable moisture limit
- describes in detail the preparation of cargo holds prior to loading bulk cargoes
- explain that separation between certain bulk cargoes and other than bulk cargoes or package of dangerous goods is required
- explains that some bulk cargoes may deplete the oxygen content of holds or produce toxic gases and describe the precautions to take before entry of holds
- describes the hazards associated with coal cargoes
- describes the precautions to take during loading and discharging coal
- explains how coal should be ventilated

Bulk Grain cargo

- defines the following terms as used in the International Grain Code:
 - * grain
 - * filled compartment
 - * partly filled compartment
- describes the cleaning and preparation of holds and decks for the carriage of grain
- states that a through check for insect or rodent infestation should be made
- explains the importance of trimming and state how it should be made
- distinguishes between the trimming of filled and partly filled compartments
- describes the use of and fitting of shifting boards
- describes how saucers or bundles of bulk grain are arranged in the square of a hatch to reduce-heeling moments resulting from a shift of grain
- describes how the surface of a partly filled compartment is secured against movement
- describes how to separate two different bulk grain cargoes loaded into the same compartment

Recommended Text(s) :

01. Cargo Work – Kemp & Young
02. Cargo Work – Capt Errol Fernandes
03. Cargo Stowage and Securing – A guide to good practice – Charles Bliault
04. Cargo Work For Maritime Operation – D.J.House
05. Cargo Matters – Marisec
06. Cargo ventilation – a guide to good practice – David Anderson
07. Marine cargo operations- a guide to good practice – Robert Merun



Course Title : Climatology

Course Code : BNS 2217
Credits : 2
Contact Hours : 28
Assessment : Term end written examination, Class test
Faculty in Charge :

Learning Outcomes : The students will understand the various wind and pressure system over the ocean including the structure of depression and anticyclone.

Syllabus Content:

The Wind and Pressure Systems Over the Oceans

- explains qualitatively, with the aid of sketches, the circulation cells which would exist on a rotating earth, not inclined to its orbit of rotation around the sun, and with a homogeneous surface
- draws the mean surface pressure and wind distribution over the earth's surface in January and July
- describes the characteristics and location of the doldrums, intertropical convergence zone, trade winds, sub-tropical oceanic highs, westerlies and polar easterlies
- describes a monsoon regime
- states the areas which experience a true monsoon regime applies previous concepts to a qualitative explanation of the causes of monsoon regimes
- applies previous concepts to a qualitative explanation of the weather associated with the January and July monsoons of the Indian Ocean, China Sea, north coast of Australia and west coast of Africa
- explains qualitatively the monsoon-type weather along the north –east coast of Brazil
- applies the concept of horizontal temperature differences to a qualitative explanation of the formation of land and sea breezes
- explains the formation of anabatic and katabatic winds
- states the regions of occurrence of anabatic and katabatic winds
- states examples of local winds

Structure of Depressions

- defines 'air mass'
- explains the formation of an air mass
- defines 'source region'
- describes the characteristics required of a source region



- describes the source-region characteristics of arctic, polar, tropical and equatorial air mass types
- defines 'warm front,' 'cold front'
- recognizes the symbols for warm and cold fronts and identifies them as drawn on a weather map
- describes, with the aid of a diagram, the weather experienced during the passage of an idealized warm front
- describes, with the aid of a diagram, the weather experienced during the passage of an idealized cold front
- defines Tropical Revolving Storm (TRS)
- describes the genesis of a TRS
- describes the location of a TRS
- signs of TRS
- describes the method of avoiding TRS
- identifies a TRS on a surface synoptic or prognostic chart
- describes the stages in the life cycle of a TRS
- describes a family of depressions
- draws a diagram of a TRS for both northern and southern hemispheres, showing isobars, warm and cold fronts, with circulation and warm sector
- draws a cross-section through a TRS on the poleward and equatorial side of the centre, showing fronts, cloud and precipitation areas
- describes the usual movement of a TRS
- applies previous concepts to an explanation of the weather changes experienced when a TRS passes

Anticyclones and Other Pressure Systems

- defines 'anticyclone'
- draws a synoptic pattern of an anticyclone, for both northern and southern hemispheres, showing isobars and wind circulation
- identifies an anticyclone on a surface synoptic or prognostic chart
- describes the weather associated with anticyclones
- defines a ridge of high pressure
- draws a synoptic pattern for a ridge, showing isobars and wind directions
- describes a typical weather sequence during the passage of a ridge between depressions across the observer's position
- defines a col
- draws a synoptic pattern for a col, showing isobars and wind directions
- describes the weather associated with a col
- identifies ridges and cols on a surface synoptic or prognostic chart
- **Recommended Text(s) :**
- 1. Marine Meteorology - Capt. H. Subramaniam
- 2. Atmosphere and Weather - Barry R.G., Chorley R.J.



- 3. Introduction to theoretical Meteorology - HESS
- 4. Meteorology for Mariners - HMSO
- 5. Marine Observer's Handbook - HMSO
- 6. Elementary Meteorology - HMSO
- 7. An introduction to Meteorology - James R. Holton
- 8. Introduction to Meteorology - Petterson B.

Course Title : Ocean Navigation

Course Code : BNS 2219
Credits : 2
Contact Hours : 28
Assessment : Term end written examination, Class test
Faculty in Charge :

Learning Outcomes : The students will be able to understand the celestial PZX triangle and using which the students will be able to find out the ship's position in deep ocean.

Syllabus Content: Position Fixing

- combines the equinoctial and horizon system of co-ordinates to determine the center and radius of a position circle and its direction in the vicinity of a selected position
- applies the principles of a method of enabling the navigation to draw a small part of the position circle in his vicinity to at a practical problem
- state the assumptions made when plotting celestial position lines and the circumstances in which they may become significant
- determines the direction of a position line through an observer and a position through which it passes
- defines and evaluate the co-latitude, polar distance and zenith distance and use them as the sides of the PZX triangle
- solves the PZX triangle to find the calculated zenith distance of the body when it is out of the meridian.
- applies this calculated zenith distance to the true zenith distance of the body to find the intercept and the intercept terminal point through which to draw the position line (Marcq. St.Helaire method)
- determines the true azimuth of the body from tables and hence determine the direction of the position line find the position of the observer at the time of the final observation, given two or more position lines with the courses and distances run between the observations.



Recommended Text(s) :

- 1. Practical Navigation - Capt. H. Subramaniam
- 2. Principles of Navigation - Capt. P.M. Sharma
- 3. Principles of Navigation - Capt. T.K. Joseph and Capt. S.S.S. Rewari
- 4. Admiralty Manual of Navigation Vol:I and Vol:II - HMSO
- 5. Principles of Navigation - A. Frost
- 6. Nicholl's Concise Guide Vol:I and Vol:II - Brown, Son and Ferguson Ltd.
- 7. Elements of Navigation and Nautical Astronomy – C.H.Cotter
- 8. Navigation for Master – D.J.House
- 9. Navigation Advanced for Mates & Master – Nadeem Anwar

Course Title : Advance Maritime Safety and Security
Sessional

Course Code	: 2202
Credit	: 1
Lecture Hours	: 28
Assessment	: Attendance, Laboratory report, note book, Quiz, Viva voce
Faculty in Charge	:

Learning Outcomes : The students will be able to conduct fire fighting management and also the survival and rescue operation in case of emergency on board.

Syllabus Contents:

Proficiency in Survival craft and rescue boat Practical
Advance Fire fighting Practical
Medical First Aid Practical

- Operate in a safe and effective manner an enclosed lifeboat on open water
- Approach and recover a crew over board into the enclosed lifeboat safely and effectively, acting as coxswain and as deckman
- Take a liferaft or lifeboat in tow safely and effectively with an enclosed lifeboat, acting as coxswain and as deckman
- Operate the enclosed lifeboat in various sea and swell conditions
- Steer compass courses as directed to move the enclosed lifeboat clear of danger in reduced visibility
- Conduct voice communications over the VHF radio as appropriate for an abandonment situation



- Launch and recover an enclosed lifeboat under gravity davits safely and efficiently using a releasing painter
- Pace with an FRB in order to transfer castaways safely and efficiently for transfer to a safe place
- Participate in a simulated abandonment into the ocean wearing an immersion suit, launch, inflate and board a liferaft and be rescued by an FRB
- Examination of Patient
- Spinal Injuries
- Burns, Scalds and Effects of Heat and Cold
- Fractures, Dislocations and Muscular Injuries
- Medical Care of Rescued Persons, including Distress,
- Hypothermia and Cold Exposure
- Radio Medical Advice
- Search & rescue techniques
- Use & control of breathing apparatus
- Major incident involving multi-compartment fires
- Fighting and search and rescue scenarios
- Major focus on “command and control”

Course Title : Admiralty Navigation

Course Code	: 2224
Credit	: 1
Lecture Hours	: 28
Assessment	: Attendance, Laboratory report, note book, Quiz, Viva voce
Faculty in Charge	:

Learning Outcomes : The student will enable to understand the information from Charts, list of lights and other admiralty publication to prepare a passage plan and execute the voyage including correction of all publication from notices to mariners.

Syllabus Contents:

- a) To find compass error by transit bearings.
- b) To find the position of a point on the chart by its latitude and longitude
- c) To find the position of a point on the chart by its bearing and distance from a navigational mark
- d) To plot ship's position given the compass bearings of two or more shore objects. The 'Cocked hat' and the reasons for its formation.
- e) To plot ship's position using three shore objects by horizontal sextant angles (given Horizontal sextant angle less than 90, equal to 90, or greater than 90).
- f) To plot a position line obtained by an astronomical observation



- g) To find compass course between two positions on the chart.
- h) To find the course and distance made good, given course steered, set and drift of current and leeway.
- i) To find the course and speed made good and the set and drift, given the course steered, speed, duration and the initial and final observed positions.
- j) To find the course from a given position so as to pass a lighthouse at a given position so as to pass a lighthouse at a given distance when abeam.
- k) To plot ship's position, given the rising or dipping bearing of a light. Caution during abnormal refraction.
- l) To plot ship's position, given vertical sextant angles and bearing of light house.
- m) To plot a position lines obtained by Radio Aids to navigation
- n) To find compass course to steer between two positions on the chart so as to counteract the given and drift of current and given leeway

Recommended Text(s):

- 01. Introduction to charts and their use- M.Chris & GR Hayes
- 02. Seaman's guide to basic chart work
- 03. Introduction to coastal navigation- a seaman's guide
- 04. Chart Work for mariners- Capt S.K.Puri
- 05. Marine Chart Work – D.A.Moore
- 06. Voyage Planning and Chart work – Capt M.V.Naik and Capt Varty
- 07. Passage Planning Practice & Principles- Seamanship Int.
- 08. Passage Planning Guide Lines- Capt Dr. Salmon

Course Title : Advance Seamanship Practice

Course Code : 2222
Credit : 1
Lecture Hours : 28
Assessment : Attendance, Laboratory report, note book, Quiz, Viva voce
Faculty in Charge :

Learning outcomes: The students will enable to understand the advance level of seamanship on board specially slinging, rigging and the care and maintenance of hatch cover and water tight elements.

Syllabus Contents:

Slinging staging and rigging
Painting
Greasing and Lubrication



Means of Access

Hatch Cover maintenance

Anchor operation

Mooring Operation

Slinging, Staging and Rigging

- demonstrates how to sling a stage
- demonstrates how to rig a bosun's chair, pilot ladder and Jacob ladder
- describes and demonstrates how to fix accommodation ladder or gangway, explains the purpose of the safety net
- explains how to rig and light the pilot ladder
- states what equipment should be at hand ready for use at the pilot ladder
- states that the rigging of the ladder and the embarkation and disembarkation of the pilot should be supervised by a responsible officer
- describes the safety precautions needed in slinging, staging and rigging
- describes care and maintenance of accommodation ladder, gangway and pilot ladder

Blocks, Purchases, Derricks, Cranes and Hatch covers

- states various types of blocks (wooden and steel)
- describes various parts of different blocks
- explains use of different blocks
- describes care and maintenance of blocks (i.e. greasing, oiling, painting, overhauling, etc.)
- explains what is purchase
- describes and rigs various purchases, explains standing part & hauling part
- describes advantages and disadvantages of different purchases
- explains mechanical efficiency
- describes and rigs a guntackle
- states different types of derricks (i.e. union purchase system, patent derricks, hallen derrick, velle derrick, stuelcken derrick, etc.)
- different types of derricks and its connections
- describes and demonstrates how to rig derricks
- describes different types of cranes
- states the use of derricks and cranes of different types
- describes the advantages and disadvantages of different types of derricks and. cranes
- state the safety precautions needed while using derrick or crane
- describes care and maintenance of derrick, crane and winch (i.e. greasing. oiling painting and overhauling)
- describes different types of hatch covers, tween decks
- describes and demonstrates how to open or close hatch covers, tween



- decks
- explain safety precautions needed while opening or closing hatch cover
- describes and states use of various lashing materials describes care and maintenance of hatchcover (i.e. greasing, oiling, painting and overhauling)

Paintings

- explains what is corrosion
- explains basic composition of paints (i.e. pigment, binding agent or vehicle, solvent and possibly a drying agent)
- explains cathodic protection
- explains bimetallic corrosion and design faults
- describes plate preparation during building and repair periods
- explains the terms - mill scale, flame cleaning, acid pickling, blast cleaning
- describes the defects that may arise from not following the proper procedure of painting
- explains the causes of paint failure
- describes shipboard preparation of painting
- describes various types of paints (i.e. alkyd, bitumen or pitch, chlorinated rubber, coaltar epoxy, epoxy, oleoresinous, phenolic, polyurethane, primers, vinyl)
- explains the use of thinner
- explains purpose of the primer and states different types of primer
- explains undercoat and topcoat paint
- explains what is fire-retardant and heat-retardant paint
- explains the meaning of anticorrosive and anti-fouling
- explains the meaning of boot-topping
- explains how wastage of the paint can be avoided by proper use at all times
- states how paint should be stored in ships store
- describes the tools needed for painting (i.e. chipping hammer, chipping goggles, wire brush, paint brush, chipping machine, spray guns)
- states the maintenance needed for the tools
- describes the personal protection and safety precautions needed while doing painting
- describes and demonstrates how to do painting by hand brush and by spray gun

Recommended Text(s):

1. Theory and Practice of Seamanship - G. Danton
2. Seamanship Notes - Kemp and Young
3. Nicholls Seamanship - Brown, Son and Ferguson Ltd.
4. Seamanship technique – D.J. House



Course Title : Radar Navigation Sessional

Course Code	: 2208
Credit	: 1
Lecture Hours	: 28
Assessment	: Attendance, Laboratory report, note book, Quiz, Viva voce
Faculty in Charge	:

Learning Outcomes : The student will enable to understand the RADAR navigation including the operation and limitation of RADAR while being used as navigational and collision avoidance aids.

Syllabus Contents:

- operates main controls (power, antenna)
- operates transmitter controls (standby/transit, pulse length, PRF)
- adjusts receiver controls to give an optimal picture (tuning, gain, linear/logarithmic gain, sensitivity time control, fast time control)
- adjusts display controls (brilliance, illumination, focus, shift, range selector, range rings, VRM, EBM, mechanical sursor, heading marker, clearscan, anti-clutter)
- demonstrates correct order of making adjustments and states the criteria for optimum setting of the controls
- states that small or poor echoes may escape detection
- describes the effects of saturation by receiver noise
- states the importance of frequent changes in range scale
- identifies different types of display mode (true motion, relative motion-unstabilized, relative motion-stabilized, north up, course up, ship's head up)
- explains the advantages and limitations of the different types of display mode
- explains the need for compass input for relative stabilized display, and compass and log input for true motion display
- identifies effects of transmitting compass error on stabilized and true motion display
- identifies effects of transmitting log error on true motion display,
- manual display, manual, speed input error
- operations special controls (presentation, speed, re-set, course made good correction, compass repeater)
- identifies maladjusted controls and explains their effects and dangers
- detects and corrects maladjustments
- states effects of incorrect speed setting and CMG correction on true motion displays
- describes the purpose and use of the performance monitor
 - records radar data: (performance monitor readings, modifications,
- blind and shadow sector diagram)
- explains how propagation conditions can affect target detection
- states methods and accuracy of measuring ranges (fixed range markers, VRM)



- measures ranges with emphasis on accuracy
- explains the methods and accuracies of measuring bearings (rotatable courser, EBL)
- measures bearings with emphasis on accuracy checks and corrects error in range and bearing

Recommended Text(s) :

04. Radar and ARPA manual – Bole, Dineley & Wall
05. Target detection by marine radar – J Briggs
06. Parallel Indexing Technique – Smith & RA Mulrone



Year-3

Course Contents of

B.Sc Honors, Nautical Science

Bangladesh Marine Academy

Under the Recognition of

Bangabandhu Shiekh Mujibur Rahman

Maritime University



Course Title : On board Training

Course Code :3102

Credit :6

Assessment :Training record book, assignments, orals

Faculty Incharge :

An approved seagoing service of not less than 12 months as part of an approved training programme, which includes onboard training that meets the requirements of section A-II/1 of the STCW Code and is documented in an approved training record book.



Course Title : Industrial Training

Course Code	:3104
Credit	:6
Assessment	:Assignments, orals
Faculty Incharge	:

Students may perform 12 months apprenticeship in a ship management, owners, or agency company, port authority, Ship yard, dry-dock, marine workshop or Inland ship or any other similar organization approved by the Bangabandhu Sheikh Mujibur Rahman Maritime University.



Year-4 Term- 1

Course Contents of

B.Sc Honors, Nautical Science

Bangladesh Marine Academy

Under the Recognition of



Bangabandhu Shiekh Mujibur Rahman Maritime University

Course Title : Thesis on Maritime Topics

Course Code : BNS 4000
Credits : 4
Contact Hours :56
Assessment :
Faculty in Charge :

Learning outcomes : The goal is to provide students with hands-on research experience through completing a research project, starting with hypothesis development (if applicable), literature searching, experimental design, data collection, analysis, and interpretation. Students will also gain experience in written and oral scientific communication by submitting several written components including a research proposal, a progress report, and final thesis for evaluation as well as presenting the results of their research in a public oral presentation

Syllabus Content:

Students will engage in independent research, to produce an original thesis on maritime topics. This may take the form of a paper or report with supporting documentation, images and notes. Research may consist of archival investigation and/or fieldwork, including personal interviews, site reports, and condition assessments.



The process of writing and submitting a thesis will provide students with understanding and competence in research and writing about conservation and preservation issues, which will be of use in the professional field.

Students will be assigned a thesis advisor, with whom they will meet regularly.

The thesis should be 40-50 pages of text, with supporting documentation, images and notes. Research may consist of archival investigation and/or fieldwork, including personal interviews, site reports, and condition assessments. Students must consistently use a citation format of their choice.

A small panel of 2 or 3 markers, which will include the student's advisor, will decide the thesis grade. Students will meet with this panel for a Final Discussion. This will be a 30-minute conversation about the thesis where students will be given feedback and a chance to discuss future plans. The discussion will not impact the student's grade.

There should be schedule and deadline including progress report and progress meeting to submit the thesis paper advising by the panel and research supervisor.

Course Title : Research methodology

Course Code : BNS 4101
Credits : 2
Contact Hours : 28
Assessment : Term end written examination, Class test
Faculty in Charge :

Learning Outcomes : On completion of the course, the student must be able to collect, analyse and present his/her own data using grounded theory or qualitative content analysis

Syllabus Content:

1. Introduction to The Process of Conducting Research

Research Design Introduction

• Steps in the Process of Research

• Identifying a hypothesis and/or research problem, specifying a purpose, creating research questions



- Reviewing literature
- Ethics of research and informed consent

2. Introduction to Qualitative Research

- Essence of Qualitative Data
- Sampling
 - o Biography
 - o Phenomenology
 - o Grounded Theory
 - o Ethnography
 - o Case Study

3. Interpreting Qualitative Data

- Qualitative Data Analysis Procedures
- Coding
- Thematic development

4. Introduction to Quantitative Research

- Essence of Quantitative Data
- Collection and Analysis Techniques

5. Sampling Concepts

- Defining the Target Population
- Representative Sample
- Potential Consequences of Unrepresentative Sampling (Gaming the System)
- Over Representative Subgroups / Weighting
- Design Effect
- Sampling Methods (Cluster, Stratified, Simple Random)

6. Quantitative

Data Collection Instruments

- Choosing a good instrument
- Interval and Ratio Scales

7. Introduction to Applied Statistics

- Identifying the dependent and independent variables
- Confidence levels
- Math that manipulates data

8. Descriptive Statistics



- Summarizing and describing a collection of data
- Univariate and bivariate analysis
- Mean, mode and standard deviation
- Percentages and Ratios
- Histograms
- Identifying randomness and uncertainty in data

9. Inferential Statistics

- Drawing inference from data
- Modeling assumptions
- Identifying Patterns
- Regression analysis
- T-test
- Analysis of Variance
- Correlations
- Chi-square

10. Introduction to Mixed Methods Research

- Advantages
- Design Components
- Explanatory Mixed Methods Framework
- Exploratory Mixed Methods Framework

11. Data Mining – Finding the Patterns and Problems in the World of Data

- 12. Writing About Quantitative Findings
- 13. Writing About Qualitative or Mixed Methods Findings
- 14. Critically critiquing Research Reports
- 15. Applying Research in the Security Environment

Recommended Text(s) :

1. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches- John Creswell
2. Business Research Methods–Donald Cooper & Pamela Schindler, TMGH, 9th edition
3. Business Research Methods–Alan Bryman & Emma Bell, Oxford University Press
4. Research Methodology –C.R.Kothari

Course Title : Meteorology for Navigation

Course Code : BNS 4103
Credits : 2
Contact Hours : 28



Assessment : Term end written examination, Class test
Faculty in Charge :

Learning Outcomes : The students will enable to understand the various weather systems and navigation of the ship with frontal depression including the ice and polar navigation.

Syllabus Content:

Weather Services for Shipping

- describes the organization, functions and objectives of the World Meteorological Organization
- states the sources of weather information available to shipping
- describes the information flow between merchant ships and Meteorological Offices
- describes the services provided for shipping by Meteorological Offices
- describes the appropriate weather bulletin and the contents of each of its sections
- describes the types of information received by facsimile machine describes the services provided for storm warnings.

Recording and Reporting Weather Observations

- explains the need for meteorological codes
- uses the Ship's Code and Decode Book to code a ship's full report
- uses the Ship's Code and Decode Book to decode a ship's full report
- uses the Ship's Code and Decode Book to decode a reduced report from a shore station
- uses Beaufort letter abbreviations for present and past weather and total cloud amount interprets a ship or shore station plot

Weather forecasting

- applies previous concepts to the interpretation of symbols and isobaric patterns on weather charts and facsimile charts
- applies previous concepts to the interpretation of synoptic and prognostic charts to ascertain wind directions, areas of strong winds, cloud and precipitation, areas, ice, and areas of fine weather explains how weather observations at a ship can be used to improve the forecast derived from synoptic and prognostic charts.

Weather Routing

- explains the basic routines of weather routing
- demonstrates the use of climatological information from routing charts and sailing directions for route planning
- explains how meteorological forecasts, and synoptic and forecast charts are used to modify the route plan to utilise favourable conditions and mitigate adverse conditions
- explains that with shore based services, comprehensive meteorological information is available to personnel ashore who issue advice as to route planning and monitor the vessel's voyage, issuing forecasts and advice as to the utilisation of favourable conditions and mitigate of unfavourable conditions
- understands that comprehensive meteorological information and on board



software may be available to the Master who plans the route and then monitors the vessels voyage and uses forecasts and warnings to utilise favourable conditions and mitigate the effects of unfavourable conditions

- states that when the ship is weather routed messages are received from the routeing service which may warn of adverse conditions (to be expected) and that these must be brought to the attention of the Master

Use of routeing in accordance with general provisions on ships' routeing

- uses published routing instructions in passage planning
- explains requirements of ship routing and mandatory reporting Systems

Ice

Navigation in Ice (Polar Navigation)

Navigation in Frontal Depression

Course Title : Damage Control and Stability

Course Code : BNS 4105
Credits : 2
Contact Hours : 28
Assessment : Term end written examination, Class test
Faculty in Charge :

Syllabus Content:

Stability and trim when dry-docking or grounding

Bilging Permeability

The inclining experiment

Approximate calculation of areas and volumes

Effects of Density

SOLAS Chapter II/1 Subdivision and stability

1.Trim

- defines 'trim' as the difference between the draught aft and the draught forward
- states that trim may be changed by moving masses already on board forward or aft, or by adding or removing masses at a position forward of or abaft the centre of flotation



- defines 'centre of flotation' as the point about which the ship trims, and state that it is sometimes called the tipping centre
- states that the centre of flotation is situated at the centre of area of the waterplane, which may be forward of or abaft amidships
- uses hydrostatic data to find the position of the centre of flotation for various draughts
- defines a trimming moment as mass added or removed x its distance forward or aft of the centre of flotation; or, for masses already on board, as mass moved x the distance moved forward or aft
- defines the moment to change trim by 1 cm (MCT 1 cm) as the moment about the centre of flotation necessary to change the trim of a ship by 1 cm
- uses hydrostatic curves or deadweight scale to find the MCT 1cm for various draughts
- given the value of MCT 1 cm, masses moved and the distances moved forward or aft, calculates the change in trim
- given the value of MCT 1 cm, the position of the centre of flotation, masses added or removed and their distances forward of or abaft the centre of flotation, calculates the change of trim
- given initial draughts and the position of the centre of flotation, extends the calculation in the above objective to find the new draughts
- given initial draughts and TPC, extends the calculation in the above objective to find the new draughts
- given initial draughts and TPC, extends the calculation to find the new draughts
- uses a trimming table or trimming curves to determine changes in draughts resulting from loading, discharging or moving weights
- states that in cases where the change of mean draught is large, calculation of change of trim by taking moments about the centre of flotation or by means of trimming tables should not be used
- calculates final draughts and trim for a planned loading by considering changes to a similar previous loading

2. Actions to be Taken in the Event of Partial Loss of Intact Buoyancy

- states that flooding should be countered by prompt closing of watertight doors, valves and any other openings which could lead to flooding of other compartments
- states that cross-flooding arrangements, where they exist, should be put into operation immediately to limit the resulting list
- states that any action which could stop or reduce the inflow of water should be taken

3. Draught, Trim and Stability

- defines 'deadweight' and 'displacement'
- sketches a ship's load line indicating marks for various seasonal zones, areas and periods
- uses a ship's hydrostatic particulars and given mean draughts to determine the approximate weight loaded or discharged



- uses a deadweight scale to determine the change in mean draught resulting from loading or discharging a given tonnage
 - given the present draughts and the density of dock water, calculates the draughts in seawater
 - given the draught amidships and dock-water density, calculates the amount to load to bring the ship to the appropriate load line in seawater
 - uses hydrostatic data to find the position of the centre of flotation, MCT and TPC for a given draught
 - calculates the change of trim resulting from loading or discharging a given weight at a specified position
 - given the initial draughts, forward and aft, calculates the new draughts after loading or discharging an given quantity of cargo
 - uses a trimming table or curves to determine changes in draughts
 - resulting from loading, discharging or moving weights
 - calculates final draughts and trim for a planned loading by considering changes to a similar previous loading
 - calculates, by using moments about the keel, the position of G for a given disposition of cargo, fuel and water
 - uses hydrostatic data to find the KM and thence the GM
 - states that, for a cargo ship, the recommended initial GM should not normally be less than 0.15m
 - uses KN curves to construct a curve of statical stability and from it reads the maximum righting lever and angle at which it occurs
 - calculates the arrival of GM from the departure conditions and the consumption of fuel and water, including the loss of GM due to FSE
 - plans the use of fuel and water to keep free surface effects to a minimum
- estimates the loss of GM resulting from absorption of water by deck cargo.

Course Title : Great Circle Sailings and Advance Navigation

Course Code : BNS 4107
Credits : 3
Contact Hours : 42
Assessment : Term end written examination, Class test
Faculty in Charge :

Syllabus Content:

Voyage Planning considering weather, load line and other factors
Sight calculation by stars, planets, sun and Moon



01. To find the true Azimuth of a heavenly body, the compass error and hence the deviation of the magnetic compass for the direction of the ship's head (ABC tables)
02. To find the compass error and deviation from amplitude of Sun and Moon
03. To find the latitude by meridional altitude of a heavenly body. To calculate meridian passage time and approx meridian altitude for setting on the sextant (computed altitude)
04. Latitude and position line by observation of polaris
05. From an observation of any heavenly body near the meridian, to find the direction of the position line and latitude corresponding to the D.R. longitude through which the passes. Time limits for ex-meridian sight
06. To find the longitude corresponding to the DR latitude through which the position line passed and the direction of position line from an observation of any heavenly body. (long by chron)
07. To find the intercept, intercept termination point and direction of position line from observation of any heavenly body. (intercept method)
08. Sextant: To use sextant for altitude of heavenly bodies viz. Sun, Stars, Planets and Moon thence to correct the sextant altitude to 'True alt' required for astronomical calculations.
09. Use of Azimuth Mirror and pelorus
10. Great Circle Sailings
 - calculate initial course and distance in great-circle sailing
 - calculate composite great circles
 - demonstrates understanding of great circle sailing including composite and limited latitude great circles
 - demonstrates the use of gnomonic charts for plotting the great circle between two points
 - transfers a great circle from a gnomonic to a Mercator chart

Course Title : Ship Structure and Stresses

Course Code : BNS 4109
Credits : 2
Contact Hours : 28
Assessment : Term end written examination, Class test
Faculty in Charge :

Syllabus Content:

Ship Stresses
Shearing Force and Bending Moment



Shipyards and Drydock practice
Structural fire protection on Passenger and cargo ship
Various plans, layouts
Tonnage Regulation
Watertight, oil tight and weather tight bulkhead and doors

Ship Stresses

- describes in qualitative terms shear force and bending moments
- explains what is meant by 'hogging' and by 'sagging' and distinguish between them
- describes the loading conditions which give rise to hogging and sagging 'stresses
- describes how hogging and sagging stresses are caused by the sea state
- explains how hogging and sagging stresses result in tensile or compressive forces in the deck and bottom structure
- describes water pressure loads on the ship's hull
- describes liquid pressure loading on the tank structure
- calculates the pressure at any depth below the liquid surface, given the density of the liquid
- describes qualitatively the stresses set up by liquid sloshing in a partly filled tank
- describes racking stress and its causes
- explains what is meant by 'panting' and states which parts of the ship is affected
- explains what is meant by 'pounding' or 'slamming' and state which parts of the ship is affected
- describes stresses caused by localised loading
- describes corrosion
- describes the causes of corrosion on board
- describes the various methods being used to minimize the effect of corrosion

Load Lines and Draught Marks

- explains where the deck line is marked
- defines 'freeboard'
- explains what is meant by 'assigned summer freeboard'
- draws to scale the load line mark and the load lines for a ship of a given summer moulded draught, displacement and tonnes per centimetre immersion in salt water
- explains how the chart of zones, areas and seasonal periods is used to find the applicable load line
- demonstrates how to read draughts
- explains that the freeboard, measured from the upper edge of the deck line to the water on each side, is used to check that the ship is within its permitted limits of loading
- lists the items in the conditions of assignment of freeboard



- describes why the height of sill of openings varies between different type of vessels based on Load Line Rules

Course Title : Shipboard Maintenance & Port watch

Course Code : BNS 4111
Credits : 3
Contact Hours : 42
Assessment : Term end written examination, Class test
Faculty in Charge :

Syllabus Content:

Timber Deck Cargoes
RoRo Ship cargo operation
Oil Tanker cargo operation
Chemical Tanker Cargo Operation
Heavy weight cargo
Cargo and port watch
Corrosion and Its prevention
Cargo Gear maintenance
Planned maintenance schedule
Hatch Cover inspection
Ballast tank inspection
Damage report
Enhanced Surevy Programme

Hatch covers inspection

- Describes the working principles of a hatch cover
- Explains the construction of a hatch cover
- Identifies the difference between watertight and weathertight
- Identifies the critical components of the hatch cover that contribute to weathertightness
- Identifies the critical components of the hatch cover that contribute to watertightness
- Identifies the structural components of a hatch cover which are most likely to experience corrosion

Describes the testing methods for a hatch cover

Ballast tanks inspection

- Describes the purpose of ballast tanks
- Reproduces the construction sketch of a ballast tank
- Identifies the parts in the ballast tanks which are most likely to experience corrosion
- Lists the period of interval for the inspection of ballast tanks

Describes the corrosion prevention methods for ballast tanks



Damage report

- Lists the items that need to be taken into account when preparing a damage report
- Lists the evidence that needs to be collected in assisting the preparation of a damage report

Enhanced Survey Programme

- Describes the guidelines on the Enhanced Programme of Inspections during surveys of Bulk Carriers

Describes the guidelines on the Enhanced Programme of Inspections during surveys of Oil Tankers

Refrigerated Cargo

- explains how holds and lockers are prepared for loading
- explains the need for the pre-cooling of spaces and hunnage to be used
- describes the dunnaging requirements for refrigerated cargo
- gives examples of commodities carried chilled
- gives examples of frozen cargoes
- lists the inspection of the cargo which should be made before and during the loading
- describes the use of brine traps in compartment drains-before this stage

explains the purpose of compartment temperature recordings

Cargo Piping System

- describes the direct pipeline arrangement in crude carriers
- describes the ring-main system in a product tanker
- describes the system of individual deep-well pumps for a product tanker
- explains the arrangement and use of:
 - * deck lines
 - * drop lines
 - * stripping lines
 - * crossovers
 - * bypasses
 - * master valves
 - * tank suction valves
 - * sea suction valves

Cargo Pumps

- describes the main operating features of centrifugal pumps
 - explains why most cargo pumps are of centrifugal type
 - describes the main operating features of the following positive-displacement pumps:
 - * reciprocating
 - * screw
 - states the applications for which positive-displacement pumps are most suitable
 - describes how eductors work and give examples of their use
- describes the conditions for which the pumps are being used such as
- stripping
 - describes the safe handling of chemical cargoes



- describes the safe handling of liquefied gas cargoes
- describes the used of ship/shore checklist

describe the importance of setting the right pumping rate during the loading and unloading operation

Deck Cargo

- states that cargoes, other than in containers, commonly carried on deck are:
 - * dangerous goods not permitted below decks
 - * large units, difficult or impossible to stow below deck, which can 8 * safely be exposed to the elements
 - * cargoes which can be exposed to the weather and which would occupy a very large space below decks
 - * livestock in limited numbers
- explains why efficient securing of cargoes is essential for the safety of the ships as well as the cargo
- states that stowage and securing of deck cargo should be adequate for the worst conditions which could be experienced
- states that hatches should be securely closed and cleated before loading over them
- states that stowage should leave safe access to essential equipment and spaces needed to navigate and operate the ship such as:
 - * sounding pipes to tanks and bilges
 - * devices for the remote operation of valves
 - * mooring arrangements
 - * fire-fighting and life-saving equipment
 - * crew accommodation and working spaces
- states that deck cargo should not obstruct the view from the navigating bridge or overside at the bow
- explains that the weight of deck cargo should not exceed the maximum permissible load on the deck or hatches
 - * increased reserve buoyancy of a timber deck cargo
- describes in outline the recommendations on the stowage and lashing of timber deck cargoes as set out in the IMO code of Safe Practice for Ships Carrying Timber Deck Cargoes
- describes the guard lines or rails to be provided at the sides of a deck stow and at openings in the stow
- describes the provision of means of safe access between the deck and the top of the stow

describes the method of safe stowage and securing of containers on deck on vessels not specially for the carriage of containers

Dangerous, Hazardous and Harmful Cargoes

- explains the different types of containment covered by the term “packaged form”
- describes the classification of dangerous goods in the International Maritime Dangerous Goods (IMDG) Code



- explains the properties, characteristics and physical state of the different substances, materials and articles covered by the 9 classes of the IMDG Code
- identifies the marking, labelling and placarding of dangerous goods as required by the IMDG Code and DGs in limited quantities, e.g. schedule 18
- states that the duty officer should have information on the quantities, types of package, proper shipping names (correct technical names), classification, stowage and segregation of the dangerous goods to be handled
- states that the duty officer should have information on the special measures to be taken when a certain dangerous cargo is handled
- states that the measures to be taken in the event of an incident or accident should be made known-and that any necessary equipment and sufficient crew to operate it should be available
- explains that the actions to be taken are laid down in the IMO Emergency Procedures for ships Carrying Dangerous Goods (EmS), the IMO Medical First Aid Guide for Use in Accidents Involving Dangerous Goods (MFAG) and the International Medical Guide for Ships (IMGS)
- states that any accident or during the handling of dangerous goods should be reported immediately to the person in charge of the operation
- explains that the IMDG Code lays down the packing requirements
- states that the doubts about the suitability and integrity of packages should be reported to the master or chief mate
- states the fire precautions which should be taken when carrying dangerous goods
- states the precautions which should be taken while loading or discharging explosives
- explains the meaning of the following stowage and segregation requirements for the different types of ships:
 - * on deck only
 - * on deck or under deck
 - * away from
 - * separated from
 - * separated by a complete compartment or hold from
 - * separated longitudinally by an intervening complete compartment

Keeping an Effective Deck Watch in Port Under Normal Circumstances

- states the arrangements for keeping watch in port should:
 - ensure the safety of life, ship, cargo and port
 - observe international, national and local rules
 - maintain order and the normal routine of the ship
- describes taking over the watch and list the information which the officer being relieved should pass to the relieving officer
- lists the matters on which the relieving officer should satisfy himself before assuming charge of the watch
- describes how the watch should be kept and list the points to which attention should be paid



- describes the actions to take on receiving a storm warning or in an emergency threatening the safety of the ship
- lists the entries which should be made in the log-book
- states the preparation of the vessel after berthing
- states the preparation of the vessel prior sailing

Keeping A Safe Deck Watch in Port when Carrying Hazardous Cargo

- defines 'hazardous cargo'
- states that sufficient personnel should be readily available on board when carrying hazardous cargo in bulk
- explains that special requirements must be necessary for special types of ships or cargo, particularly with respect to:
 - the number of crew required on board
 - the state of readiness of fire-fighting appliances and other safety equipment
 - special port regulations
 - communications with the shore in the event of an emergency arising
 - special precautions to prevent pollution of the environment
- explains that the officer of the watch should be aware of the nature of the hazards and any special precautions necessary for the safe handling of the cargo
- states that the officer of the watch should be aware of the appropriate action in the event of a spillage or fire
- describes the procedure for entry into enclosed spaces using a 'permit to work', and the monitoring of work in progress
- describes the arrangements and procedures for rescue from an enclosed space in an emergency

Course Title : Global Maritime Distress and Safety System

Course Code : BNS 4113
Credits : 2
Contact Hours : 28
Assessment : Term end written examination, Class test
Faculty in Charge :

Syllabus Content:

Sea Area
Requirement of Equipment
Radio Communication
Type of Communication Distress, Urgent, Safety, Routine
Radio Log



Radio Watch

A. DETAILED KNOWLEDGE OF THE MARITIME MOBILE SERVICE AND THE MARITIME MOBILE-SATELLITE SERVICE

- A1. The principles and features of the maritime mobile service
- A2. The principles and features of the maritime mobile-satellite service

B. DETAILED THEORETICAL KNOWLEDGE AND ABILITY TO USE THE BASIC EQUIPMENT OF SHIP STATION

- B1. Principles of electricity and theory of radio and electronics relevant to GMDSS communications and ancillary equipment
- B2. Use in practice the basic equipment of a ship station
- B3. Digital Selective Calling (DSC)
- B4. General principles of Narrow Band Direct Printing (NBDP) and Telex Over Radio (TOR) systems. Use maritime NBDP and TOR equipment in practice
- B5. Usage of INMARSAT systems. Use INMARSAT equipment or simulator in practice

C. OPERATIONAL PROCEDURES IN THE GMDSS AND DETAILED KNOWLEDGE OF THE OPERATION OF THE GMDSS AND SUBSYSTEMS

- C1. Global Maritime Distress and Safety System (GMDSS)
- C2. INMARSAT
- C3. Marine Safety Information (MSI) and Navtex
- C4. Emergency Position Indicating Radio Beacons (EPIRBs)
- C5. Search and Rescue Radar Transponder (SART)
- C6. Distress, urgency and safety communication procedures in the GMDSS
- C7. Search and rescue (SAR) operation

D. GENERAL KNOWLEDGE OF SHIP STATION RADIO NAVIGATION EQUIPMENT

- D1. Basic knowledge of navigational techniques
- D2. General principles and functions of Radar systems
- D3. General principles and functions of navigational aids

E. PRACTICAL KNOWLEDGE OF MAINTENANCE PROCEDURES AND ABILITY TO MAINTAIN SHIP STATION EQUIPMENT IN SERVICE

- E1. Practical knowledge necessary for carrying out preventive maintenance procedures on ship station communication and radio navigation equipment
- E2. Detailed practical knowledge necessary for locating faults in ship station communication and Radio navigation equipment
- E3. Detailed practical knowledge necessary for effecting repairs on ship station communication and Radio navigation equipment



E4. Preparation of technical records and reports concerning repair and maintenance of radio communication and radio navigation equipment

F. MISCELLANEOUS SKILLS AND OPERATIONAL PROCEDURES FOR GENERAL COMMUNICATIONS

F1. Ability to use English language, both written and spoken, for the satisfactory exchange of communications relevant to the safety of life at sea

F2. Obligatory procedures and practices

F3. Practical and theoretical knowledge of general communication procedures

F4. Telephone systems

F5. General awareness of Electro-Magnetic Compatibility (EMC)

Course Title : Bridge Team and Bridge Resource Management

Course Code : BNS 4115

Credits : 2

Contact Hours : 28

Assessment : Term end written examination, Class test

Faculty in Charge :

Learning Outcomes : The intent of the course is to ensure trainees gain experience in handling ships under various conditions and will make a more effective contribution to the bridge team during ship manoeuvring and emergency situations.

Syllabus Content:

- Review of the Basic Principles
- Familiarization with the bridge
- Standard Manouvres
- Wind and Current effect
- Attitude and Cultural awareness
- Briefing and Debriefing
- Challenge and Response
- Shallow water effect, Bank, channel interaction effect
- Planning Authority
- Management on the bridge
- Workload and stress
- Anchoring and single buoy mooring
- Human Factor in error
- Master pilot relationship



- Decision making
- Planning and carrying out a voyage in normal and emergency situation

BRIDGE RESOURCE MANAGEMENT

- describes the basic principles of bridge resource management
- explains how responsibility for the safety is clearly defined at all times, including periods when the master is on the bridge and while under pilotage
- demonstrates clear, concise communications and acknowledgements (at a times) in a seaman-like manner
-
- demonstrates the allocation, assignment and prioritisation of resources
- demonstrates the importance of ensuring the effectiveness of communication between bridge team members
- explains the importance of ensuring the effectiveness of information exchange with pilot
- demonstrates effective information exchange
- defines “situational leadership”
- explains the relationship between assertiveness and leadership
- explains the importance of challenge and response
- explains the importance of obtaining and maintaining situational awareness
- demonstrates appropriate challenges and responses
- demonstrates the ability to maintain situational awareness in complex situations

Course Title : Global Maritime Distress and Safety System **Sessional**

Course Code : 4114
Credit : 2
Lecture Hours : 56
Assessment : Attendance, Laboratory report, note book, Quiz, Viva voce
Faculty in Charge:

Syllabus Contents:

Care and Use of all radio communication equipment VHF, MF, HF, Navtex, Sat-C, Sat-B, SART, EPIRB, GMDSS Walkie Talkie.



Course Title : Bridge Team and Bridge Resource Management Sessional

Course Code : 4116
Credit : 2
Lecture Hours : 56
Assessment : Attendance, Laboratory report, note book, Quiz, Viva voce
Faculty in Charge :

Syllabus Contents:

Practical Navigation watch by Radar and ARPA simulator under professional instructor guidance at various sea condition and at various sea area encountering various targeted ships

Perform manual radar plotting

- explains a relative motion triangle, various vectors and angles
- constructs a relative motion triangle on a plotting chart
- constructs a relative motion triangle on a reflection plotter, where available
- determines course, speed and aspects of other ships from a relative presentation (stabilised and unstabilised)
- determines course, speed and aspect of other ships from a true presentation
- takes ranges and bearings at frequent, regular intervals
- states the factors affecting the accuracy of derived course, speed and aspect
- determines set and rate of current from observations of fixed target
- explains the track made over the ground by own ship
- determines CPA and TCPA with relative presentation (stabilised and unstabilised)
- determines CPA and TCPA with true presentation
- states the factors affecting the accuracy of CPA and TCPA obtained by plotting
- recognizes the effects of changes of course and/or speed by other ships
- compares between visual and radar observations
- explains the delay between change in the course or speed and detection of that change
- states the advantages of compass stabilization of a relative display
- explains the effect of changes in own-ship course or speed on the observed movement of targets (stabilised rel/true; or unstabilised)
- states the hazards of small changes of course and/or speed in relation to accuracy and direction
- makes a report stating the elements: bearing, range, CPA, TCPA, course, aspect, speed

Use Radar to Ensure Safe Navigation

- states the characteristics of good, radar conspicuous objects
- states the characteristics of objects which give poor radar responses
- fixes the position fixing based on radar bearings and radar ranges
- explains possible errors and how to minimize them



- cross checks the accuracy of radar against other navigational aids
- compares features displayed by radar with charted features
- identifies passive aids (corner reflector-recognition and use)
- identifies active aids (ramark, racon, echo enhancers, transponders- recognition and use)
- identifies SARTS (recognition and use)
- states data source information on active and passive aids
- uses parallel indexing technique in radar navigation
- sets up and uses a parallel indexing line by electronic means
- constructs and uses a parallel indexing line on a reflection plotter, where fitted
- takes correct action when an echo departs from the parallel indexing line
- uses more than one parallel indexing line
- explains and demonstrates following, while using parallel indexing techniques:
 - * constructs and uses lines for two ranges scales (construction and use)
 - * the importance of "wheel over"
 - * use of "wheel over"
 - * the importance of safety margins
 - * use of safety margins
 - * real motion of vessel from a tracked echo
 - * appropriate action to counteract for current-on a straight course and when vessel is maneuvering
 - * use of line of turn

* constructs and uses parallel indexing for radial turns

Use Radar to Avoid Collisions or Close Encounters

- applies COLOREG to avoid collision or close encounter
- uses the radar as a means of lookout, and states importance of continuous plotting
- lists the factors which determine a safe speed, with emphasis on factors related to radar
- lists factors which provide a good plot to avoid collision/close encounter
- makes substantial alteration of course or speed to avoid collision/close encounter
- states times when radar is to be used in clear weather by day, at night when there are indications that visibility may deteriorate, and at all times in congested waters

ARPA

- Describes an ARPA System
- describes an ARPA system

states the advantages and disadvantages of the use of an system



Year-4 Term- 2

Course Contents of

B.Sc Honors, Nautical Science

Bangladesh Marine Academy

Under the Recognition of



Bangabandhu Shiekh Mujibur Rahman **Maritime University**



Course Title : Thesis on Maritime Topics

Course Code : BNS 4000
Credits : 4
Contact Hours :56
Assessment :
Faculty in Charge :

Learning outcomes : The goal is to provide students with hands-on research experience through completing a research project, starting with hypothesis development (if applicable), literature searching, experimental design, data collection, analysis, and interpretation. Students will also gain experience in written and oral scientific communication by submitting several written components including a research proposal, a progress report, and final thesis for evaluation as well as presenting the results of their research in a public oral presentation

Syllabus Content:

Students will engage in independent research, to produce an original thesis on maritime topics. This may take the form of a paper or report with supporting documentation, images and notes. Research may consist of archival investigation and/or fieldwork, including personal interviews, site reports, and condition assessments.

The process of writing and submitting a thesis will provide students with understanding and competence in research and writing about conservation and preservation issues, which will



be of use in the professional field.

Students will be assigned a thesis advisor, with whom they will meet regularly.

The thesis should be 40-50 pages of text, with supporting documentation, images and notes. Research may consist of archival investigation and/or fieldwork, including personal interviews, site reports, and condition assessments. Students must consistently use a citation format of their choice.

A small panel of 2 or 3 markers, which will include the student's advisor, will decide the thesis grade. Students will meet with this panel for a Final Discussion. This will be a 30-minute conversation about the thesis where students will be given feedback and a chance to discuss future plans. The discussion will not impact the student's grade.

There should be schedule and deadline including progress report and progress meeting to submit the thesis paper advising by the panel and research supervisor.

Course Title : Professional Ethics

Course Code : BNS 4201
Credits : 2
Contact Hours :28
Assessment :
Faculty in Charge :

Learning Outcomes :The objectives of this course are: (a) to understand the moral values that ought to guide the Marine profession, (b) resolve the moral issues in the profession, and (c) justify the moral judgment concerning the profession. It is intended to develop a set of beliefs, attitudes, and habits that mariners should display concerning morality.

Syllabus Content:

Chapter 1 – Human Values

- 1.0 Objectives
- 1.1 Morals
- 1.2 Values.
- 1.3 Ethics
- 1.4 Integrity
- 1.5 Work ethics



- 1.6 Service learning
- 1.7 Virtues
- 1.8 Respect for others
- 1.9 Living peacefully
- 1.10 Caring
- 1.11 Sharing
- 1.12 Honesty
- 1.13 Courage
- 1.14 Valuing time
- 1.15 Cooperation
- 1.16 Commitment
- 1.17 Empathy
- 1.18 Self-confidence
- 1.19 Challenges in the work place
- 1.20 Spirituality

Chapter 2 – Engineering Ethics

- 2.0 Overview
- 2.1 Senses of engineering ethics
- 2.2 Variety of moral issues
- 2.3 Types of inquiries
- 2.4 Moral dilemma
- 2.5 Moral autonomy
- 2.6 Moral development (theories)
- 2.7 Consensus and controversy
- 2.8 Profession
- 2.9 Models of professional roles
- 2.10 Responsibility
- 2.11 Theories about right action (Ethical theories)
- 2.12 Self-control
- 2.13 Self-interest
- 2.14 Customs
- 2.15 Religion
- 2.16 Self-respect
- 2.17 Case study: Choice of the theory

Chapter 3 – Engineering as Social Experimentation

- 3.0 Engineering as experimentation
- 3.1 Engineers as responsible experimenters
- 3.2 Codes of ethics
- 3.3 Industrial standards
- 3.4 A balanced outlook on law
- 3.5 Case study: The challenger

Chapter 4 – Safety, Responsibilities and Rights



- 4.0 Safety definition
- 4.1 Safety and risk
- 4.2 Risk analysis
- 4.3 Assessment of safety and risk
- 4.4 Safe exit
- 4.5 Risk-benefit analysis
- 4.6 Safety lessons from 'the challenger'
- 4.7 Case study: Power plants
- 4.8 Collegiality and loyalty
- 4.9 Collective bargaining
- 4.10 Confidentiality
- 4.11 Conflict of interests
- 4.12 Occupational crime
- 4.13 Human rights
- 4.14 Employee rights
- 4.15 Whistle blowing
- 4.16 Intellectual property rights

Chapter 5 – Global Issues

- 5.0 Globalization
- 5.1 Multinational corporations
- 5.2 Environmental ethics
- 5.3 Computer ethics
- 5.4 Weapons development
- 5.5 Engineers as managers
- 5.6 Consulting engineers
- 5.7 Engineers as expert witness
- 5.8 Engineers as advisors in planning and policy making
- 5.9 Moral leadership
- 5.10 Codes of ethics

Recommended Text(s) :

- 3. A text Book on Professional Ethics and Human values – R.S.Naagarazan
- 4. Professional Ethics in Engineering – William Frey
- 5. Engineering Ethics- Concepts, Viewpoints, Cases and Codes
- 6. Ethics and Excuses: The Crisis in Professional Responsibility By Banks McDowell
- 7. Just a Job? Communication, Ethics, and Professional Life By George Cheney; Daniel J. Lair; Dean Ritz; Brenden E. Kendall
- 8. A Global Standard for Professional Ethics: Cross-Border Business Concerns By Allen, Catherine; Bunting, Robert
- 9. Talking Virtue: Professionalism in Business and Virtue Ethics By Blackburn, Margaret; McGhee, Peter



10. Conflict of Interest in the Professions By Michael Davis; Andrew Stark
11. Virtue Ethics and Professional Roles By Justin Oakley; Dean Cocking
12. Preferred Strategies for Learning Ethics in the Practice of a Discipline By Pettifor, Jean L.; Paquet, Stephanie
13. Working Ethics: How to Be Fair in a Culturally Complex World By Richard Rowson
14. Professional Ethics and Civic Morals - Emile Durkheim
15. Ethics and Professionalism - John Kultgen

Course Title : Maritime Law, Insurance and risk management

Course Code : BNS 4203
Credits : 3
Contact Hours :42
Assessment :
Faculty in Charge :

Learning outcomes : The course will enable the student to understand the basic principles of contract, tort and property alongside the fundamentals of the shipping and commodity markets. It also cuts across the boundaries of public and private law.

Syllabus Contents :

INTRODUCTION TO SHIPPING LAW

Historical Development of Maritime Law
Characteristics of Maritime Law and Main Differences between the Major Legal Systems
Regional Maritime Law, including EU Shipping Law
Regulatory Maritime Law: International Conventions
Admiralty and Shipping Practice
Statutory Law on Shipping
Judicial Remedies in Maritime Law
Shipping Institutions
Law of Contracts
Law of Torts/Delict
Law of Property
International Trade Law

International Sale of Goods
Sale of Goods Legislation (Comparative Law)
International Commercial Terms (INCOTERMS)
The United Nations Convention on Contracts for the International Sale of Goods, 1980

NATIONALITY, REGISTRATION AND OWNERSHIP OF SHIPS



Nationality of Ships
Ship Registration
Registration and Ownership of Ships
The Concept of 'Genuine Link'
Types of Ship Registries
Closed Registries
Open Registries
International Registries
Types of Ship Registration
Regular Registration
Bareboat Registration
Provisions on Ship Registration in the Convention on the High Seas, 1958
Provisions on Ship Registration in UNCLOS
United Nations Convention on Conditions for Registration of Ships, 1986
PROPRIETARY INTERESTS IN SHIPS
Acquisition and Transfer of Title and Ownership in Ships
Shipbuilding Contracts
The Shipbuilding Contract (Formation of the Contract, Rights and Obligations of the Parties Involved)
Agreements Ancillary to Shipbuilding Contracts
Standard Forms of Contracts
Ship Conversion Contracts
Commercial Practices
Sale and Purchase of Second hand Tonnage
Sale and Purchase of Second hand Tonnage Contracts (Formation of the Contract, Rights and Obligations of the Parties Involved)
Standard Forms of Contracts
Alternative Security Arrangements
Commercial Practices
Security Rights in Ships
Ships Mortgages and Hypothecs
Nature and Characteristics of Ship Mortgages and Hypothecs
Mortgages and Hypothecs Distinguished
Formation of Ship Mortgages and Hypothecs
Registration of Ship Mortgages and Hypothecs
Rights and Duties of the Parties Involved
Priority and Ranking of Ship Mortgages and Hypothecs
Extinction of Ship Mortgages and Hypothecs
Conflict of Laws in Relation to Ship Mortgages and Hypothecs
Maritime Liens and Privileges
Historical Development of Maritime Liens and Privileges
Sources of Maritime Liens and Privileges



Nature and Characteristics of Maritime Liens and Privileges
Distinction between Liens / Privileges and Mortgages / Hypothecs
Types of Maritime Liens and Privileges
Priority and Ranking of Maritime Liens and Privileges
Enforcement of Maritime Liens and Privileges
Extinction of Maritime Liens and Privileges
Conflict of Laws in Relation to Maritime Liens and Privileges
International Conventions on Maritime Liens and Mortgages: 1926, 1967 and 1993

ENFORCEMENT OF MARITIME CLAIMS

In Rem and In Personam Proceedings
Arrest of Ships
Historical Development of International Regulation
International Convention Relating to the Arrest of Sea Going Ships, 1952
International Convention on the Arrest of Ships, 1999
Arrest of Ships (Comparative Law)
Mareva Injunction and Attachment
Establishing Jurisdiction for the Enforcement of Maritime Claims

CARRIAGE OF GOODS BY SEA

Carriage of Goods by Sea under Bill of Lading Terms
Bills of Lading and Other Transport Documents (Sea Waybills, Delivery Orders, Through Bills of Lading)
Conventions Relating to International Carriage of Goods by Sea
International Convention for the Unification of Certain Rules of Law relating to Bills of Lading, 1924 (Hague Rules)
Protocol to Amend the International Convention for the Unification of Certain Rules of Law Relating to Bills of Lading, 1968 (Hague Visby Rules)
United Nations Convention on the Carriage of Goods by Sea, 1978 (Hamburg Rules)
United Nations Convention on Carriage of Goods Wholly or Partly by Sea, 2008 (Rotterdam Rules)
Electronic Commerce and Electronic Transport Documents for the Carriage of Goods by Sea
Charterparties
Different Types of Charterparties
Rights and Obligations of the Parties Involved
Bills of Lading Issued under Charterparties
Multimodal Transport
Multimodal Transport Documents
United Nations Convention on International Multimodal Transport of Goods, 1980
Impact of the Rotterdam Rules on Multimodal Transport

LAW OF MARINE INSURANCE



Historical Background
The Nature and Extent of Marine Insurance
Subject Matter Insured
Insurable Interest
Formation and Form of the Marine Insurance Contract
Preliminaries to the Issue of a Policy
When is the Contract Deemed to be Concluded?
The Doctrine of Utmost Good Faith
The Role of Marine Insurance Brokers
Payment of Premium and Duration of Cover
Classification of Marine Policies
Voyage Policies
Time Policies
Conditions and Warranties in Marine Insurance
Change of Voyage, Deviation and Delay
Marine Perils
Insured Perils
Excluded Perils
Types of Losses
Actual Total Loss
Constructive Total Loss
Loss of Freight
Partial Losses
Measure of Indemnity
Standard Insurance Clauses
Hull and Machinery Insurance
Cargo Insurance
Liability Insurance (P&I Insurance)

Course Title : Shipboard and Shipping Management

Course Code : BNS 4205
Credits : 3
Contact Hours :42
Assessment :
Faculty in Charge :

Syllabus Contents :



1) Introduction to the Shipping Industry

- How the marine industry has developed
- World trade
- Shipping markets
 - Dry bulk, wet bulk, container, RoRo etc.
- The way ships trade
 - Liner and tramp traders
 - Charters
- Documentation overview
- Shipping legal framework overview
- The way ships are managed and how they operate
- What support is available to the management of shipping?

2) Business Management Skills for the Ship Manager

- Customer services
 - The importance of customer focus
 - Identifying & meeting customer needs
 - Training and motivation of staff in customer service
 - Performance standards
- Strategic analysis
 - Internal environment
 - Products and services
 - External environment
 - Strategic options
 - Implementing change
- IT use and strategy
- Project Management
 - Examples of typical projects
 - Project and planning principles
 - Roles and responsibilities, leadership and managing the project team

3) Employ and Manage Marine Personnel for Vessel Activities

- Plan the workforce
- Recruit, select and retain staff
- Provide learning opportunities
- Monitor and take action to ensure seafarer certification
- Manage induction processes



- Staff appraisals – tool to motivate your team
- Manage personnel travel procedures
- Provide for the wellbeing and welfare of seafarers and office staff
- Key performance indicators
- A 'just culture' versus a 'blame culture'

4) Vessels Support Services: Buy/Sell/Equip/Maintain/Supply

- Manage the acquisition of vessels
- Vessel disposal
- Develop and implement vessel maintenance plans
- Project management
- Manage physical resources
- Procurement processes
- Organise and oversee the management of contractors
- Establish and implement systems for the management of vessel supplies

5) ISO Maritime Standards

- International Standards Organisation (ISO)
 - What is the ISO and how does it function
 - Accreditation bodies
 - Audit cycles and how are they performed
- Quality Management Systems
 - The evolution of quality standards
 - Applying quality standards
 - The significance and benefits
 - The disciplines involved
 - Industry legislation and organisations
- Environmental Management Systems
 - The evolution of environmental standards
 - Applying environmental standards
 - The significance and benefits
 - The disciplines involved
 - Industry legislation and organisations
 - The relationship between environmental standards and maritime environmental legislation
 - MARPOL73/78 as amended
 - Greenhouse Gas Emissions (GHG) from ships
 - Carbon reductions and carbon trading
 - Emission Control Areas
 - Cleaner Fuels for ships



- Anti-fouling legislation for ships
- New fuel sources for ships
- Occupational Health and Safety Management Systems (OHSMS)
 - Introduction to the standard
- Information technology — Security techniques — Information Security Management Systems
 - Introduction to the standard
 - Relationship with the ISPS Code
 - Relationship with companies and the carriage of privately armed security guards on board
- Energy Management Systems
 - Introduction to the standard
- Social Accountability
 - Introduction to the standard
 - Relationship with manning agencies
 - Relationship with MLC 2006

Course Title : Ship Handling Simulation

Course Code : BNS 4202
Credits : 2
Contact Hours :56
Assessment :
Faculty in Charge :

Learning Outcomes : The trainee who successfully completes this course will have gained experienced in handling ships under various conditions and will make a more effective contribution to the bridge team during ship manoeuvring in normal and emergency situations.

Syllabus Contents :

1. Review of basic principles
2. Familiarization with the Bridge
3. Standard Manoeuvres
4. Human Factor in error
 - Attitude, Cultural Awareness, Communication, Briefing & Debriefing and Challenge & Response.
 - Authority – Assertiveness, Management on the bridge
 - Workload and Stress, Decision making
5. Passage Planning
6. Wind and current effects
7. Shallow-water effects and Bank, channel and interaction effects
8. Anchoring



9. Single – buoy mooring
10. Picking up Pilot, Berthing / Unberthing, Use of tugs
11. Crisis Management, Contingency Planning and carrying out a voyage in emergency situations

Recommended Textbooks

The Ship Handler's Guide by Capt. R. W. Rowe (N.I.)
Bridge Procedures Guide by International Chamber of Shipping
International Regulations for Preventing Collisions at Sea (COLREG 1972) as amended by IMO
Perils at Sea and Salvage – A guide for Masters by ICS & OCIMF
Bridge Team Management by Capt. A. J. Swift

Collisions & their causes – Capt. Richard A. Cahill. (N.I.)
Maritime Resource Management - Student workbook developed by SAS Flight Academy, Sweden.
A Guide to Collision Avoidance Rules by Cockcroft and Lameijer
Ship Manoeuvring principles and Pilotage by Paul R. Williamson
The Navigation Control Manual by A. G. Bole, W. O. Dineley & C. E. Nicholls

Course Title : Advanced Training for Oil Tanker cargo operation

Course Code :4221

Credit Hours : **3**

Contact Hours : 42

Assessment : Term end written examination and Class tests

Faculty in Charge :

Aims:

This course aims to provide advanced, specialized training for those on board oil tankers who have immediate responsibility for loading, discharging and care in transit or handling of oil cargoes.

Learning Outcome:

After successful completion of this course, the students will have sufficient knowledge on:

1. The equipment, instrument and controls used for cargo handling on a tanker;



2. The need of proper planning, the use of checklists and the scales involved in the various cargo handling operations;
3. Applying proper and safe procedures at all times when carrying out the various operations on board an oil tanker;
4. Identifying operational problems and solving them;
5. Making decisions which promote safety and protect the marine environment; and
6. Plan and co-ordinate actions during emergencies.

Course Outline:

1. Knowledge of oil tanker design, systems and equipment;
2. Knowledge of pump theory and characteristics, including types of cargo pumps and their safe operation
3. Proficiency in tanker safety culture and implementation of safety-management system
4. Knowledge and understanding of monitoring and safety systems, including the emergency shutdown
5. Loading, unloading, care and handling of cargo
6. Knowledge and understanding of oil cargo related operations
7. Development and application of cargo-related operation plans, procedures and checklists
8. Ability to calibrate and use monitoring and gas-detection systems, instruments and equipment
9. Ability to manage and supervise personnel with cargo-related responsibilities
10. Knowledge and understanding of the physical and chemical properties of oil cargoes
11. Knowledge and understanding of safe working practices, including risk assessment and personal shipboard safety relevant to oil tankers:
12. Knowledge and understanding of oil tanker emergency procedures
13. Actions to be taken following collision, grounding, or spillage
14. Knowledge of medical first aid procedures on board oil tankers
15. Understanding of procedures to prevent pollution of the atmosphere and the environment
16. Knowledge and understanding of relevant provisions of the International Convention for the Prevention of Pollution from Ships (MARPOL), as amended, and other relevant IMO instruments, industry guidelines and port regulations as commonly applied
17. Case Studies

Course Title : Advance Training for Chemical Tanker Cargo operation



Course Code :4223 Credit Hours : 3
Contact Hours: 42 hrs
Assessment : Term end written examination and Class tests
Faculty in Charge :

Aims:

This course aims to provide specialist training in subjects appropriate to the duties of senior officers and any person with immediate responsibility for loading, discharging, care in transit or handling of bulk chemical cargoes..

Learning Outcomes:

After successful completion of this course, the students will have sufficient knowledge on:

1. Chemical tanker designs, systems, and equipment;
2. Pump theory and characteristics, including types of cargo pumps and their safe operation;
3. Tanker safety culture and implementation of safety management system
4. Ability to perform cargo measurements and calculations
5. Development and application of cargo-related operation, Plans, procedures and checklists
6. Ability to calibrate and use monitoring and gas-detection, Systems, instruments and equipment.

Course Outline:

1. Introduction (STCW Regulation V/1-1 para 6, Code Table A-V/1-1- 3)
2. Chemistry and Physics
3. Hazards and control measures Chemistry and Physics
4. Rules and Regulations
5. Chemical tanker Design and Cargo Containment
6. Cargo-handling Systems
7. Occupational health and Safety and Pollution Prevention
8. Loading, unloading, care and Handling of cargo
9. Tank-cleaning Operations
10. Ship/Shore Interface
11. Response to Emergencies

Course Title : Maritime Economics

Course Code : 4225
Credit Hours : 3
Contact Hours : 42 hrs



Assessment : Term end written examination and Class tests
Faculty in Charge :

Aims:

To review the fundamentals of economics, to present the basic concerns and special features of transport and maritime transport, and to apply economic principles to maritime transport

Course Outline:

1. **Introduction to maritime Economics:** Economic concepts; economics concerns; questions that maritime economics provides answers to; Maritime Transport Market; Main Characteristics of International Shipping; Factors of Production; Basic trade theory; Contributors to Trade Growth.
2. **Demand of Maritime Transport:** the structure of seaborne Trade, the features maritime demand
3. **Sea trade evolution and Maritime Geography:** The evolution of seaborne trade, the factors that affect maritime demand, the geographic features of maritime demand, Economic concept- Price elasticity of demand and supply
4. **Supply of Maritime Transport:** Factors regarding the size of supply, the structure of maritime supply and its evolution, the economics of ship's size and speed, the current supply in terms of major suppliers of various shipping services, Economic concepts: Economies of scale, Productivity and optimization and Laws of diminishing return
5. **Types of Shipping Organization:**The economic reasons for having different shipping organizations, the major features of tramp shipping and liner shipping, Economic Concepts: Market equilibrium under competition and monopoly, Maritime Cooperation and other related services.
6. **Maritime Cooperation and Other Related Services:** The main forms and features of maritime cooperation, the basic functions of a port and the relationship between port and shipping, the roles of shipping intermediates, Economic Concepts: Principle of substitution
7. **Maritime transport cost and financing:**The capital requirement of shipping, the major financing options and their main features, the concept of opportunity cost and the marginal utility theory, Economic Concept: Opportunity cost, Marginal utility.
8. **Cost analysis:**The running cost aspect of shipping companies, the basic cost structure of various shipping organizations, the economic concepts and principles regarding shipping cost and pricing, Economic Concepts: Fixed cost and variable cost, Marginal cost
9. **Maritime freight market:**The basic structure of maritime freight of both liner and tramp market, economics of freight market, the dry bulk freight index system and future market for maritime freight, Economic concepts: Perfect competition, monopolistic competition and monopoly
10. **Economics of maritime regulations:**The regulatory framework of maritime transport, the economics of shipping regulations, the economic implications and benefits of



maritime regulations, Economic Concepts: Property right and externality, Market-based control measures

Course Title: Maritime Safety and Environment

Administration

Course Code :4227
Credit Hours : 3
Contact Hours : 42
Assessment : Term end written examination and Class tests
Faculty in Charge :

Aims:

This course aims to provide comprehensive understanding of maritime administration activities in the context of IMO and essential management tools required to implement safety, security and environmental protection standards.

Course Outline:

1. **Introduction to IMO Member State Obligations:** The role of government in policyformulation and the administration of maritime affairs. To define and examine “maritimeadministration” conceptually. An overview about IMO member State obligations as flag,port or coastal State under the IMO III Code. To introduce the IMO member Stateauditing scheme as a tool to assess Member State performance.
2. **Maritime Risk Management:**Safety and risk, including risk assessment, safety and Formal Safety Assessment (FSA). The relationship between risk assessment and maritime casualty investigation. Essential tools for the consideration of all relevant factors involved in the development of maritime accidents, such as human and organizational factors.
3. **Maritime Human Element:** the relevant IMO and ILO instruments, including the MLC 2006, relating to maritime labour and welfare, and in particular the rights and expectations of seafarers in relation to occupational safety.
4. **Marine Environmental Protection:**Marine environmental protection and coastal and ocean governance in a context broader than shipping and the maritime sector. Sources of pollution, the science, mechanisms and technologies for pollution monitoring and control. The importance of emergency preparedness measures and contingency planning as part of the overall risk management process

Shipboard Issues in Maritime Safety and Marine Environmental Protection:Key



aspects of design for safety principles and relate them to SOLAS requirements. Marine environmental operational issues and measures necessary to protect the marine environment as required by MARPOL, such as ballast water management, bio-security, anti-fouling systems and the recycling of ships.

Course Title : Supply Chain Management

Course Code :4229
Credit Hours : 3
Contact Hours : 42
Assessment : Term end written examination and Class tests
Faculty in Charge :

Aims:

This course aims to provide the concepts, principle and techniques for managing manufacturing and service operations. It emphasizes decision making in operation function of organizations and supply chains.

Learning outcomes:

After successful completion of this course, the students will be able:

1. Develop the ability to identify, understand and evaluate the operations component of a variety of manufacturing and service organizations.
2. Develop a process view of the organization/supply chain.
3. Understand the issues in process, quality, capacity and inventory.
4. Planning and scheduling method.

Course Outlines:

1. **Introduction:** Meaning and nature of supply chain and supply chain management; importance of supply chain management; drives of supply chain competitiveness; strategies-tactics-mission-goal-factors of competitiveness; quality and time based strategies.
2. **Demand forecasting:** Concept of forecasting and demand forecasting; elements of good forecast; steps in forecasting; approaches to forecasting; qualitative and quantitative approach to forecasting; time series-naive method-moving average-exponential smoothing.
3. **System design:** Product design-meaning-importance-phases in product design & development-service design-challenges of service design. Need for capacity planning; capacity strategy steps.
4. **Facility location:** Nature, meaning, importance, factors affecting location of manufacturing and service organization; facility location decisions



5. **Facility layout:** nature-objectives-types of layout; features of good layout for manufacturing and service organization; designing product and process layout.
6. **Supply Chain Management:** Purchasing-purchasing cycle; ethics in purchasing-value analysis-outsourcing; advantages and disadvantages of outsourcing; vendor selection; supply chain strategy; logistics management.
7. **Inventory management:** Concept of inventory-types-objectives of inventory-inventory control-cost of inventory. Inventory control models; safety stock-material requirement planning; problem solving.
8. **Managing quality:** Meaning of quality-dimensions of product quality and service quality-quality control technique-cost of poor quality; Total quality management-elements of TQM.
9. **Aggregate planning:** Meaning and nature of aggregate planning; technique and steps in aggregate planning; master production scheduling.
10. **Operations Scheduling:** Nature and meaning-demand scheduling-workforce scheduling-operations scheduling-forward scheduling-backward scheduling-scheduling criteria; dispatching-priority sequencing rule; linking operations scheduling to the supply chain.
11. **Project management:** Project management planning-project scheduling techniques.

Recommended text(s):

1. William J. Stevenson, Operations management.

Course Title : Integrated Coastal Zone and Marine Fisheries Management

Code : BNS 4231
Credits : 3.0
Contact Hours : 42
Assessment : Term end written examination and Class tests
Faculty in Charge :

Aims:

To provide in-depth knowledge on the management of the coastal zone using an integrated approach regarding all aspects of the coastal zone, including geographical and political boundaries in an attempt to achieve sustainability. This course will also discuss on the marine fisheries and aqua culture management.

Learning Outcomes:

Students will be able to describe/explain/discuss/analyze:



1. Integrated coastal zone management concept, method and its implementation
2. Marine Fisheries and its sustainability
3. Management of aquaculture
4. Development of blue economy

Syllabus Contents:

Coastal Zone Management:

1. Integrated Coastal Zone Management concept and method
2. Implementation of Integrated Coastal Zone Management
3. Building harmonious and beautiful marine environment through integrated management of marine environment
4. Promoting development and build a beautiful living environment through integrated management of Bay area.
5. Development of blue economy and boost marine emerging industry.
6. Promoting marine culture and enhance public conscious of maritime activities.
7. The future plan of marine functional zones in Bangladesh
8. Integrated Coastal Zone Management in various countries.

Marine Fisheries Management:

1. **Marine Fishery:** Introduction, importance and opportunities of Marine Fishery.
2. **Marine Ecosystem:** Features of sea floor, Ecological division of marine environment, concepts on sea shore, estuaries, mangroves and coral reefs. Marine food chains and food webs.
3. **Fish & Shellfish Morphology & Classification:** External feature, aims & methods of classification.
4. **Fish Migration:** Definition, types, causes, significance and importance.
5. **Fish Population Dynamics:** Concepts, significance, population dynamics of fish.
6. **Fishing ground detection:** Aim & objectives. Fish school detection. Major fishing grounds of the Bay of Bengal.
7. **Marine Resources:** Meaning, Major exploited marine fisheries of Bangladesh, their developmental history and present status. Major minerals and their present exploitation rate in the Bay of Bengal.
8. **Climate change & Sea level rise:** Meaning, causes, effects on marine environment.
9. **GIS and remote sensing:** Definition, types, importance and application in marine capture fishery.

Aquaculture:

1. **Aquaculture:** Definition, objectives & importance.



2. **Species & Site selection:** Criteria for suitable species & sites.
3. **Shore based aquaculture system:** Traditional, semi-intensive, intensive aquaculture practice.
4. **Methods of aquaculture:** Rafts, racks, cages, poles and ropes.
5. **Grower pond management:** Pond Preparation, fertilization, culture operation & management.
6. **Aquaculture Planning:** Major aspects, required basic data.
7. **Aquaculture Extension:** Objectives, methods, awareness program.
8. **Aquaculture Economics:** Significance, cost management, economic return & economic appraisal evaluation.
9. **Culture of live food organisms & Feed formulation:** Biology and culture requirements of important live food organisms. Green algae, diatoms. Nutritional requirements of cultivable fish and shellfish and manufacturing method of fish feed.

Recommended Text(s):

1. Coastal Zone management Handbook by John R. Clark
2. Perspective on Integrated Coastal Zone Management by W. Salomons and R.K Turner.
3. Coastal Zone Management, David R. Green, University of Aberdeen
4. Global Challenges in integrated coastal zone management, Dr. Erlend Moksness
5. Practical Hand book of Marine Science by Michael J. Kennish
6. Ichthyology by Karl S. Lagler
7. Prawn Aqua Culture by Marpoh
8. Applied Fisheries and Aqua culture by B.K Sing

Course Title : Marine Offshore Technology

Course Code	: BNS 4233
Credits	: 3.0
Contact Hours	: 42
Assessment	: Term end written examination and Class tests
Faculty in Charge	:

Aims:

To familiarize students with marine offshore design, offshore oil and gas technology and offshore engineering.

Learning Outcomes:

Students will be able to describe/explain/analyze:



- The characteristics of the maritime offshore industry
- The important ship types and competencies needed to execute offshore operations.
- The design consideration of offshore structure.
- Technologies used in the off-shore oil and gas platforms

Syllabus Contents:

1. History of the Maritime Offshore Industry
2. Introduction to the oil and gas industry
3. Maritime Offshore segments and ship types
4. Planning, documentation and execution of various safe offshore operations
5. Key rules and regulations related to the maritime offshore industry
6. Vessel and installation types and operations
7. Offshore operations
8. Offshore logistics and supply chain
9. Vessel and installation cooperation
10. Human Factors
11. Design criteria and loadings
12. In-place analysis and code compliance
13. Fatigue analysis
14. Dynamic analysis
15. Certification and inspection

Recommended Text(s):

1. Ship-shaped offshore installations, Jeom Kee Paik, 2011, Pusan National University
2. American Petroleum Institute, API RP2A (2000), Recommended Practice for Planning, Designing and Constructing Fixed Offshore Structures, 21st edition, Washington D.C., USA
3. Subsea Engineering Hand Book, Author: Yong Bai, Qiang Bai, Publisher: Elsevier Science.

Course Title : Port Management

Course Code :4253

Credit Hours : **3**

Contact Hours : **42 hrs**

Assessment : Term end written examination and Class tests

Faculty in Charge :

Aims:

This course aims to provide a thorough understanding of different aspects of port management, including both the technical and commercial aspects and the principles and practices of modern port management.



Course Outline:

1. **Quantitative Methods and Market Analysis in Shipping and Ports:** Statistical concepts and an introduction to economic modeling and market analysis in transportation, shipping and logistics. Real market data and statistical software, and apply existing quantitative techniques and models to complex logistics and transport problems, particularly regarding the shipping industries
2. **Fundamentals of Shipping and Port Management:** Understanding of port management, including the role and significance of ports in maritime transport, the importance of ports to the national/regional economy, ownership and other contemporary issues.
3. **Port Management:** Port performance indicators (PPIs) and the importance of key performance indicators (KPIs) in ports. Port KPIs for berth planning, quay transfer operation, storage and receipt/delivery operations. The use of port KPIs for futuristic planning in ports and terminals.

Port Logistics and Planning: The concept of port logistics and its meaning in the total transport chain. The importance of a proper container terminal capacity (PCTC) for both a port and its customer. The factors affecting PCTC and analyze port transport system in terms of total transport chain. The implication of an improper container terminal capacity from the viewpoint of planning and development.

Course Title : Marine Environmental Science

Course Code : 4251
Credit Hours : 3
Contact Hours : 42
Assessment : Term end written examination and Class tests
Faculty in Charge :

Syllabus Contents :

1. Map projection system and Geographical position of the Bengal Basin
2. Geological and structural setting of the Bengal Basin.
3. Physiography and hydrography of the Bengal Basin - major subdivisions.
4. The development of Bengal Delta through time.
5. Stratigraphy, structure, and geological history of the Bengal Basin.
6. Relationship of the Bengal Basin with its neighbouring sedimentary basins.
7. Economic minerals and rocks of the Bengal Basin and their utilization.
8. Introduction: Hydrologic Cycle, Importance of Hydrology, Water Balance, Energy Budget.
9. Precipitation and Water losses: Types and forms, causes and measurements of precipitation and its analysis; types of water losses, Infiltration, methods determining Infiltration, Factors affecting evaporation, methods determining evaporation and evapotranspiration.



10. Runoff: Sources, Catchment characteristics, Factor affecting runoff and runoff estimation
Hydrologic Instrumentation, Remote Sensing in Hydrology.
11. Hydrograph: Definition, Hydrograph separation, Unit Hydrograph, Preposition and application of unit hydrograph, Catchment modelling.
12. Groundwater: Definition, origin and depth of GW, springs and wells, Aquifers and Aquifers properties, Water yield, Groundwater flow, Groundwater investigations, Well tests, Steady state well Hydraulics, Methods of Groundwater exploration.
13. Hydrological Environments: Hydrogeological environments of Bangladesh, Sea-water intrusion in coastal aquifers, Hydrogeological models and their use in resource assessments.
14. Water Resources planning & management: Water, and its impurities, criteria of water quality, Sources of fresh water, characteristics of domestic industrial & Irrigation water. Estimation & Collection system of surface & ground water, Effluent disposal, reuse & misuse of water, Basic concept of water resource planning & management, Wetlands & water resources, Soil water relationship, Human impact on water resources: Irrigation & flood control system strategic planning: conceptual frame work & models: Watershed management of urban (Municipal) & Rural area emphasis on drinking water (urban) & Irrigation water (Rural), Economic considerations, Business response, water and conflict
15. Basic concepts: Definition, significance of Biodiversity, Benefits from Biodiversity, Types of Biodiversity, Biodiversity and species concept, Status of biodiversity in Bangladesh.

Recommended Text(s) :

1. Curray, J.R. & Moore, D.G., 1974, Sedimentary and Tectonic Processes in the Bengal Deep-Sea Fan and Geosyncline; In: Burke, C.A. & Drake, C.L. (eds.), The Geology of the Continental Margins, Springer- Verlag, Heidelberg, New York, p. 617-627.
2. Evans, P., 1932, Tertiary succession in Assam; Trans. Min. Geol. Inst., India, vol. 27,
3. Evans, P., 1934, The Tectonic Framework of Assam; Geological Society of India Journal, vol. 5, p. 80-86.
4. Khan, F.H., 1991, Geology of Bangladesh; The University Press Ltd., Dhaka.
5. Reimann, K.U., 1993, Geology of Bangladesh; Gebrueder Borntraeger, Berlin.
6. Kiely, G., 1998, Environmental Engineering, McGraw-Hill.
7. Raghunath, H.M., Hydrology: Principles, Analysis and Design.
8. Abdel-Aziz, I.K., 1986; Groundwater Engineering. McGraw-Hill Book Co., New York.
9. Lioyd, J.W. & Heathcote, J.A., 1985, Natural Inorganic Hydrochemistry in relation to Ground Water: An Introduction; Claredon Press.
10. UNITED NATIONS, 1982, The Hydrogeological Condition of Bangladesh; United Nations Ground Water Survey Technical Report, New York.

Course Title : Marine Surveying and Casualty Investigation

Course Code :4255
Credit Hours : 3
Contact Hours : 42



Assessment : Term end written examination and Class tests
Faculty in Charge :

Syllabus Contents :

- Introduction to Marine Surveying
 - Relationship between Surveyors and their Clients
 - Business Skills for Surveyors
 - Laws and Conventions relating to Marine Surveying Marine Surveying and Insurance
 - The Surveyor's Role in Incident and Accident Investigation
 - Naval Architecture for Marine Surveyors
 - Marine Engineering and Systems for Surveyors
 - Hull and Structural Surveys
 - Safety and Security Surveys
 - Non-Liquid Cargo Surveys
 - Liquid Cargo Surveys
 - Superyacht Surveys
 - Marine Environmental Surveys
 - Marine Engineering and Systems Surveys
 - International Safety Management (ISM) Code Surveys
 - Marine Warranty Surveys
 - Mobile Offshore Drilling Unit Surveys
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- International legal basis for marine accident investigations
 - International Safety Management (ISM) Code and accident investigation
 - Managing a marine accident investigation
 - Marine accident site risk assessment and hazard identification
 - Evidence preservation and collection issues in common marine accident scenarios
 - Advanced interview techniques
 - Human performance and human factors in marine accidents
 - Human factors analysis and classification tools
 - Collision, contact and grounding accidents
 - Ship fires
 - Ship structural failures, loading and stability problems
 - Mechanical failure and maintenance error accidents
 - Marine occupational health and safety accidents.



Course Title : International Trade and Ship Chartering

Course Code :4257

Credit Hours : 3

Contact Hours : 42

Assessment : Term end written examination and Class tests

Faculty in Charge :

Syllabus Contents :

01. International Trade and Shipping : Seaborne trade of the world composition and direction of cargoes – different types of ships which carry them – Technological developments – Role of Shipping on national economic development.
02. Basic Structure of Shipping Industry : Types of Shipping services – Liner and Tramp – Role of Intermediaries in shipping business: Freight brokers, Clearing and Forwarding Agents – Stevedores – Shipbrokers, Bunker and Stores suppliers etc. Shipping Agencies.
03. Liner Trades – Characteristics – Liner Conferences – How Freight rates are fixed Components of Liner Freight – Non-Conference lines – competition. Procedures of Shipping cargoes and related documentation : Mate's Receipt. Bill of Lading. Unitload systems – containerization and multimodal transport.
04. Tramp Trades – Chartering – different types of chartering ships – their relevance to trades – Procedures and documentation relating chartering – Charter markets of the world – How freight/ charterhire is fixed.
05. Organization of shipping company – Manpower planning – Business and cargo management – Statutory regulations to be complied with like Foreign Exchange Regulation.
06. Role of ports : Port locations – Functions and range services – Financial aspects of utilization and cargo handling. India's ports, their organization and administration. Modernization and development of ports.
07. Role of Customs : Customs Act and documents relating to customs relating to ship operations and trade
08. Maritime Frauds : Safeguards to be taken to prevent frauds with special reference to shipping industry, operators and seafaring personnel.
09. Role of International Organisation : IMF, World Bank, IMO, UNCTAD, WTO.

Recommended Text(s)

1. Economics of Shipping and other papers : Dr. S.N. Sanklecha
2. International Maritime fraud : Ellen and Campbell
3. Elements of Shipping : Alan Branch