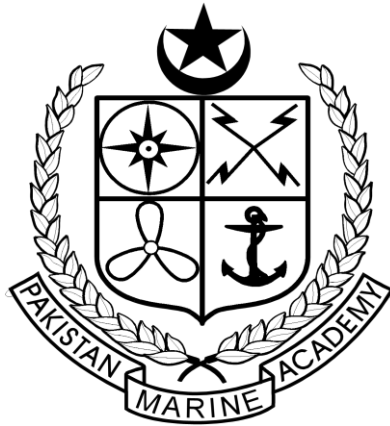


PAKISTAN MARINE ACADEMY



SCHEME OF STUDIES ASSOCIATE DEGREE PROGRAMME IN SHIP MANAGEMENT

INTRODUCTION TO THE PROGRAMME & DETAILS

Name of the Programme : Associate Degree in Ship Management

Offered At: Pakistan Marine Academy, Karachi

Programme Nature : Full time(Residential)

Eligibility Criteria for Admission:

- i) Must be unmarried male citizen of Pakistan
- ii) At least 45% marks in HSSC(Pre-Engineering)/equivalent examination with Physics, Mathematics & Chemistry
- iii) Maximum 20 years of age by 31st December of the year when application is submitted. One (01) year relaxation for candidates belonging to FATA, Gilgit /Baltistaan and Azad Kashmir
- iv) Must have qualified the defined pre-admission entry test
- v) Medically fit as per the criteria approved by the Ministry of Ports & Shipping
- vi) Merit will be based on 50% Entry Test + 50% HSSC %age

Intake: Once a year, 75 on open merit and 10 on self finance

Commencement: First semester- Spring January

Duration of the Programme: 2 years/4 semesters

SCHEME OF STUDIES
for
ASSOCIATE DEGREE PROGRAMME IN SHIP MANAGEMENT/NAUTICAL
SCIENCE

1st Year

Semester-I

Course Code	Course Title	Cr Hrs
	Academic	
ED-101	English-I	3
ED-102	Pakistan Studies	1
ED-103	Physics(Theory)-I	3
ED-105	Physics(Practical)-I	1
ED-104	Mathematics-I	3
	Professional	
NS-151	Principles of Navigation-I	2
NS-152	Ocean & Offshore Navigation-I	2
NS-153	Seamanship(Theory & Practical)-I	3
NS-154	Marine Communication-I	2
NS-155	General Ship Knowledge-I	3
NS-156	Marine Meteorology-I	2
GT-161	Computer Familiarization-I	1
	General Training	
GT-162	Officer Like Qualities-I	2
	TOTAL	28

Semester-II

Course Code	Course Title	Cr Hrs
	Academic	
ED-201	English-II	3
ED-202	Islamic Studies	1
ED-203	Physics(Theory)-II	3
ED-205	Physics(Practical)-II	1
ED-204	Mathematics-II	3
	Professional	
NS-251	Principles of Navigation-II	2
NS-252	Ocean & Offshore Navigation-II	2
NS-253	Seamanship(Theory & Practical)-II	3
NS-254	Marine Communication-II	2
NS-255	General Ship Knowledge-II	3
NS-256	Marine Meteorology-II	2
GT-261	Computer Familiarization-II	1
	General Training	
GT-262	Officer Like Qualities-II	2
	TOTAL	28

2nd Year**Semester-III**

Course Code	Course Title	Cr Hrs
	Academic	
ED-301	English-III	3
ED-302	Personal & Organizational Management	1
ED-303	Chemistry(Theory)-I	3
ED-305	Chemistry(Practical)-I	1
ED-304	Mathematics-III	3
	Professional	
NS-351	Principles of Navigation-III	2
NS-352	Ocean & Offshore Navigation-III	2
NS-353	Seamanship (Theory)-III	2
NS-354	Coastal Navigation-I	3
NS-355	General Ship Knowledge-III	3
NS-356	Watchkeeping-I	1
NS-357	Radar Navigation-I	2
NS-358	Electronic Navigation-I	2
GT-361	Computer Familiarization-III	1
	General Training	
GT-362	Officer Like Qualities-III	2
	Total	31

Semester-IV

Course Code	Course Title	Cr Hrs
	Academic	
ED-401	English-IV	3
ED-402	International & Legal Maritime Studies	1
ED-403	Chemistry(Theory)-II	3
ED-405	Chemistry(Practical)-II	1
ED-404	Mathematics-IV	3
	Professional	
NS-451	Principles of Navigation-IV	2
NS-452	Ocean & Offshore Navigation-IV	2
NS-453	Seamanship (Theory)-IV	2
NS-454	Coastal Navigation-II	3
NS-455	General Ship Knowledge-IV	3
NS-456	Watchkeeping-II	1
NS-457	Radar Navigation-II	2
NS-458	Electronic Navigation-II	2
GT-461	Computer Familiarization-IV	1
	General Training	
GT-462	Officer Like Qualities-IV	2
	Total	31

SUMMARY OF THE PROGRAMME

- Total number of Credit Hours 118
- Duration of the Associate Degree 2 years
- Semester Duration 20 weeks
- Semesters 4
- Course Load per Semester 28-31 Cr Hrs
- Average number of Courses per Semester 14 Courses/Semester

COURSES FOR ASSOCIATE DEGREE PROGRAMME IN SHIP MANAGEMENT (NAUTICAL SCIENCE)

SEMESTER-I

ED-101 English-I

Oral communication

- Participation in small and large group or class discussion: strategies for turn taking, polite expressions for agreeing/disagreeing/presenting one's ideas or view point; giving examples, taking simple notes for connecting further points with prior discussion

Study Skills

- Dictionary Skills: Reading pronunciation symbols (IPA international phonetic alphabets) for correct pronunciation and syllable stress
- Note taking: using annotation symbols while reading, methods for summarizing class lectures and readings such as Cornell method

Grammar

- Morphology: Derivation (root, suffixes, prefixes for word classes i.e. noun/verb/adverb/adjective
- Tenses (All types): exercise from oxford practice grammar
- Preposition, Articles: exercises from oxford practice grammar

Advanced Reading Comprehension

- Skimming & Scanning
- Speed Reading
- Practice of PQ3R / SQ3R
- Contextual clues: looking for synonyms, repeated or extended ideas, key terms used etc
- Vocabulary enhancement: passage based reading of target words and usage through practice worksheets

Recommended Books

1. Eastwood J., 1997, Oxford Practice Grammar, Oxford University Press (Re-print in 2006)
2. Langan, J., 1985, College Writing Skills, 2nd Edition, McGraw Hill (Re-print in 2005)
3. Wallace, J. M., 2004, Study Skills in English, 2nd Edition, Cambridge University Press

ED-102 Pakistan Studies

Pakistan Movement – Brief; The importance of Gawadar Port; Exclusive Economic zone (EEZ) of Pakistan; The Salient Features of the Constitution of 1973; Constitutional amendments; A brief account of the constitutional crisis of 1971; Economic survey of Pakistan with a focus on present situation; International conventions on environmental pollution related to sea; Pakistan's relations with neighbours; Pakistan's relations with superpowers ; Pakistan and the Muslim world; Pakistan and International Maritime Organisation (IMO); Human Rights; Islamic Perspective (The last sermon of the Holy Prophet P.B.U.H.); Western Perspective (UN Charter); The issue of Piracy.

Recommended Books:

1. Rafi Raza, 2003, Pakistan in Perspective 1947-1997, Oxford University Press
2. Shahid Amin M., 2000, Pakistan's Foreign Policy: A Reappraisal, Oxford University Press
3. Hamid Khan, 2005, Constitutional & Political History of Pakistan, Oxford University Press

4. Khalid bin Sayeed, 1991, Pakistan: The Formative Phase 1857 – 1948, 2nd Edition, Oxford University Press.

ED-103 Physics(Th)

Mechanics: Vector algebra and its applications, Line and Surface Integrals and their applications, Gradient, Curl, Divergence and applications, Newton's laws and their applications, Motion in two dimension, Moment of inertia, Angular momentum and its conservation, Work, energy and power Efficiency, Work done by a variable force.

Properties of Matter: Elasticity Bulk Modulus, Modulus of Rigidity, Young's Modulus, Poisson's ratio, Torsion Pendulum, Bending Beams, Fluids, Liquids and Gases, Hydrostatic Pressure, Hydrostatic Pressure due to Liquid Column, Manometer, Viscosity, Coefficient of Viscosity, Variation of viscosity with Temperature, Molecular Forces, Surface Tension, and its variation with Temperature.

Heat and Thermodynamics: Simple kinetic theory of gases and the Ideal Gas Law. Heat, temperature and temperature scales. Heat transfer: conduction and conduction equation, convection and radiation: thermal expansion; specific heat capacity. 1st and 2nd law of thermodynamics, Entropy Entropy and 3rd law of thermodynamics, heat Engines, Maxwell's Thermodynamic relations.

Waves and Optics: Wave properties, types and behavior. The wave equation Progressive and standing waves. Nature of sound: propagation, velocity, infrasonic and ultrasonic waves, Variation of velocity of sound with temperature, sound intensity, loudness and the decibel. The Doppler Effect. Water waves, wave motion in deep and shallow water, tides. Principles of Meteorology, end systems Electromagnetic spectrum: general properties of Reflection, Refraction, Snell's Law, Total internal reflection, fiber optics and their applications, lenses and associated applications. Interference, diffraction. Polarization. Microscopes and Telescopes, Sextant, Spectrometer.

ED-105 Physics(Pr)-I

Experiments:

1. Value of 'g' using compound pendulum.
2. Modulus of rigidity using Maxwell needle.
3. To determine the coefficient of viscosity by Stoke's method.
4. To determine the thermal conductivity of a poor conductor by Lee's method.
5. To find the moment of inertia of a flywheel.
6. To determine the mechanical equivalent of heat by using Callender and Barnes apparatus.
7. To determine the frequency of an electrically maintained tuning fork by Melde's apparatus.
8. To determine the vertical distance between two points using sextant.
9. To determine the wave length of sodium light using a grating spectrometer.
10. To determine the high resistance of the order of 10 Ohms by using neon flash circuit.

Recommended Books:

1. Principles of Physics Extended, 9th Edition International Student Version by David Halliday, Robert Resnick, Jearl Walker
ISBN 9780321696892, June 2010, ©2011
2. University Physics, 13th Edition International Student Version by Roger A. Freedman
3. Schaum's Outline of Vector Analysis by Murray R. Spiegel
4. B.Sc. Practical Physics by CL Arora S Chand Limited, 2001

ED-104 Mathematics-I

SPHERICAL TRIGONOMETRY Logarithm to any base, Calculations involving multiplication & division by logarithm, Power & Roots, Exponential equations, Properties of spherical

triangles, Napier's Rules of circular parts, Solution of right angled & quadrantal spherical triangles, Solution of oblique spherical triangles.

MENSURATION OF AREAS & VOLUMES Basic formulae for area of regular figures & applied problems, Surface areas & theorem of Pappus; Simpson's and mid ordinate rule, Volume of prism, pyramid and sphere, Simpson's rule applied to volume; center of gravity, Flow of liquid through pipes and valves.

MATRIX THEORY Basic concepts, definition, notation, Algebra of matrices, Special matrices, Elementary row & column operations; reduced echelon form, Rank of a Matrix, Inverse of a Matrix, Determinate of a square matrix; expansion & general properties of determinants, Cramer's Rule, Determinant & Inverse matrix.

ALGEBRAIC EQUATIONS Homogeneous & Non-Homogenous system of linear equations, Solution set and admissible operations, Gaussian elimination method, Gauss Jordan Methods, Consistency criterion, Eigen Values & Eigen Vectors.

COMPLEX NUMBER Complex Numbers and its properties, Argand Diagram, De Moivre's Formula & its applications, Root of polynomial equations, Standard functions (exponential, circular and hyperbolic), Inverse trigonometric & hyperbolic functions.

STATICS Composition and resolution of forces, Principle of moments, Stress and strain, Simple machines, Lever; screw jack; pulley systems, Velocity ratio and efficiency, Pressure in liquids.

DYNAMICS Composition and resolution of velocities and accelerations, Newton's laws of motion, Motion under gravity, Work, power; kinetic and potential energy, Momentum, Friction.

Recommended Books

1. Calculus with Analytic Geometry by Howard Anton (Seventh Edition), Willey, 1980
2. Elementary Linear Algebra by Howard Anton (Tenth Edition), 2010
3. Munro's mathematics for Deck Officers by Capt. G. E. Earl, 1980
4. Reed's mathematics for Engineers by W. Embleton, 1981
5. Engineering Mechanics by Russell C. Hibbeler (Twelfth Edition), Prentice Hall (2009)
6. Engineering Mechanics by LarvingHorman Shames (Fourth Edition) Prentice Hall (1997)

NS-151 Principles of Navigation-I

DESCRIPTION OF THE EARTH: Shape of the Earth. Ellipsoid, Compression of Poles, Equator, Meridians, Latitudes, Parallels of latitudes, Prime Meridian and Longitudes, D.Lat. D.Long, Great and Small Circles, Verticals. Rotation of Earth's Axis, Datum provided by the Meridian, Rhumb line, Polar and equatorial circumferences. Direction, True, Magnetic and Compass North. Land and Sea miles a measure of distances.

SAILING : Departure, D.long, Parallel Sailing and Proof of its formula, Calculation of speed of rotation of points in different latitudes, course and distances. Definition of true course and rhumb line, Derivation of plane sailing formula. Mean and Middle latitudes. Mercator chart and Mercator Sailing, Requirements of a chart appropriate of marine navigation, Principles of construction of Mercator Chart, its accuracy and limitations, Natural scale of chart, Meridional parts and D.M.P. Mercator sailing formula. Course and distance between two positions.

Recommended Books

Text: Nicholls's Concise Guide, Volumes I & II, Edward J. Coolen, Brown, Son, & Ferguson, 1984

- Reference:**
1. Admiralty Manual of Navigation, Volumes I, II & III, H M S O, 1992
 2. Navigation for Watch-keeper, L.W.J. Field

NS-152 Ocean & Off Shore Navigation-I

CALCULATING COURSES AND DISTANCES : Use of Parallel sailing formula, Distance between two positions on the same parallel of latitude, Finding of final position using D.lat, and D.long. Use of plane sailing formulae. Practical problems in plane sailing. Day's work. Understanding layout of traverse table. Use of traverse table in Practical Sailing problems. Application of Variation, Deviation Compass Error to True, Magnetic & Compass Courses. Mercator Sailing Formulae, Comparison of mercator sailing and other sailing. use and understanding of meridional parts and finding of course and distance between two positions.

Recommended Books

Text: Nicholls's Concise Guide, Volumes I & II, Edward J. Coolen, Son, & Ferguson, 1984

Reference: 1. Admiralty Manual of Navigation, Volumes I,II& III, H M S O, 1992
2. Navigation for Watch-keeper, L.W.J. Field

NS-153 Seamanship(Th&Pr))-I

BASIC PERSONAL CONDUCT : Norms of personal conduct ashore and on boardship including relationship with officers and crew members. Carrying out orders, personal appearance, pride of uniform, general smartness etc. Financial affairs, leaving an allotment opening a bank or other account, saving for leave, Personal Insurance, Social Security Contributions, sending letters and radio messages. positive approach to using leisure time effectively by taking active interest in hobbies and recreations. The procedures of joining and leaving a ship, and use of personal documents. The need for health, personal hygiene, care of eyes in extreme climatic conditions, sunburn, heat exhaustion frostbite, general disease, alcohol, drugs, precautions in eating ashore, the ships medicine chest etc. Cleanliness of accommodation. Clothing and personal effects. Keeping fit, importance of exercise.

GENERAL TERMS APPLIED : Terms applied to a ship parts of a ship i.e. Hull, Stem, Stern, Port, Stbd, Water Borne, Ship Side, Decks, etc. Terms applied to Hull. Direction and position out side the ship i.e. Relative Bearing, Ahead, Abeam, Astern Bow, Quarter, Fine bow etc. Bearings (Compass, Gyro or True). Gyro & Magnetic Compass - Cards & Repeaters. Deck and Ships. Glossary of Shipping Terms.

HELM'S MAN SHIP: Interpretation of 0° - 360° notation. The division of Card into 'Points' and 'Half - Points'. Relative bearings of objects in degrees or points on the Bow, abaft the beam and on the quarter. Box the Compass in half-points. Identify the meaning of standard helm-orders.

WATCH ORGANISATION & MUSTERS: Two watch and three watch system, Dog-watch. Striking the bell, time indication emergency signals. Muster list, Muster & Drills, Action and Joining various signals.

ROPES & WIRES: Properties of natural fiber ropes, materials in common use and their properties. Define: 'Lay'. Hawser, Cable, Plaited lays. Properties lay gives a rope, with regard to flexibility, handling characteristics etc. Recognises properties of synthetic fiber ropes: Materials in common use and their properties, Staple, monofilament, multifilament and Film Fibers. Construction and characteristics of steel wire ropes. Characteristics of combined wire/fiber and natural/synthetic ropes. The care of ropes and wire including : Storage. Correct method of coiling and flaking. Breaking out new coils. Method of lubricating wires. Correct method of leading wires and ropes; kinking, chafing and sharp bights.

LIFTING GEARS: Blocks, Parts of block, types of blocks, Care & Maintenance. Purchase and Tackles, Types, Parts, Mechanical Advantage, Velocity Ratio. Shackles - Parts, Types Thimbles - Parts, Types - Hooks & their types. Parts of a Simple Derrick, Sheer leg, Gyn. Various types derricks in use.

Recommended Books

Text:

1. Nicholl's Seamanship & Nautical Knowledge by A.N. Cockerft, 2004
2. Seamanship Techniques, D. J. House, 2000

Reference:

1. The Theory and Practice of Seamanship by Danton, 2002
2. Mariners Hand Book, H. M. S. O.
3. Survival at Sea by Cdre.N.F. Keens
4. Survival at Sea by C.H. Wright, Son and Feguson (2003)
5. Personal Safety on Ships, D O T.
6. The Collision Regulations explained by C.H. Wright, 1981
7. Code of Safe Practice.H. M. S. O., 1981
8. Bridge Procedures Guide(ICS)
9. Efficient Deck Hand by C.H. Wright, Brown, Son & Ferguson, Limited, 2012
10. A Pocket guide for cold water survival, I. M. O.
11. Ship Fire Fighting Manual, Polytech-International
12. Boat Work by L. G. Taylor
13. Search & Rescue Manual, I. M. O.
6. Manual on Oil Pollution, I. M. O.
7. Marine Pollution 1973 , I. M. O.
8. Safety of Life at Sea, I. M. O.. 1999
9. Prevention of Marine Pollution, I. M. O.
10. Tanker Safety & Pollution Prevention, I. M. O.
11. The Inert Gas System , I. M. O.
12. STCW 1995(2010)

Seamanship(Practical)-I

ROPE WORK: Construction of Natural and Synthetic ropes-lay of rope. Small stuff.
Rope work and cordage tools. Fid s-Marline spikes serving board - serving Mallet, Palm and needles. Seizing, worming, Parceling and serving. Whipping.

BOAT WORK: Types of Boats. Parts & Equipments of Boats .

BENDS AND HITCHES: Bends and Hitches in common use on board ships.

ROPE WORK: Rope splicing, various types of splices used on board ships:

BOAT WORK: Boat pulling terms. Practical Boat pulling-lowering and hoisting boats. Types and parts of Davits.

Recommended Books

- Text:** 1. The Theory & Practice of Seamanship by DANTON, 2002
2. Nicholas Seamanship & Nautical Knowledge by A.N. Cockerft, 2004

Reference: Knots splices & fancy work. By C.L. Spencer

NS-154 Marine Communications-I

BASIC DEFINITIONS: The purpose of international code of signal. Addressee, Group, Hoist, Identity signal originator procedure signal, receiving station, Station of origin, tack line, transmitting station, visual signaling.

MORSE CODE, LETTER AND FIGURE SPELLING: Morse Code from A to Z and 1 to 0 letter and figure spelling from A to Z and 1 to 0.

DESCRIPTION OF FLAGS: Recognizing Alphabetical flags, Numeral pendants and substitutes. Sending & receiving MORSE BY HAND FLAGS OR ARMS.

TYPES OF SIGNAL LETTERS: Single letter signals, and meaning two letter signal, three letter signals, four letter signals, five letter signals.

METHODS OF SIGNALING: Flag signaling, flashing light and sound signaling, voice over loud hailer, radio telegraphy and radio telephony.

PARTS OF SIGNAL MADE BY FLASHING. PRACTICAL: Reception and transmission of signal by flashing light at the rate of 15 characters per minute.

GLOBAL MARITIME DISTRESS & SAFETY SYSTEM (GMDSS): Introduction of GMDSS & familiarization with system and equipment.

CODING AND DE-CODING: Coding with single letter signals, coding with two letter signals, coding with three letter signals, coding with table of completing printing of some groups on right side of the book. Communications with port operation, coast station and vessel traffic services in the form of traffic lists and Trans Receiver.

FLAG SIGNALING: How to call, how to answer, how to complete a signal, to act when signal is not understood. The uses of substitutes, communication by local signal code, communications by flags between men-of-war and merchant vessels, Position of hoists on different positions. Use of Answering pendant. Practical :Reception and transmission of signal by flashing light at the rate of 15 characters per minute.

SIGNALING: How to spell word in plain language, use of answer pendant, procedure when using "Affirmative" "Negative" and "Interrogative". Means of group "YU", "YZ", "YV". How to signal numbers, single letter signals with compliment. Azimuth or bearing, course, date, latitude, longitude, distance, speed, time, communication by local signal code. How time of origin may be included.

Recommended Books

Text: International Code of Signals, Published by IMO, 1987

NS-155 General Ship Knowledge-I

A. Ship Stability

Hydrostatic Principles : Definitions of mass, density, relative density, weight, buoyancy, reserve buoyancy, displacement volume, displacement mass, Pressure, thrust. Principles of Floatation, light & loaded displacement, dead weight. Use of Draft displacement, dead weight tables/curves. Determination of mass from given volume and density and vice versa. Determination of pressure at given depth and density. Calculation of thrust from given pressure and area including effects of liquid head on tanks. Centre of pressure and calculation from given details of regular vertical surfaces.

Form Co-Efficient: Definition of length, beam, AP, LBP, draught and Freeboard. Block co-efficient of fineness, calculations finding C_b from displacement and dimensions and vice versa. Finding of C_w from W.P.A. and dimensions.

B. Ship Construction

General Description Of Ships: General Description of a dry cargo ship: Arrangements of holds, ballast spaces, machinery spaces, accommodation etc. (Crude Carrier). General description of a tanker: (tanks, pump-rooms and cofferdams etc). Types of Ships: (Passenger; Bulk; Container, Combination Carrier, RORO. Measurement terminology - Definition of Net & Gross Tonnage. Light and loaded displacements, Deadweight, LOA. Length at Waterline. LBP, Lloyd's, moulded beam, depth and draft. Structural terminology : Definition of camber, rise of floor, flare, sheer, rake, etc.). Knowledge of Structural parts of a ship : Frames, floors, tank-tops, deck plating, deck beams, beam knees, brackets, pillars, and coamings, shell plating

terminology. Double bottoms and arrangements for sounding pipes. Striker plates etc. Hatch girders and beams, bulkheads and stiffening arrangements. Stringers, Cofferdams, deep and peak tanks, bulwarks, bow framing and stern framing. Identification of above parts on a ship's plans. Use of various plans i.e. Half breadth plan, line plan shear plan etc. General idea on Welding, Reviting, Burning and the precaution to be taken when such processes being carried out on board ship.

C. Cargo Handling & Stowage(Cargo Operations)

Basic Definitions: Understanding hold, hatch covers, Dunnage, Spar Ceiling, Bilge Wells, Deep Tanks, Broken Stowage, Stowage Factor, Freight, Bale and grain capacity, measurement of Cargo/Spaces.

Preparation of Holds: Cleaning hold, Dunn aging, Preparations for loading cargo, Separation, Marking of cargoes. Securing, Lashing. General Inspection, infestation, Hygienic standards of bilges. Deep tanks, Preparations for loading/discharging of liquid cargoes.

Cargo Handling Equipment: Deck Machinery (i) Winches, Steam & Electric self tensioning. (ii) Capstans. Derricks: Single, Swinging derrick, Union purchase rig, Finding of Stresses on different gears by Parallelogram of forces. Hatch Covers: (i) Steel hatch covers types (ii) Hydraulic hatch covers. (iii) Pontoon hatch covers. Opening, Closing and battening down of hatch covers. Heavy lifting cargo gears: Details of: i) Hallen Derrick ii) Stulken derrick iii) Velle Crane iv) Thompson derrick and their comparison with each other.

Recommended Books

Text:

1. Ship Stability by D.R.Derrett, 2011
2. Merchant Ship Construction by H.J. Puresy, 2002
3. Cargo Work, D. J. House, 1998

Reference:

1. Merchant Ship Stability by .J.Pursey, 1983
2. Ship Construction Sketches and Notes by J.F.Kemp, 1976
3. Reed's Ship Construction Vol-5 by F. Stokoe, Bloomsbury Academic, 2004
4. Know Your Own Ship by B.Baxter
5. Ship Stability Notes and Examples by J.F. Kemp
6. Ship Construction by D.J.Eyres
7. Thomas Stowage by Capt.O.O.Thomas
8. Cargo Work by Capt.L.D.Conway
9. Cargo Access Equipment for Merchant Ships by L.L.Buxton
10. Tanker Cargo Handling by D.Rutherford
11. Code of safe practices for Solid Build Cargoes, I.M.O.
12. Code of Safe practices for Merchant Seamen H.M.S.O.
13. Code of Safe Practice for ships carrying timber deck cargoes I.M.O.
14. Grain Rules I.M.O.
15. Emergency Procedures for ships carrying dangerous goods. I.M.O.
16. International Maritime Dangerous Goods Code (IMDG Code) I.M.O.
17. International Safety Guide for Oil Tankers and Terminals, Int..Chamber of Shipping
18. Int. Association of Ports and Harbours.

NS-156 Marine Meteorology-I

General introduction to "marine meteorology" as a science. Mercurial barometer-theoretical and practical aspects. The Aneroid Barometer-theoretical and practical aspects. The barograph-principles, theoretical and practical aspects. Thermometry,-different type of thermometers and temperature scales in use. Hygrometers and psychrometer. Sea-surface temperature as distinct from surface air Temperature .Earth's atmosphere; physical characteristics and division.

Heat-exchange between the earth and its atmosphere: the "lapse rate". Water-vapour in atmosphere; humidity and its parameters .Atmospheric pressure & its related aspects. The

processes of "condensation" and "precipitation. Formation of fog, and types of cloud.

Recommended Books

Text: 1. Notes on Marine Meteorology by Kemp & Young, 1999, Stanford Maritime, London,

Reference: 1. Marine Meteorology for Mariners, Marine Div.(M.O) Meteorological, H.M.S.O. Office London (U.K)

2. Marine Meteorology at Sea by Ray Sanderson, 1982, Stanford Maritime London.

GT-161 Computer Familiarization-I

Computer Concepts: Computer Basics, Development of Modern Computer, Types of Computers, Data Representation Number System

Computer System Components Units-I: Central Processing Unit, Memory Unit, Cache, Virtual Memory, Controller, Chipset, Buses and Expansion Slots, IDE and SATA Technologies, ROM, BIOS, CMOS

SEMESTER-II

ED-201 English-II

Oral communication

- Interpersonal communication: talk for socialization and talk for information exchange, admission interviews or employment interview

Listening

- Listening to real life communication: authentic listening text and exercises
And/OR
- IELTS-General listening exercises recommended

Grammar

- Passive voice: units from oxford practice grammar (to write sentences with an understanding when action is more important than 'agent', when 'agent' can be absent in a sentence)
- Direct & indirect speech: units from oxford practice grammar, paraphrasing

Reading

- Vocabulary enhancement: extended passages based reading of target words and usage through practice worksheets

Composition

- Pre-writing: exploring internet and other sources, free writing, mind mapping, outlining
- Paragraph writing: writing topic sentence, support with details, using sentence connectors, articles etc. for coherence
- Punctuation: capitalization, apostrophe, colon, comma, exclamation mark, full stop, hyphen, question mark

Recommended Books

1. Eastwood J., 1997, Oxford Practice Grammar, Oxford University Press (Re-print in 2006)
2. Langan, J., 1985, College Writing Skills, 2nd Edition, McGraw Hill (Re-print in 2005)
3. Wallace, J. M., 2004, Study Skills in English, 2nd Edition, Cambridge University Press
4. Oshima Alice, &Hogue A., 2006, Writing Academic English, Longman / Pearson

ED- 202 Islamic Studies

THE HOLY QURAN: Virtues of Quran, Benefaction and Verses of Quran, Surah All – Hujarat – Text and Translation, Surah Al – Furqan – Verses 63 -77 – Text and Translation.

AL – SUNNAH: The Importance of Sunnah, Hadith from Riaz –un- Salaheen(250, 251, 264, 266, 171, 273, 291, 298, 299, 593, 594, 596, 606, 628, 630, 344, 591)

ISLAM IN THE LIGHT OF QURANIC VERSES AND AHADITH: Toaheed, Risalat and the Day of Judgement, Namaz, Haj, Zakat and Jihad

USWA-E-HASANA: THE Holy Prophet's Life in Makkah – Birth to hijrah and nd His way of preaching, The Holy Prophet's Life in Madinah; Brotherhood(Fraternity), The Madinah Pact, Conquest of Makkah, The Last Sermon At Hajjat –ul- Wida.

NORMAL VALUES OF ISLAM AND THE FUNDAMENTAL ATTRIBUTES OF ISLAMIC SOCIETY : Character Building, The meaning of High Morality, Truthfulness, Tawakkul (Trust in Almighty), Taqwa (Abstinence from evil), Respect for Covenant or Treaty, Austerity, Regard for Parent and Elders, Tolerance and Broad Mindedness, Islamic Society, Kasb-I-Halal (Pious Earnings) Human Dignity , Social, Legislative Political and Economic Justice, Shoora.

ROLE OF ISLAM IN THE RECONSTRUCTION OF CIVILIZATION OF MINDKIND: Islam a Retrospect, Middle Nation and Best Nation Slavery, Role of Islam in the World history; Reason and knowledge as Basis of Faith; Contribution of Islam to Sciences.

OUR PROBLEMS AND THEIR SOLUTIONS: Some of the problems facing Pakistan today as corruption, Un-employment, man-power and Literacy, immorality and their solutions.Socio- Economic problems and their solutions.

Recommended Books:

Text: Sirat-e- Mustakeem by Abdul QayyumNatiq, 2013

Reference:

1. Islamic Ideology Part I & II by Anwar Hashim
2. What Islam is? by Muhammad Asif Kidwai
3. Islamic Education by M.D. Zafar
4. Riaz-us- Salehee Part- I, by Sharf- uddinNoori
5. Toward understanding Islam (Diniat) by AbulAllaMaudoodi
6. The Sealed Nectar by Safi-ur- Rehman Mubarak Puri

Ed-202A ETHICAL BEHAVIOUR (Alternate course for Non Muslim students in place of ED-202)

Introduction to ethics, definition of ethics, differentiation between normative and positive science. Problem of free will. Method of ethics, uses of ethics. Ethical theories. History of ethics, Greek ethics, medieval, modern ethics. Basic concept of right and wrong; good and evil. Utilitarianism, hedonism, self realization, egoism, intuitionism, rationalism, Kant's moral philosophy, Ethics & Religion, the relation of ethics to religion. Basic ethical principles of major religions: Hinduism, Judaism, Buddhism, Zoroastrianism, Christianity, Islam. Ethics, Society and moral theory, Ethical foundation of Rights and Duties, Applied ethics, Society as the background of moral life. Universalism and Altruism. Theories of punishment.

Recommended Books

1. "An Introduction to Ethics", Lillie W., 3rd Edition, Reprinted in 1974
2. "Philosophy: the Basic" Warburton N., Routledge, London, 4th Edition, 2004

ED-203 Physics-II

Electricity: Continuous Charge distribution, Force and Electric Field due to Continuous Charge distribution, Capacitors and dielectrics, Electric potential difference, Insulations and insulation, Electric and magnetic fields associated with electric potentials and currents, Electric Current and its heating effect, Power and its relationship with current and resistance, chemical effects, Passage of current through a conducting solution, Primary and secondary

cells and batteries, Automating voltage and currents in outline, Frequency phase relationship, peak instantaneous and r.m.s. values, reactance, Impedance, Power dissipation, RLC circuits, Simple A.C and D.C circuits, Fuses and circuit breaker devices, The effects of dirt and moisture, Principles of electric generators and motors, Outline of shipboard power supplies, Emergency sources, safety precautions for electrical equipment's including spars on board.

Magnetism: Magnetic Field, Magnetic force on a moving charge particle, Hall Effect, The magnetic field caused by current and resulting effects, the effect of a current carrying conductor in a magnetic field, Biot-Savart law, Ampere's law, Magnetic field of rings and Coil, Magnetic Dipole moment of atom, Theory of Magnetism, Laws of Magnetism, Intensity of Magnetization, Permeability, Retentivity, Hysteresis Curve for ferromagnetic materials. Pole strength, Field strength, Magnetic Moment and Couple, deflection of Magnetized Needle. Terrestrial Magnetism and its determination, Magnetic elements and variation.

Semiconductor Physics and Electronics: Intrinsic and Extrinsic semiconductor, Charge carriers in semiconductor, PN Junction, Half and full wave rectifiers, Filters, Transistors and its characteristics, Transistors as a switch, Transistor as an amplifier, Concept of electromagnetic radiation and the need for a high frequency carrier wave, Propagation, Polarization and wavelength/frequency relationship Ground and sky waves Functions of typical marine communications transmitters and receivers. Typical serial system Introduction to Digital Electronics.

Modern Physics: Wave nature of light, wave particle duality, De Broglie hypothesis, Photoelectric effect. Characteristics of different types of photo cell, Electron Microscopes, laser and its applications, Atomic spectra, generation and properties of X-ray spectra, Nuclear radiation, Nuclear reactions, Carbon dating, Nuclear radiation detectors, Hazard and use of Nuclear Radiation.

ED-205 Physics(Pr)

Experiments:

1. To determine ionization potential of mercury using mercury diode tube.
2. To study the behavior of an acceptor circuit and determine the value of the inductance.
3. To study the behavior of a rejecter circuit and determine the value of the inductance.
4. To study the spectral characteristics of photocell.
5. To determine the stopping potential of a given photocell.
6. To draw the characteristics of GM tube.
7. To study the I-V characteristics of forward and reverse biased diode.
8. To study the static characteristics of a transistor.
9. To determine voltage gain of single stage common emitter amplifier.
10. To set up and study various logic gates (AND, OR) using diodes and develop their truth table.

Recommended Books:

1. Principles of Physics Extended, 9th Edition International Student Version by David Halliday, Robert Resnick, Jearl Walker
ISBN 9780321696892, June 2010, ©2011
2. University Physics, 13th Edition International Student Version by Roger A. Freedman
3. Schaum's Outline of Vector Analysis by Murray R. Spiegel
4. B.Sc. Practical Physics by CL Arora S Chand Limited, 2001

ED -204Mathematics-II

Differential Calculus Functions, Graph of a functions, Limit of function, Continuity of function, Gradient and rate of change, Maximum and minimum points, L` Hopitals rule, Partial differentiation, Exact differential equations and its application in computing errors, Solution of non-linear equation by using Newton Raphson method, Properties of ellipse and hyperbola of navigational importance.

Integral Calculus Basic techniques of integration, Approximate integration, Application of integration.

Ordinary Differential Equations Introduction, Formulation of ODE's, General & Particular Solution, Initial Value Problems (IVP)and Boundary Value problems (BVP), First order linear differential equation with applications, Approximate solution of linear differential equations, The Linear Second Order ODE's(Homogeneous and Non-Homogeneous Cases), Cauchy-Euler ODE's and their Solution Procedure.

Recommended Books

1. Advanced Engineering Mathematics by Erwin Kreyszig, Seventh Edition, John Wiley & Sons Inc, 1992
2. Calculus & Analytical Geometry by Howard Anton, Fifth Edition, 1988 by John Wiley & Sons
3. Differential Equations by Dannis G. Zill, Sixth Edition, 2004

NS-251 Principles of Navigation-II

GENERAL ASTRONOMY: Milky-way galaxy and its dimensions in terms of light years. Position and movement of solar system within the milky-way. Principal star types and their comparison with the sun. Recognition of stellar constellations. Solar system, its composition and dimensions, Inferior and superior planets, Kepler's Laws of Planetary motion. Definitions of perihelion, aphelion and eccentricity. Description of the Earth's elliptical orbit and its eccentricity. Inclination of Earth's axis to the plane of the orbit and formation of seasons. Solstices and equinoxes and affect of Kepler's Laws on the length of seasons. Earth's axial rotation and formation of day and night. Varying length of day light through the year. Daylight, Day light and darkness in various latitudes.

Purpose of altitude correction, Visible, Sensible and rational horizons. Sextant, observed and true altitudes and relevant corrections.

T I M E : L.A.T., L.M.T., Equation of time, Solar day Lunar day-Sidereal Day, Relationship between L.H.A. and L.A.T., G.M.T., L.M.T. and Longitude Zone time and Standard time.

Recommended Books

Text: Nicholls's Concise Guide, Volumes I & II, Edward J. Coolen, Brown, Son, & Ferguson, 1984

Reference:

1. Admiralty Manual of Navigation, Volumes I,II& III, H M S O, 1992
2. Navigation for Watch-keeper, L.W.J. Field

NS-252 Ocean & Off Shore Navigation-II

Finding of distance and courses by great circle sailing and composite sailing.

NAUTICAL ALMANAC: Understanding the information contained in general in Nautical Almanac and details in the daily pages. Use of these information for Navigational problems. The Chronometer - Finding Mean Time at Greenwich.

ALTITUDE CORRECTIONS: Obtaining of true altitude from sextant altitude by applying all necessary corrections. True Zenith distance. Use of Sextant to measure vertical and horizontal angles. Finding of index error of the sextant by Star, Sun etc.

Recommended Books

Text: Nicholls's Concise Guide, Volumes I & II, Edward J. Coolen, Son, & Ferguson, 1984

- Reference:**
1. Admiralty Manual of Navigation, Volumes I, II & III, H M S O, 1992
 2. Navigation for Watch-keeper, L.W.J. Field

NS-253 Seamanship(Th&Pr)-II

GENERAL SAFETY AND ACCIDENT PREVENTION: The causes of accidents including falls; sky larking; slippery decks; improper footwear - mooring ropes and wires; hold ladder; congested deck - staging - hatch covers - hatchways; steam pipes; running; lifting weights, heather. Explain that accidents are caused, they do not happen. Distinguish the primary and secondary cause of accidents (i.e. self inflicted and negligence causing accidents to others). Distinguish the latent effects of negligence - human elements. The importance of following laid down procedure and 'Job Discipline' and using the correct for the job. Examples of accidents occurring when using wrong tools. Explain the need for protective clothing and equipment (goggles, face, masks, helmets etc.). The hazards of entering enclosed spaces, electrical steam and compressed air systems, working aloft and over side, incorrect clothing, describes the function of ear defenders. Describes the safety organisation on board ship-safety committee. The need of an effective emergency organisation. Regular and effective drills.

ROPES AND WIRES : Types of whipping and their various uses. Types of Seizing and their uses. Stoppers and their uses. Splices and their uses. Explain Safety Precautions to be taken when handling ropes & moorings. Hand lead line, marking, reporting of sounding. Safety Precautions to be taken when constructing, rigging and using stages and Boson's Chair. Performing the individual tasks involved in covering and uncovering, opening and closing hatches with wooden/tarpaulin, covers, steel or wooden slabs/tarpaulin covers, steel gasketed hatches, tank lids, side openings. Term with reference to hatches etc. 'pontoon' 'piggyback' 'flush deck' 'roll up hatches' 'single pull', 'side ports'. Safety precautions when working in holds and openings and losing hatches.

ANCHOR, WINDLASSES & STOWAGE OF CABLE: The constructional features of anchors and cables. Common method of marking anchor cable. Reporting the amount of cable veered. Performing the individual tasks required of a member of an anchor party, i.e. in securing the anchor for sea or at anchor. Walking out, Weighing, Aweigh, Foul, Brought up, Compressor, Devils claw, bow stopper, Spurling pipe, Hawse pipe. The common methods of sealing the spurling pipe. The method of safe handling of chain cable on deck and in non-selfstowing lockers. The controls of wind lasses and capstans. Rope and wires when warping, surging and paying out. Examples of the safety precautions when working with windlasses, Capstans and handling moorings. Chain lockers, methods of securing of the "bitter" end, means of cleaning and pumping chain lockers and the trim effect of (a) the quantity of cable and (b) the locker full of water. Supervises the maintenance of the windleas and associated equipment.

CARGO HANDLING EQUIPMENT : The parts of a derrick including the parts of a block. The purpose of a preventer. Leading a runner or rope to a winch correctly. Operating winches and dolly winches safely. General precautions to be taken before and during the operation of a winch whether used for working cargo or for warping. States use of single and double gearing on steam winches. A winch in single and double gear. The term deaman, schooner guy, steam Guys. The rigging of derricks for union purchase, swinging derrick and doubling gear. The operational features, the safety precautions required and the appropriate use of the following deck equipment in all climatic conditions. Electric, Steam and hydraulic and self tensioning winches, capstans, windlasses, hoists and other lifting gear.

MOORING OPERATIONS : The average mooring arrangements. States the use of head ropes, stern ropes, breast rope and springs. Demonstrating ability to make a mooring rope fast mooring bits. Identifying the hazards involved in handling mooring and knows the correct working practice. Explaining the importance of correct maintenance of leads, rollers winch drums etc.

Recommended Books

Text:

1. Nicholl's Seamanship & Nautical Knowledge by A.N. Cockerft, 2004
2. Seamanship Techniques, D. J. House, 2000

Reference:

1. The Theory and Practice of Seamanship by Danton, 2002
2. Mariners Hand Book, H. M. S. O.
3. Survival at Sea by Cdre.N.F. Keens
4. Survival at Sea by C.H. Wright, Son and Feguson (2003)
5. Personal Safety on Ships, D O T.
6. The Collision Regulations explained by C.H. Wright, 1981
7. Code of Safe Practice.H. M. S. O., 1981
8. Bridge Procedures Guide(ICS)
9. Efficient Deck Hand by C.H. Wright, Brown, Son & Ferguson, Limited, 2012
10. A Pocket guide for cold water survival, I. M. O.
11. Ship Fire Fighting Manual, Polytech-International
12. Boat Work by L. G. Taylor
13. Search & Rescue Manual, I. M. O.
6. Manual on Oil Pollution, I. M. O.
7. Marine Pollution 1973 , I. M. O.
8. Safety of Life at Sea, I. M. O.. 1999
9. Prevention of Marine Pollution, I. M. O.
10. Tanker Safety & Pollution Prevention, I. M. O.
11. The Inert Gas System , I. M. O.
12. STCW 1995(2010)

Seamanship(Practical)-II

ROPE WORK: Steel wire ropes, construction, uses on board.

TACKLES AND PURCHASE: Type of blocks - wooden steel, their parts. Reeving various blocks, tackles to advantage , dis-advantage. Use of - shackles thimbles hooks, wire rope grips, clips, turn buckles etc.

BOAT WORK: Power boat handling lowering hoisting.

ROPE WORK: Opening a new coil of fibre - steel wire Rope.Mousing a hook, shackle pin. Passing rope and chain stoppers. Putting and removing mooring ropes on the bits.

Rigging and using bosuns chair and stages for working aloft and over sides.

BOAT WORK: Sails - Sailing terms, Sail boat handling

PILOT LADDER: Detailed construction of pilot ladder.

Recommended Books

Text:

1. The Theory & Practice of Seamanship by DANTON, 2002
2. Nicholas Seamanship & Nautical Knowledge by A.N. Cockerft, 2004

Reference:

1. Knots splices & fancy work. By C.L. Spencer

NS-254 Marine Communications-II

MORSE SIGNALING: Procedure signals and signs, form of message. Describing how to signal depths. Practical: Transmission and reception of signal by flashing light.

SOUND SIGNALING: Procedure for transmission of sound signals. Signal between ice breaker and assisted vessels. PRACTICAL: Procedure for sending a message to unknown

ship in plain language are coded errors, repeat, AA, AB, WA, WB, BN, AS, C, N, RQ and AR.] Explain the use of identity signal and KK, KN.

Note: Cadets will be examined in transmitting and receiving actual messages where they will be declared pass only if they obtain at least 90% marks.

Recommended Books

Text: International Code of Signals, Published by IMO, 1987

NS-255 General Ship Knowledge-II

A. Ship Stability

Tones per cm Immersion: Definition TPC and derivation of formula for TPC, Variation of TPC with draught and density. Calculations of TPC from given dimensions and Cw. Calculations of cargo to load and discharge to obtain given small change in draught and freeboard. Use of hydrostatic curves to obtain TPC & displacement at different draughts and freeboard. Solution of problems involving large and small changes in displacement and use of TPC curves. Simpson Rules: The use of Simpson Rule in the computation of areas, volumes Centroids.

B. Ship Construction

Stresses in Ship's Structures :Shearing & Bending Stresses. Hogging and Sagging, Causes of Stresses in a ship's structure considering ship to be a girder. Pounding, Panting. Regions effected by pounding and panting. Causes of these Stresses. Water pressure stress, caused by sea, caused by liquid in tanks (DYNAMIC). Stresses Created by uneven loading, concentration of mass, e.g. on deck, engine room, in holds. Local stresses: Rolling, Racking, Vibration, During Dry Docking. Stresses Caused by discontinuity at hatch ways and Super-structures. Stresses during buildings. Framing Systems: Longitudinal, Transverse, Combined and Reason for using different framing, Arrangement of frames side girders. Transverse members in each system of framing.

C. Cargo Handling & Stowage(Cargo Operations)

Methods of Slinging. Care and maintenance of all cargo gears, their correct use and safety requirements. Introduction to horizontal & vertical systems.

Cargo Stowage Organizations: Cargo Plans, i) Distribution of Cargo to avoid Stresses ii) Employment of gangs to advantage. Calculations of Cargo Stowage. Stowage of different Commodities. Precautions to be taken when loading/discharging heavy lifts. Prevention of over stowage and sequence of discharge. Other Documents.

Ventilation And Sweat : Factors to control sweat. Ventilation: i) Natural ii) Forced various methods of controlling humidity iii) Operation of various forced ventilation systems. Cargoes requiring special ventilation techniques.

Recommended Books (As listed for Course No. NS- 155)

NS-256 Marine Meteorology-II

Correlation between "wind" and "pressure" the forces involved. Mean synoptic surface pressure and wind distribution – belts. The principal cloud types according to "mode of formation".

Basic concepts relating to "low pressure" and "high pressure" Systems. Elementary concepts regarding "air masses" and allied aspects. Elementary concepts about "fronts" and related aspects. Elementary concepts regarding "high latitude frontal depression". "Occlusion" - mechanism, types. Elementary theoretical and practical concepts about TRS The beaufort wind scale; weather notation used at sea.

Introduction to met-reporting .The principal ocean currents - general ideas . Floating ice" - general basic ideas.

Recommended Books

- Text:** 1. Notes on Marine Meteorology by Kemp & Young, 1999, Stanford Maritime, London,
- Reference:** 1. Marine Meteorology for Mariners, Marine Div.(M.O) Meteorological, H.M.S.O. Office London (U.K)
2. Marine Meteorology at Sea by Ray Sanderson, 1982, Stanford Maritime London.

GT-261 Computer Familiarization-II

Computer System Component Units-II: Mother Board, RAM, Optical Devices, Expansion Cards, Storage Device(Hard Disk Drive, Solid State Storage, USB Flash Disk, Zip Drive, Thumb Drives, SD Cards etc

Computer Peripherals: Input Devices, Output Devices, Backup Devices, Multimedia Devices

Notebooks: Types of Notebooks, Recovery of OEM/Preinstalled OS in Notebook

SEMESTER-III

ED-301 English-III

Formal Oral Presentations

Developing Persuasive, Informative and explanatory presentations

- Select presentations topic
- Collect information about the topic
- Organize the information: a) Introduction b) Body c) Conclusion
- Rehearse the Presentation

Designing effective electronic presentations

- Using Templates, Working colours, Building bullet points
- Adding Multimedia and other effects

Critical Reading

Critical reading strategies (Previewing, Contextualizing, Questioning to understand and remember, **Reflecting** on challenges, Outlining and summarizing, evaluating an argument, Comparing and contrasting related readings etc.), Practice reading passages.

Essay Writing

Descriptive, narrative, expository and process Essays

- Provide students with at least four essays of each type
- Help them read and analyse the essays (according to each type)
 - a. Find out thesis statement, topic sentences and supports etc.
- Help students :
 - a) Decide a topic
 - b) Collect information about the topic (brain storming, mind mapping etc.)
 - c) Encourage them write first draft of the essay
 - d) Give feedback on content, organization and language of the essay
 - e) Peer feedback(if teacher finds appropriate for the group)
 - f) Help them write many drafts

Recommended Books

1. Langan, J., 1985, College Writing Skills, 2nd Edition, McGraw Hill (Re-print in 2005)
2. Wallace, J. M., 2004, Study Skills in English, 2nd Edition, Cambridge University Press
3. Oshima Alice, &Houge A., 2006, Writing Academic English, Longman / Pearson

4. Business Communication Today (6th Edition) by Courtland L. Bovee & John V. Thill. Prentice Hall International Inc.

ED-302 Personal & Organizational Management

Managing Self

1. Self awareness & Self Esteem [strengths, weaknesses, talents, values, preferences, setting goals]
2. Motivation
3. Prioritization
4. Time Management
5. Stress Management
6. Professional Attitude & Ethics
7. Personality & Non verbal communication [first impressions, personal appearance, body language, postures, gestures. Manners/etiquettes]

Managing Team and collaboration

8. Interpersonal Communication [Ethics, principles and problems]
9. Intercultural communication/Multicultural communication [basic norms/principles]
10. Avoiding and managing conflict

Managing Organization

11. Management Function: Planning, organizing and controlling
12. Resource Management
13. Leadership and decision making

ED-303 Chemistry-I

Gases: Gas laws, Vanderwaal's equation, gas equation, critical phenomenon, liquefaction of gases, specific heat (molar heat capacity), Liquid and solution; surface tension, viscosity, pH, colloidal chemistry, osmosis, reverse osmosis, spectrophotometer, liquid crystal (smectic, nematic, cholesteric)

Thermodynamics: first law, second law, calorimeter, specific heat of solid and liquid, thermochemistry.

Electrochemistry: ohms law, thermocouple, photoelectric effect, work power and energy, electrolysis, electrochemical cell, electrolytic cell, electroplating.

Corrosion: theories, inhibition and protection, mechanism of electrochemical corrosion, cathodic and anodic protection, steel manufacturing, classification of steel and stainless steel, type of alloy

Water and sewage: hardness, quality of water, water purification, sources of water, water analysis.

Experiment

1. Estimation of acidity in water sample
2. Estimation of alkalinity in water sample
3. Estimation of ferrous iron by redox titration
4. Estimation of hardness of water by EDTA method
5. Determination of chlorine in water sample.
6. Determine the surface tension of a liquid using drop weight method.
7. Determine viscosity of given liquid (density to be determined).
8. Determination of Sulphate by Turbidimetric Method

Recommended Books

Text Book:

1. General Chemistry, by Darrell D. Ebbing and Steven D. Gammon: 8th Edition, 2008, Houghton Mifflin Company, New York.

Reference Books:

1. Petrucci, Harwood, Herring, Principles and Modern Applications, General Chemistry 9th Edition, 2006
2. B.S.Bhal, G.D. Tulli, AvumBahl, Essential of Physical Chemistry (Multi Colour Edition)
3. R. Goplan, Engineering Chemistry, 3RD Edition 2009
4. S.S.Dara, Introduction to Chemical Engineering, S Chand 2008
5. Engineering Chemistry. Author/S: Uppal, M M, Bhatia, S C. Publisher: Khanna Publishers: 7th Edition: 2005

ED-304

MATHEMATICS-III

PLANE CURVES-I: Equation of 2nd degree; Pair of straight lines, Parabola, ellipse & hyperbola; translation of axes, Rotation of axes, Equations of Tangents & Normal

PLANE CURVES-I: Maxima & Minima, Polar coordinates and parametric representation of curves,

Length of arc, Area under a curve, Curvature; center of curvature; evolutes.

THREE DIMENSIONAL SPACE: Rectangular coordinates system in 3-dimensional space, Direction Cosines, Equation of Plane, Equation of Straight Line, Equation of Qibla.

STATISTICS: Discrete and continuous data, Construction of frequency distribution & presentation of data, Measure of Central Tendency and Dispersion

PROBABILITY: Permutation and combination, Concept of probability and its basic theorem, Conditional probability, Random variables and probability distribution, Mean & Variance of distribution, Binomial & Poisson distribution, Normal distribution curves; standardized normal curve

RECOMMENDED BOOKS

- Text:**
1. Calculus & Analytical Geometry by Howard Anton (Seventh Edition)
 2. Elementary Linear Algebra by Howard Anton (tenth Edition)
 3. Probability and Statistics for Engineering & Scientists by Walpole R.E. & Myres (latest edition)

NS-351

Principles of Navigation-III

TIME: Twilight, Civil, Nautical and Astronomical, use of Nautical Almanac to find out twilights, Necessary conditions for twilight and night continuous day light or darkness.

CELESTIAL SPHERE : Celestial sphere-true and Mean motion of sun, Ecliptic, Celestial Poles, Meridians, Equinoctial. The obliquity of the ecliptic. Equinoctial system of co-ordinates S.H.A. Declination and Polar distance. Nautical Almanac. Hour angle, G.H.A., L.H.A. and Longitude relationship. Daily motion and horizontal system of co-ordinates Horizon, Zenith and nadir, vertical circles and Prime Vertical. Elevated and depressed poles. Altitude of elevated pole in observer's latitude, observers upper and lower meridian. Apparent daily path of all bodies. Relationship between azimuth, quadrantal bearings and 360° notation bearings. Rising and setting points and amplitudes. Conditions for a body to be circumpolar and to cross the Prime Vertical. Figure drawing on the plane of rational horizon and observers celestial meridian using equidistant projection and illustration of navigational problems and principles. Amplitude formula, effects of latitude on the accuracy of amplitude observation. Theoretical and visible rising and setting of sun. Extraction of information from the Nautical Almanac about rising and setting of heavenly bodies and Meridian Passage Times.

Recommended Books

Text: Nicholls's Concise Guide, Volumes I & II, Edward J. Coolen, Brown, Son, & Ferguson, 1984

- Reference:**
1. Admiralty Manual of Navigation, Volumes I,II& III, H M S O, 1992
 2. Navigation for Watch-keeper, L.W.J. Field

NS-352 Ocean & Off Shore Navigation-III

COMPASS ERRORS – AZIMUTHS: Finding compass errors by comparing azimuths of the heavenly bodies. Solution of amplitude problems. Use of isogonal lines and other information on charts to obtain magnetic variation at various places. Finding of compass errors and deviation for ship's head. Finding times of Twilight, Rising, Setting and Meridian Passage Times of Heavenly bodies.

Recommended Books

Text: Nicholls's Concise Guide, Volumes I & II, Edward J. Coolen, Brown, Son, & Ferguson, 1984

- Reference:**
1. Admiralty Manual of Navigation, Volumes I,II& III, H M S O, 1992
 2. Navigation for Watch-keeper, L.W.J. Field

NS-353 Seamanship(Th)-III

SHIP MANOEUVERING AND HANDLING : Recounting the basic principles involved in executing the following manoeuvre: Coming to a single anchor emergency use of anchors; turning vessel short round with effect of trim; wind, displacement and type of machinery; turning vessel in heavy weather; Berthing and unberthing under various conditions of wind and tide; Approaching a pilot vessel with due regard to weather and tide; handling a vessel in rivers, estuaries and other shallow waters, having regard to the effects of current, wind an restricted room on the response to the helm also back rejection, square effects and interaction between passing vessels. Choice of anchorage, the operation of anchoring to two anchors in unrestricted and limited anchorages. Explaining the factors to consider when determining the scope of anchor cable to be used. Describes the remedies for dragging anchors and clearing foul anchors. Explaining the precautions when maneuvering for launching boats and or life rafts in heavy weather. Enumerating the methods of taking on board survivors from lifeboats and / or life rafts. Demonstrating familiarity with the maneuvering characteristics of a ship e.g. stopping distances, turning, circles. Outlining the use of and navigation in traffic separation schemes Enumerating practical measures to be taken when navigating in ice or condition of ice accretion. Explaining the procedures of dry-docking in both the intact and damaged conditions. Explaining means of lessening drift when "Hove to" in heavy weather. Describes the uses of oil on water in heavy weather. Stressing the importance of moderate speed in situations where own ships wake could cause damage.

SEARCH AND RESCUE : Explains merchant ship position reporting systems that are available, their value and the use of these systems. Paraphrasing regulation 10 chapter V of the SOLAS Convention. Categorizing types of distress incidents. Distinguishing the various agencies that will be involved in a distress incident. Outlining the co-ordination procedures for on-scene co-ordination. Outlining the action to be taken by the ship in distress. Explaining the signals likely to be received by the assisting vessels. Explaining immediate action by assisting vessels Describing the action to be taken whilst proceeding to the distress. Describing the strict radio discipline necessary in inter-ship communications. The necessary actions on approaching the scene. The possible search procedures on arrival at the scene. The co-ordination with the SAR aircraft in planning the search. The special problems connected with restricted visibility. Outlining the co-ordination procedures when land-based authorities are involved. Analysing evidence of a casualty and interprets this to judge if the search should be continued. illustrating the conclusion of a search, both successful and unsuccessful. The special problems and characteristics of an aircraft casualty at sea. The routine of questioning survivors.

EMERGENCY PROCEDURES : Summarizing the precautions to be taken prior to beaching a vessel. Action to be taken prior to and after grounding. Action to be taken when floating a grounded vessel, with or without assistance. Action to be taken following a collision. Action to be taken regarding temporary plugging of leaks. Precautions for the protection and safety of

passengers and crew in various emergency situations. Methods of rigging and use of : Emergency steering, jury steering and where practicable the rigging of a jury rudder. The action to be taken when an emergency arises in port; including sources of assistance from ashore. The arrangements for towing, and being taken in tow in an emergency. The role of a junior officer when assisting a vessel in distress. The lowering and recovery of an emergency boat to pick up a man overboard. Producing an organizational plan for personnel and shipboard facilities to assist in damage control. The procedures to be followed in the event of a total or partial electrical failure. The need to seek sea room in the event of an adverse weather forecast Drawing up a comprehensive roster and emergency station and explaining safety Recommendations. Identifying and uses the lifesaving appliances on passenger carrying and cargo carrying ships. Demonstrating and understanding of the minimum scale of provision of distress signals and explains how they are operated and how to dispose of time expired pyrotechnics. Summarising the requirements for line throwing equipment. Enumerating the dangers inherent in the use of line throwing gear. Procedures in wind and with tankers, special signals for tankers. Explaining how the breaches buoy rescue equipment can be set up and used. Types of helicopters used in search and rescue and commercial operations and describes their operational limitations. Supervision of deck party engaged in working with a helicopter.

Recommended Books(As listed for course NS-253)

NS-354 Coastal Navigation-I

CHARTS: Fathom and Metric Charts. How charts are made, Description of Charts. Categories of charts - Ocean charts, Coastal charts, Plans - some special types of charts. Hyperbolic lines- Lattice charts- Routing charts. Salient features of charts - symbols and abbreviations used. Information available from charts.

MISCELLANEOUS ADMIRALTY PUBLICATION: Notices to Mariners information they contain large and small corrections. Other publications related to charts and navigation information they contain.

FINDING POSITION, COURSE AND DISTANCE: Compass rose - use of chart work instruments. Position by bearing and distance. Latitude, longitude.

FIXING SHIP'S POSITION: Various methods of obtaining positions and position by cross bearings. Ranges/position D.R. position fix estimated position and fix

COMPASS CORRECTIONS: True and Magnetic meridians. Variations - Deviation and compass error definitions. Conversion of compass courses and vice versa. Magnetic courses to true courses and vice versa. Compass courses to true courses and vice versa. Gyro errors and corrections.

RUNNING FIX: Simple running fix position. Double angle on the bow. Four point bearing selected angles.

HORIZONTAL & VERTICAL ANGLES: Finding position by horizontal and vertical sextant angles. Bearings by erroneous compass and finding compass error. Dipping and rising bearing of lights. Distance sailed round on arc.

CURRENT AND LEEWAY: D.R position estimated position. Set and rate of current effects of currents and Examples and exercises. Application of lee Way. Examples and exercises.

Recommended Books

Text: 1. Chart and Abbreviations, H M S O , 2008

Reference:

1. Nicholls's Concise Guide Vol-I by .H.Brown , HHB, 2010
2. Nicholls's Concise Guide Vol-II by H.H.Brown , HHB, 2010
3. Navigation for Watch-keepers by L.W.J.fifield, LWJF
4. Basic Costal Navigation by Convad Dixon, CD, 1985

5. Modern Chart Work by W.H.Squair, WHS, 1992
6. Publications Containing Navigational information, H M S O

NS-355 General Ship Knowledge-III

A. Ship Stability

Effect of Density On Draught: Change of draught and density calculations for box shaped vessels. The Marine Hydrometer and its use. FWA and derivation of formula

Solution of problems involving FWA and DWA. Bilging & Permeability

Loading/Discharging and Shifting Weights: Definition of C of G and effect on C of G when loading, weights at a distance from the original C of G. Effects on C of G when discharging weights from a certain distance from the original G. Effects on C of G due to shifting weights. Derivation of formula CG1. Solution of problems involving loading, discharging and shifting of weights in a ship. Moments about the keel and centre line. Loading or discharging required weights to obtain given KG or GM. Explanation of list. Sketch showing forces through G and B on listed ships, hence triangle GG₁M. Derivation of formula. Problems involving loading weights off the centre-line and calculating list and bringing the listed ship upright. Effective C of G suspended weights and Prediction of maximum list. Increase of draft with list. Use of the Ralston stability indicator. Short comings of traditional methods of stability calculations.

Transverse Stability (Small Angles): Definition of C of B and movement of C of B in a vessel heeled. Forces through C of B and C of B at a small angle of heel. Transverse metacentre, metacentric height (GM) and righting lever (GZ). Calculation of Righting moments in numerical problems. Stable, Unstable and neutral equilibrium and angle of loll.

Transverse Stability (Large Angle): Gross curves of stability and their use to obtain GZ. Use of KN curves to obtain KN values. Information obtained from GZ curves i.e. range of stability, max GZ and angle, angle of vanishing stability, initial GM, angle of deck edge immersion. GM alone is not sufficient for the safety of ship. Difference in typical curves for stiff and tender ships at angle of heel and angle of loll. Solution of numerical problems on above. Effect of quartering and beam seas on Ship's stability.

B. Ship Construction

Double Bottom Tanks : Function and Construction: Transverse half section through D.B. Tank of transverse framed and longitudinal framed ship, types of floors. Bilge drainage systems. Bilge piping. Ballast system, Sounding & Air pipes. Duct Keel. Pounding - Structural Compensation, Areas requiring strengthening, arrangement of frame floors and side girders to combat pounding stresses. Panting - Structural Compensation Strengthening and form of stiffening, details at forward end. Transverse section of above arrangements, Alternate panting arrangements, Panting arrangements at after end.

Structure At Upper Deck: Sheer strake and stringer plates, rounder sheer strake. Hatch coamings and deepwebs. Tank lids and coamings of oil tankers with details. Hatch covers of Dry Cargo Ship. Various types. Loss and Compensation of hatch opening in decks. Details of Structure. Connections of Superstructure to hull at ship side. Fashion plate - Bulwark plate. Bulwarks, Guard rails, Freeing arrangements, Scuppers, Freeing ports. Bilge Keels.

C. Cargo Handling & Stowage(Cargo Operations)

Safety At Work: Factors effecting safety, Check lists for maintenance of Cargo Gears. Paraphrasing "Code of Safe practice for Merchant Seamen". Entry into enclosed spaces.

Carriage Of Dry Cargoes: Calculations for charging freight. Amount of Cargoes to be loaded, Permissible heights, Volume limited and Dead weight limited ships. Full and Down.

Carriage Of Bulk Cargoes: General requirements of "IMO" Code of safe practice for the carriage of Bulk Cargoes. Main hazards associated with the carriage of Bulk Cargoes.

Carriage Of Grain Cargoes: IMO Regulations, recommendation, procedures and ventilation.

Carriage Of Coal Cargoes & Deck Cargo Including Timber : Various types of coals carried, specific hazards spontaneous combustion, ventilation procedures precautions during loading/discharging and carriage. IMO code of safe practice for ships carrying timber deck

cargo. Carriage Of Dangerous Cargoes: Classification of dangerous cargoes, IMDG Code. Labeling of dangerous cargoes. Precautions to be taken during loading/discharging. Construction of magazines.

Recommended Books(As listed for Course No. NS- 155)

NS-356 Watch-Keeping-I

1. Principles of Watchkeeping
 - i) Watchkeeping in restricted Water and Visibility
 - ii) Radio Watch
2. Watchkeeping Arrangements And Procedures
 - i) The content, application and intent of COLREG 72.
 - ii) Keeping a safe navigational watch

Recommended Books

Text: 1. International Light, Shape & Sound Signal by D.A. Moore, B.H. Newnes, 1993,
2. The Collision Regulations fully explained by C.H. Wright, 1981

Reference:

1. Basic Principles to be observed in keeping a Navigational Watch, I. M. O.

NS-357 Radar Navigation-I

RADAR BASICS: Methods by which a radar installation gathers information and presents it on a visual display. ECHO Principle and its application to radar pulses. Components of a simple block diagram of a radar installation. Path followed by a single radar pulse from transmitter to target, and returning echo through the receiver to its appearance on the C.R.T. Method by which the C.R.T. is able to display an echo at the correct range and bearings. Radar horizon and the factors which affect its distance from the observer. Safety precautions necessary when in the vicinity of open equipment and the radiation hazards near antennae and open wave guides.

SETTING UP AND MAINTAINING, DISPLAYS: Setting controls to obtain and maintain an optimum display of targets. The correct switching on. Safe guards and Procedures. Ship's Head up, North up, Relative Motion and True Motion presentation. Alignment of display to a specific mode. Checking accuracy of the heading marker by comparison with visual observations. Performance monitoring procedure and its use. Use of range and bearing measurement controls and reporting procedures. Functions of other controls. Blind and shadow sectors. Detection of poor response targets, growlers, man overboard and landfall. Radar's limitations.

UNWANTED AND SPURIOUS RESPONSE: Problems associated with unwanted and spurious responses. Action of limiter. Potential to detect a target beyond the rain clutter area, recognition of true echo out of multiple and indirect echoes. Radar to radar interference.

Recommended Books

Text: 1. Radar Observer's Hand Book by W. Burger, 9THEdn 2010
2. Radar Watch-Keeping by Capt. W.D. Moss, Maritime Press, London, 2ndEdn. 1973

Reference: 1. Worked Examples in Radar Plotting by I. W. Bagshaw, Brown, Son & Ferguson, 1979

NS-358 Electronic Navigation Systems-I

ELECTROMAGNETIC WAVES: Nature and Propagation of Electromagnetic Waves

GYRO COMPASS: Free gyro scope and its gimble mountings. Gyroscope inertia and precession. Courses of precession. Tilt Drift effects of earth's rotation. Making a free gyroscope north seeking by the use of gravity control and the resulting oscillation of the axis. Use of damping in azimuth and damping in tilt to cause settling of the axis. Achievement of control and damping by replacing ballistic elements with electrical signals. Starting of the gyro compass minimizing settling time by slowing and leveling to the correct heading. Settings to

be made or adjusted while the compass is in use. Gyro inputs to the D.F. and Radar. Alarms fitted to a gyro compass.

THE MAGNETIC COMPASS: Construction of a liquid card magnetic compass, sketching a section through the compass to show the float chamber, the pivot support and arrangement of magnets. Keeping the card practically horizontal in all latitudes. Composition and allowance for change in volume of the liquid. Removing of air bubbles from the bowl. Support of bowl in the Binnacle-Marking of lubber line. Binnacle and arrangements of correcting devices.

ECHO SOUNDERS AND SPEED MEASUREMENT: Principles of marine echo sounding equipment. Physical factors affecting the velocity of sound waves in sea water. Main components on a block diagram. Transducers. Recorders. Echo sounder controls. Cross noise - mechanical and electrical noise. Aeration or Reverberation. Pythagoras error. False echoes or 2nd trace echoes. Maintenance. Automatic pilots. The off course alarm. Various logs - The stream log, Dynamic pressure or Pitot log, The impeller log, The Electromagnetic log, and The Doppler log.

BERTHING MONITOR: Doppler Effect. Doppler Radar. Doppler Sonar.

Recommended Books

1. Electronic Aids to Navigation by Appleyard, 1988
2. Radio & Radar Aids to Navigation by Sonnenberg , 1988
3. Admiralty Manual of Navigation Vol-I, Admiralty UK, 6th Edition 2008

GT-361 Computer Familiarization-III

Software: Software and its Types, Operating System, Functions of Operating System(Process Management, Memory Management, File/Data Management, Device Management etc)

Operating System Usage: Introduction to DOS to Windows, Components of Windows, The Control Panel, System Information Utility, Command Prompt Window, Installation of Windows XP/Vista/7/8, Recovery and Trouble Shooting in Windows, Installing and Configuration Devices

Security Essentials: User Access Management, Malicious Software and Strategies for dealing with it, Antivirus and Firewall.

SEMESTER-IV

ED-401 English-IV

Letter writing, memos and emails

- Letter, memo and email formats
- Appropriate language and style
- Using elements and formats correctly and developing Word Documents using MS Office
- Writing Routine official messages and correspondence using memo or letter formats
- Using email for routine official correspondence

Writing short reports/ briefs/ progress updates

- Formats for short reports (Informative and Analytical)
- Writing Informative reports (for various situations)
- Writing analytical reports(for various situations)
- Writing brief progress reports or status updates
- Developing reports/ updates/ briefs using visuals (tables, lists, diagrams, charts, graphs, pictures etc)

- Sending digital reports through emails

Recommended Books

- Business Communication Today (10th Edition) by Courtland L. Bovee & John V. Thill. Prentice Hall International Inc. 2013

ED- 402 International and Legal Maritime Studies(ILMS)

Law: English Law, The Common Law, Rules of Equity, Statute Law, Sources Of International Law, International Law, Customary Law, Treaties, Maritime Law, Flag State Jurisdiction, Coastal State Jurisdiction, Port State Jurisdiction.

International Organizations: International Maritime Organization (IMO), United Nations Conference on Trade and Development (UNCTAD), International Labour Organization (ILO), World Health Organization (WHO), International Telecommunications Union (ITU), World Meteorological Organization (WMO), Committee Maritime International (CMI), International Chamber Of Shipping (ICS), International Shipping Federation (ISF), International Transport Workers Federation (ITF), International Ship Managers' Association (ISMA), International Association Of Dry Cargo Ship, Owners (Intercargo), International Association Of Independent, Tanker Owners (Intertanko), Baltic and International Maritime Council (BIMCO).

Legal Aspects Of Ship Ownership And Operation: Ship Construction, Ship Ownership, Ship Sale And Purchase, Ship Registration, Securities And Liens, Master Crew And Other Maritime Labour, General Maritime Safety

Legal Aspects Of Navigation And Safety At Sea: Marine Collisions, Other Marine Accidents, Marine Pollution, Marine Salvage, General Damage Liability,

Carriage Of Goods And Passengers At Sea: Carriage Of Goods, Charter Parties, Time Charter, Voyage Charter, Demise Charter, Bill of Lading, The Hague Rules, The Hamburg Rules, Multimodal Transport, Carriage Of Passengers At Sea,

Master And Crew: Master's Authority, Master's Liabilities, Master's Power Of Arrest, Presence On Board Ship, Relationship with Deck and Engineer Officers, Responsibility For Cadets, Master's Duties, Succession To Command In Emergency,

Manning: Manning And Certification, Power To Exempt From Manning Requirements, Prohibition Of Going To Sea Undermanned, Unqualified Persons Going to Sea as Qualified, British Certificates Issued Abroad, Certificates Of Service,

United Nations Convention On The Law Of The Sea (Unclos): General Information and Provision, Limits Of The Territorial Sea, Passages and Zones,

International Maritime Organization (IMO): Brief History, IMO Conventions, Structure Of IMO Bodies.

Recommended Books:

1. Notes on International & Legal Maritime Studies by Capt. Nasim Ahmad Tariq, 2015

ED-403 Chemistry

Fuels: classification, gross and net calorific value, storage of fuel, flash point, limit of flammability, explosive limit, fuel as a source of energy

Metal and alloy: properties and general composition such as iron, copper, aluminum, chromium, zinc used in engineering field. Inorganic engineering materials(cement and glass) organic engineering materials(polymers, rubber, plastic and paint, semi conductors and dielectric materials)

Lubricants: classification, purification and refining of lubricants, mechanism, testing of lubricants,

Oil purification: microbial degradation of lubricating oil, gravitation, separation, filtration of fuel and lubricating oil

Pollution: types of sphere, air pollution, water pollution, soil pollution, solid waste management.

Experiment

1. Determination of the percentage of moisture in a sample.
2. Determine the heat of neutralization of strong acid with strong base.
3. Determination of the amount of copper in the copper ore solution
4. Determination of Wavelength of Maximum Absorbance
5. Verification of Beer-Lambert's law and determination of concentration of metal ions spectrophotometrically
6. Acid-base titration by Potentiometric method.
7. Spectrophotometric determination of chlorine in water sample.
8. Determine the amount of Oxalic acid and Sulphuric acid in one litre of solution, given standard sodium hydroxide and Potassium Permanganate.

Recommended Books

Text Book:

4. General Chemistry, by Darrell D, Ebbing and Steven D. Gammon: 8th Edition, 2008, Houghton Mifflin Company, New York.

Reference Books:

6. Petrucci, Harwood, Herring, Principles and Modern Applications, General Chemistry 9th Edition, 2006
7. B.S.Bhal, G.D. Tulli, AvumBahl, Essential of Physical Chemistry (Multi Colour Edition)
8. R. Goplan, Engineering Chemistry, 3RD Edition 2009
9. S.S.Dara, Introduction to Chemical Engineering, S Chand 2008
10. Engineering Chemistry. Author/S: Uppal, M M, Bhatia, S C. Publisher: Khanna Publishers: 7th Edition: 2005

ED-404 MATHEMATICS-IV

Infinite Series: Introduction, Convergence of a series, Comparison Tests, Root Test, Ratio Test and Raabe's Test

Fourier series: Introduction to Fourier series, Euler Fourier formulae, Application of Fourier series, Fourier transforms

Laplace transforms: Laplace transforms of some elementary function, First and Second translation or shifting theorems, Laplace transform of the nth order derivative, Laplace transform of integrals, Laplace transform of functions $t^n F(t)$ and $F(t)/t$, Inverse Laplace transforms of some elementary functions, Convolution theorem, Solutions of ordinary differential equations using Laplace transform (I.V.P's & B.V.P's).

Advanced Calculus: Limit of double integration, Change of order, Area, centroid and moment of inertia, Triple Integration & its application

Vector Calculus: Vector differentiation (Gradient, Divergence & Curl), Vector Integration (line, surface & volume integrals), Green's, Divergence & Stoke's theorems with applications

RECOMMENDED BOOKS

Text:

1. Advanced Engineering Mathematics by Erwin Kreyszig, Seventh Edition
2. Calculus & Analytical Geometry by Howard Anton Seventh Edition
3. Higher Engineering Mathematics by John Bird, Third Edition

NS-451 Principles of Navigation-IV

PZX triangle, Haversine formulae and Napier's Rules to solve PZX triangle.

POSITION LINE THEORY: Combination of equinoctial and horizon system of co-ordinates to determine centre of position circle and its direction in the vicinity of a selected position. Assumptions made when plotting celestial position lines and the circumstances in which they become significant. Meridian altitudes of celestial bodies and determination of observer's latitude from observation of bodies on the meridian above and below the pole. Pole star observations to find latitude and direction of P/L. Understanding and application of relevant corrections.

Recommended Books

Text: Nicholls's Concise Guide, Volumes I & II, Edward J. Coolen, Brown, Son, & Ferguson, 1984

- Reference:**
1. Admiralty Manual of Navigation, Volumes I,II& III, H M S O, 1992
 2. Navigation for Watch-keeper, L.W.J. Field

NS-452 Ocean & Off Shore Navigation-IV

ASTRO POSITION LINE: Latitude by meridian altitude in both hemispheres. Relationship between altitude of the elevated pole and the observer's latitude. Circumpolar stars at upper and lower transits, position line and its direction. Pre-computation of sextant altitude of a heavenly body at the meridian. Use of Polaris to find the observers latitude by apply necessary corrections. Azimuth and direction of P/L obtained by Polaris. Position line and its direction. Formation and solution of PZX triangle. Derivation of longitude of the observer from the L.H.A. and G.H.A. Finding the intercept and the intercept terminal point through which to draw P/L (Mareq. St. Hilaire method). Pre-computation of altitude and azimuths of heavenly bodies to determine their suitability for position fixing, using star charts. Familiarity in the use of modern sight reduction tables. Astronomical and terrestrial position lines, visual bearings and radio line of position. Finding of position of the observer from two or more position lines obtained simultaneously.

Recommended Books

Text: Nicholls's Concise Guide, Volumes I & II, Edward J. Coolen, Brown, Son, & Ferguson, 1984

- Reference:**
1. Admiralty Manual of Navigation, Volumes I,II& III, H M S O, 1992
 2. Navigation for Watch-keeper, L.W.J. Field

NS-453 Seamanship(Th)-IV

OFFICER-ON-WATCH DUTIES AT SEA & HARBOUR : Basic principles to be observed in keeping a Navigational Watch. Look out their duties & additional duties - Officer-on-Watch as a look out - conditions. Operational guidance for officer incharge of a Navigational Watch. Taking over a watch. Periodic checks of Navigational Equipment. Navigation in Coastal Water. Restricted visibility. Navigation with Pilot Embarked. Ship at Anchor. Taking over watch in port - keeping a watch. Preparation prior proceeding to sea. Scral Entries. Embarking and Disembarking of Pilot - Pilot ladder. Navigation into ice. Hearing to, Turning a vessel in heavy weather.

PREVENTION OF POLLUTION OF THE MARINE ENVIRONMENT: All objectives refer to the IMO Conference on Marine Pollution 1973.

GENERAL POLLUTION: Classifying liquid and noxious substances which can give rise to pollution. Outlines the definitions used in the Conference. The requirements concerning the duty to report an incident, when to report, how to report and the contents of the report. The procedure for reporting incidents involving harmful substances.

TANKER POLLUTION: The regulations for the prevention of pollution by oil. Familiarity with the use of the oil record book (both Tanker and Non-Tanker). The regulations concerning the issue of the International Oil Pollution Prevention Certificate (1973) i.e. form, duration, survey, issue. The regulations concerning the control of discharge of oil, and the requirements of special areas with regards to reception facilities. The regulations concerning segregated ballast tanks.

The regulations concerning the size and arrangements of cargo tanks.

POLLUTION BY SUBSTANCES IN BULK - NON PETROLEUM: The regulations for the prevention of pollution by substances carried in bulk. Familiarity with the use of the cargo record book for ships carrying noxious substance in bulk. The regulations concerning the issue of the International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk (1973). The regulations for the prevention of pollution by harmful substances in packaged forms or in containers or wagons.

POLLUTION BY SEWAGE AND GARBAGE: The regulations concerning pollution by sewage and garbage from ships. The regulations concerning the issue of International Sewage Pollution Prevention Certificate (1973). The regulations concerning the discharge of sewage, the exceptions, and reception facilities. The regulations concerning the disposal of garbage from ships, including special areas and reception facilities.

INTERNATIONAL MARITIME ORGANIZATION: What is I.M.O., its functions and working. Members & Associate member Countries. I.M.O. Conventions, Protocols, Agreements.
a) STCW b) MARPOL c) SOLAS d) UNCLOS
Names and outline of contents of the conventions ratified by Pakistan.

THE AUTOMATIC PILOT: Principles of an Auto Pilot System. Manual settings and their functions. Procedures for change over from Auto to Manual and vice versa. Course monitor and off course alarm. Regulations and performance standards of Automatic Pilot. Maintenance and listing of Auto Pilot

KEEPING A LOG: Rules and Regulations and common practice regarding Keeping A Log. Proper keeping of different kinds of log, during ocean passages. Coastal Navigation and in ports.

Recommended Books(As listed for course NS-253)

NS-454 Coastal Navigation-II

POSITION LINE BY ASTRONOMICAL OBSERVATIONS: Position lines, Longitude by chronometer method. Position line, Marcq St. Helaire Method. The use of a single position line to approach a position making use of current and leeway efforts. Fixing position by astronomical position lines withdrawn between. Exercises.

PASSAGE PLANNING: Principles of passage planning and execution. Landfalls in thick and clean weather situation of a suitable anchorages and entering measured waters.

TIDES: Finding times of High and Low water at standard and secondary ports from the tide tables. Use of tables and tide courses to find time at which tide reaches a specific height and corrections applicable to charted heights, depths etc. Exercises.

Recommended Books(As listed for course No. NS-354)

NS-455 General Ship Knowledge-IV

A. Ship Stability

Inclining Experiment: Purpose of experiment and necessary conditions. Proof of formulae and Applications to "Last Parcel" checks on GM. Problems involving inclining experiment.

Free Surface Effect: Movement of C of G due to slack tanks. Virtual movement of G to obtain equivalent reduction in righting lever. Dangers of slack tanks with tender ships and the precautions to take during voyage. Solution of KG Problems involving correction for free surface. Method of correcting an angle of loll and Precautions to avoid one. Effect of longitudinal sub-division of tanks.

Longitudinal Stability: Definitions of trim, LCF, GML, trimming moment and MCTC. Change of

Trim with Density.

B. Ship Construction

Stern Structure: Functions of Stern Frames, Stern frames, single screw ship's. Transom stern - connection to stern frame. Functions of stern tubes, Oil Lubricated stern tubes. Rudders & Propellers. Types; principle of screw propulsion shaft tunnel.

Bulk Heads: Purpose of sub-division and basic requirements positioning of bulkheads, various types of bulkheads. Continuity of strength through oil tight bulkheads. Corrugated and stiffened bulkhead. Half cross sections of cargo compartment of dry cargo ship with details. Half cross section of cargo compartment of bulk carrier. Half cross section of cargo compartment of tanker showing web-framing and longitudinal stiffeners. Cross section of cellular container ship. Deck fittings, lashings. Half cross section of passenger ship, Combination Carrier, RO/RO.

Moorings & Fittings: Fairleads - Mooring bits - Winches - Anchors arrangement for mooring & anchoring forward. Description of Construction: Derricks, Deck Cram Masts, Sampson Posts - support at base.

Corrosion: Care and precaution against corrosion in a ships structure.

C. Cargo Handling & Stowage(Cargo Operations)

Carriage Of Special Cargoes :Tallying, Check lists. Precautions, Pilferage.

Unitized Cargoes: Cargoes suitable for unitization. Description of Pallets and equipment to handle them. Container types and equipment to handle them. Hazards involved. Lashing techniques for containers & trailers.

Carriage Of Refrigerated Cargoes: Hold and locker preparations prior loading. Types of cargoes which are carried chilled. Types of cargoes which are carried Frozen. Points to inspect in a Cargo :a) Prior loading (b) During loading. c) During Carriage.

Oil Cargoes Safety: Precautions during cargo operations and gas freeing-safety check list. Explosimeter - Chemical absorption gas detectors. Toxic effects of Petroleum gases and skin ailments. Health hazards while carrying hydrogen sulphide and Benzene. Marine Pollution Convention (MARPOL 73/78) Coverage: Annex 1 (Oil Pollution Prevention). Control of oil from Machinery spaces Oil Record Book. Precaution to be taken to prevent Accidental Pollution by oil.

Recommended Books(As listed for Course No. NS- 155)

NS-456 Watch- Keeping-II

1. Keeping A Watch In Port

- i) Keeping an effective deck watch in port under normal circumstances.
- ii) Keeping a safe deck watch in port when carrying hazardous cargo.

2. IALA Maritime Buoyage System

3. Weather

- i) Reports of danger navigation
- ii) Weather forecasts

4. Rules concerning lights and signals.

- i) Distress signals
- ii) Pilot signals

Recommended Books(As listed for course No. NS-356)

NS-457 Radar Navigation-II

RANGE AND BEARING: Navigational information provided by radar, sources of errors in accuracy of ranges and bearing. Target features which contributes to its radar response. Introduction to active and passive Radar Responders. Comparison of the chart and P. P. I. for radar conspicuous targets. Racons and Remarks on radar screen. Use of Radar in Passage plan and application of parallel indexing techniques. Effects of pulse length, beam width shadowing and radar horizon on charted topography. Minimum range detection limits imposed by pulse length. Comparison of positions obtained by radar and other position fixing systems. Importance of radar for warning of restricted visibility. Practical.

RADAR PLOTTING: Radar as an aid for avoiding collision. Basic theory of true and relative radar plots. Limits of accuracy of information obtained from afterglow. Tracking of an echo in real time. Symbols used to indicate target movements. True and relative plot and derivation of target vessels course and speed, CPA, and time to CPA, aspect etc. Making a complete report. Detecting course and speed change of other ships. Effect of change in own ship's course and speed. Possible errors in plotting and their effects on the information from a plot. Use of reflection plotter. Factor involved in efficient radar watch-keeping especially where dual radar facilities are available. Importance of operating Radar on suitable range in relation to prevailing circumstances and hence the use of correct plotting interval.

APPLICATION ON COLREG AT SEA: Duties and responsibilities as required by COLREG when carrying radar. Understanding of rules which apply when vessels are in sight of one another and when not. Need for early action and appreciation of delay between the initiation of alteration of course and speed and recognition of change by the target vessel. Recognition of dangers of assumption made on scanty information. Hazards of small alterations. Advantages of moderate speed when using radar. There is no such thing as a stand on vessel in restricted visibility. Alteration of course to port to be avoided when safe and practical.

AUTOMATIC RADAR PLOTTING AID: Basic Introduction to ARPA and its limitations. Meaning of terms PPC & PAD, their construction and use in collision avoidance. Introduction to T.V. like Radar display sets i.e. Raster Screen, their advantages and limitation. Practical & Exercises

Recommended Books

- Text:**
1. Radar Observer's Hand Book by W. Burger, 9THEdn 2010
 2. Radar Watch-Keeping by Capt. W.D. Moss, Maritime Press, London, 2ndEdn. 1973
- Reference:**
1. Worked Examples in Radar Plotting by I. W. Bagshaw, Brown, Son & Ferguson, 1979

NS-458 Electronic Navigation Systems

BASIC PRINCIPLES OF HYPERBOLIC NAVIGATION: The nature of hyperbola - Hyperbolic Pattern with two foci. Principles of hyperbolae being position lines. The causes of ambiguity and reduced accuracy in the base line extension area. Confirmation of two hyperbolic patterns.

GLOBAL POSITIONING SYSTEM (GPS): Working. Accuracy. GPS Satellite System. Signal. Sources of GPS signal errors. Finding Location with GPS. GPS signal characteristics. GPS system segments. GPS system time.

LORAN-C SYSTEM: Basic Loran-C System - Principle of Operation. Transmission pulses. Cycle matching - Measurement of the time Difference. Reception of sky wave signals. Chain identification. Loran-C Charts, Tables and corrections. Coverage and accuracy of Loran-C.

ELECTRONIC CHART DISPLAY & INFORMATION SYSTEM (ECDIS): Nautical Chart. Raster Navigational Charts (RNC). Electronic Navigation Charts (ENC). Geodetic Datum. Working of system.

INTRODUCTION OF AUTOMATIC IDENTIFICATION SYSTEM (AIS): Introduction. System concepts. Integration with ARPA.

Recommended Books

4. Electronic Aids to Navigation by Appleyard, 1988
5. Radio & Radar Aids to Navigation by Sonnenberg, 1988
6. Admiralty Manual of Navigation Vol-I, Admiralty UK, 6th Edition 2008

GT-461 Computer Familiarization-IV

Networking Essentials: Data Communication, Networking Technologies, Wireless and Broadband Technologies, Internet

Office Automation: Microsoft Word, Microsoft Excel, Microsoft Power Point, Microsoft Access