INTRODUCTION TO THE PROGRAMME & DETAILS

Name of the Programme : Associate Degree in Nautical Science (ADNS)

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 55% marks in HSSC (Pre-Engineering) / equivalent examination with Physics, Mathematics & Chemistry

iii) Maximum 20 years of age by 31\textsuperscript{st} 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

Regulations: Academic Regulations for Associate Degree Programme-2017

Commencement: First semester- Spring January

Duration of the Programme: 2 years/4 semesters

Total No. of Credit Hours: 77

No. of Courses: 30
### APPROVED SCHEME OF STUDIES
### FOR
### ASSOCIATE DEGREE IN NAUTICAL SCIENCE

#### FIRST YEAR

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
<th>Cont Hrs</th>
<th>MKS</th>
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<td>Th Pr Tot</td>
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<td>ED-154</td>
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<td>Marine Meteorology</td>
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<td>19 6 25</td>
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<td>GT-121</td>
<td>Officer Like Qualities-I **</td>
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<td>GT-171</td>
<td>Officer Like Qualities-II **</td>
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<td>GT-122</td>
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<td>GT-172</td>
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* Academic Course
**General Training assed by a Board at the end of each Semester
# SECOND YEAR

## Spring Semester

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<td>ED-###</td>
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<td>NS-263</td>
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### Non Credit/Mandatory Courses

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<td>GT-221</td>
<td>Officer Like Qualities-III**</td>
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<tr>
<td>GT-291</td>
<td>Personal Safety &amp; Social Responsibility *</td>
</tr>
<tr>
<td>GT-292</td>
<td>Elementary First Aid *</td>
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<tr>
<td>GT-293</td>
<td>Tanker Familiarization *</td>
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<tr>
<td>GT-271</td>
<td>Officer Like Qualities-IV**</td>
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<tr>
<td>GT-294</td>
<td>Personal Survival Techniques *</td>
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<tr>
<td>GT-295</td>
<td>Basic Fire Fighting *</td>
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</table>

### Elective Courses

- ED-252- International & Legal Maritime Studies(ILMS)
- ED-253 - Personal & Organizational Management

* Mandatory Short Professional courses (3-5 Days)

**General Training assed by a Board at the end of each Semester
### SUMMARY OF THE ASSOCIATE DEGREE PROGRAMME IN NAUTICAL SCIENCE

<table>
<thead>
<tr>
<th>S.NO</th>
<th>Category</th>
<th>No. of Courses</th>
<th>Credit Hours</th>
<th>% age of total Cr Hrs</th>
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<td><strong>77</strong></td>
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- Theory: 64 hours (83.12%)
- Practical: 13 hours (16.88%)

- Total number of Credit Hours: 77
- Duration of the Associate Degree: 2 years
- Semester Duration: 20 weeks
- Semesters: 4
- Course Load per Semester (except non-credit): 18-20 Cr Hrs
- Average number of Courses per Semester: 7-8 Courses/Semester
## Elective Courses

(any one)

- International & Legal Maritime Studies (ILMS)
- Personal & Organizational Management
# PAKISTAN MARINE ACADEMY
# ASSOCIATE DEGREE PROGRAMME IN NAUTICAL SCIENCE
# COMPARISON OF SCHEME OF STUDIES

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<tr>
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* English replaced with Business Communication
### SUMMARY OF THE SCHEME OF STUDIES
#### FOR ADP IN NAUTICAL SCIENCE

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<th>Remarks</th>
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<td>As per HEC policy</td>
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**Reduction of Courses in program**

#### Academic
- English: 2
- Physics: 1
- Chemistry: 1
- Mathematics: 2
- Pakistan Studies: 1
- Islamic Studies: 1
- International & Legal Maritime Studies: 1 (Elective)

#### Professional
- Principles of Navigation: 2
- Ocean & Offshore Navigation: 2
- Seamanship (Th + Pr): 4
- Marine Communication: 1
- Marine Meteorology: 1
- General Ship Knowledge: 4
- Coastal Navigation: 2
- Watch Keeping: 2
- Radar Navigation: 1
- Electronic Navigation Systems: 1

#### General Training/Officer Like Qualities
- 0 Changed to Non Credit

#### Personal & Organizational Management
- 0 Non Credit

#### Computer Familiarization
- 1

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### ED-101 Pakistan Studies

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Remarks

Pakistan Movement – Brief History;

**Constitution:** The Salient Features of the Constitution of 1973; Constitutional amendments; A brief account of the constitutional crisis of 1971

**Pakistan’s relations:** With neighbours; with superpowers; Pakistan and the Muslim world; Pakistan and International Maritime Organization (IMO);

**Economic Survey of Pakistan** with a focus on present situation; The importance of Gwadar Port; Exclusive Economic zone (EEZ) of Pakistan

**International conventions** on environmental pollution related to sea

**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:**

### ED-102 Applied Physics

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Remarks

**Vectors:** Vector algebra and its applications,

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

**Heat and Thermodynamics:** Heat, temperature and temperature scales. Heat transfer: conduction and conduction equation, convection and radiation: thermal expansion; specific heat capacity. 1st, 2nd 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. 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:

**Electricity:** Continuous Charge distribution, Force and Electric Field due to Continuous Charge distribution, Capacitors and dielectrics, Electric potential difference, Electric and magnetic fields associated with electric potentials and currents, Electric Current and its heating effect, Power and its relationship with current and resistance, effects of current, 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 device, Principles of electric generations and motors, Outline of shipboard power supplies, Emergency sources, safety precautions for electrical equipment's including spares 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, Biotsavart law, Amperes law, Magnetic field of rings and Coil, Magnetic Dipole moment of atom, Laws of Magnetism, Intensity of Magnetization.

**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. Introduction to Digital Electronics.

**Modern Physics:** Wave nature of light, wave particle duality, De Broglie hypothesis, Photoelectric effect. Laser and its applications, Atomic spectra, generation and properties of X-ray spectra, Nuclear radiation, Nuclear reactions, Nuclear radiation detectors, Hazard and use of Nuclear Radiation.

**Recommended Books:**

4. B.Sc. Practical Physics by CL Arora S Chand Limited, 2001
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<td>Mathematics-I</td>
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**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, Determinant of a square matrix; expansion & general properties of determinants, Cramer’s Rule, Determinant & Inverse matrix. Application of matrix theory; Geometrical Transformation, reflection (M), rotation (R), translation (T), enlargement (E), shear (H), stretching (S) and their combinations.

**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.

**Relative Velocity:** Composition and resolution of velocities, relative velocity, including solving problems on interception.

**Recommended Books**

2. Elementary Linear Algebra by Howard Anton (Tenth Edition), 2010
4. Reed’s mathematics for Engineers by W. Embleton, 1980
### NS-111  Principles of Navigation-I

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**Description of the Earth:** Shape of the Earth, Rotation of Earth's Axis, Gyro and Magnetic Compasses, Departure.

**Sailing:** Parallel, Plane, Mercator, Great Circle and Composite Great Circle Sailings.


**Time:** Local Mean Time (LMT), Equation of time, Solar, Lunar and Sidereal Days, Time Zones.

**Recommended Books**

3. Navigation for Watch-keeper, L.W.J. Field

### NS-112  Ocean & Off Shore Navigation-I

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**Nautical Almanac:** Understanding the information contained in Nautical Almanac. 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**

3. Navigation for Watch-keeper, L.W.J. Field
**Seamanship – I**

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**Remarks**

- New Course
- Revised Course
- Applicable to all Batches

**BASIC PERSONAL CONDUCT:** Norms of personal conduct ashore and on-board ship. Carrying out orders, personal appearance. Financial affairs including Personal Insurance, Social Security Contributions and Awareness of Ship’s Documentation. Health and Personal Hygiene, Prohibition of Drugs, Alcohol be insured. Ships Medicine Chest as per requirement.

**GENERAL TERMS APPLIED:** Terms applied to a ship Structural Parts. Using of Ship Directions and positions related to her Courses. Glossary of Shipping Terms.

**HELMS MAN SHIP:** Interpretation of 0 – 360° notation. The division of Card into ‘Points’ and ‘Half - Points’ as well as Relative bearings of objects.

**WATCH ORGANISATION & MUSTERS:** Procedures of Watch Systems at Sea/Ports.


**BOAT WORK:** Types of Boats. Parts & Equipment 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**

1. Nicholl’s Seamanship & Nautical Knowledge by A.N. Cockeroff, 2004
2. Seamanship Techniques, D. J. House, 2000
3. The Theory and Practice of Seamanship by Danton, 2002
4. Mariners Hand Book, H. M. S. O.
5. Survival at Sea by Cdre.N.F. Keens
7. Personal Safety on Ships, D O T.
8. The Collision Regulations explained by C.H. Wright, 1981
12. A Pocket guide for cold water survival, I. M. O.
14. Boat Work by L. G. Taylor
15. Search & Rescue Manual, I. M. O.
16. Manual on Oil Pollution, I. M. O.
17. Marine Pollution 1973, I. M. O.
18. Safety of Life at Sea, I.M.O. 1999
19. Prevention of Marine Pollution, I. M. O.
20. Tanker Safety & Pollution Prevention, I. M. O.
21. The Inert Gas System, I. M. O.
**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, 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:** Communications with port operation, coast station and vessel traffic services in the form of traffic lists and Trans Receiver in the form of Coded Letter Signals.

**Flag Signaling:** Communications by flags between men-of-war and merchant vessels, Position of hoists on different positions, use of Answering pendent.

**Practical:** Reception and transmission of signal by flashing light at the rate of 15 characters per minute.

**Signaling:** Communication with flag Signals in coded groups to indicate various Navigational terminologies including Affirmative, Negative and Interrogative expressions.

**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 Signal between ice breaker and assisted vessels. Procedure for sending a message to unknown ship and Letter Codes as per International Code of Signals.

**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**
1. International Code of Signals, Published by IMO, 1987
NS-115 General Ship Knowledge-I

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Remarks

- **New Course**
- **Revised Course**
- **Applicable to all Batches**

a) **Ship Stability**
Hydrostatic Principles: Definitions of Hydro physical quantities (mass, density, relative density etc). Principles of Floatation and use of dead weight tables/curves. Relationship between pressure and depth of water and relevant Mathematical Calculations
Form Co-Efficient: Definition of length, beam, AP, LBP, draught and Freeboard. Block co-efficient of fineness, calculations finding Cb from displacement and dimensions and vice versa. Finding of Cw 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.

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.
Cargo Handling Equipment: Deck Machinery, Winches, Capstans. Various types of Hatch Covers and their Opening and Closing procedures, Heavy lifting cargo gears. Types of Derricks and Stress Calculations.

**Recommended Books**

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

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<th>ED- 151</th>
<th>Islamic Studies</th>
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**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 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, Shooora.

**Role of Islam in The Reconstruction of Civilization of Mankind:** 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:**
2. Islamic Ideology Part I & II by Anwar Hashim
3. What Islam is? by Muhammad Asif Kidwai
4. Islamic Education by M.D. Zafar
5. Riaz-us- Saleheen Part- I, by Sharf- Uddin Noori
6. Towards understanding Islam (Diniat) by Abul Alla Maudoodi
7. The Sealed Nectar by Safi-ur- Rehman Mubarak Puri
ED-152 Ethical Behaviour (Alternate course for Non-Muslim students in place of ED-151)

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Remarks


Recommended Books

ED-153 Applied Chemistry

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Remarks

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, nemectic, cholesteric)

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

Electrochemistry: ohms law, thermocouple, photoelectric effect, work power and energy, electrolysis, electro chemical 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.

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, semiconductors 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.

Recommended Books
5. Introduction to Chemical Engineering, S.S.Dara, S Chand 2008

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<tr>
<th>Course Code</th>
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<td>Mathematics-II</td>
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**Remarks**

**Differential Calculus:** Functions, Graph of a function, Limit of function, Continuity of function, Gradient and rate of change, Maximum and minimum points, Points of inflection, L’ Hospitals 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**

**NS-161  Principles of Navigation-II**

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**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.


Relationship between azimuth, quadrantal bearings and 360° notation bearings. Rising and setting points and amplitudes. Circumpolar Bodies. Figure drawing on the plane of rational horizon and observer's celestial meridian using equidistant projection. Effects of latitude on the accuracy of amplitude observation. Theoretical and visible rising and setting of sun.

**Spherical Trigonometry:** Properties of spherical triangles, Solution of right & quadrantl spherical triangles, Solution of oblique spherical triangles. Haversine formulae and Napier's Rules to solve PZX triangle.

**Position Line (P/L) Theory:** Combination of equinoctial and horizon system of co-ordinates. Plotting celestial position lines. 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.

**Recommended Books**

3. Navigation for Watch-keeper, L.W.J. Field
### New Course

#### NS-162 Ocean & Off Shore Navigation-II

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**Remarks**

- **Compass Errors – Azimuths:** Solution of amplitude problems. Use of isogonal lines and other information on charts to obtain magnetic variation at various places. Compass errors and deviation for ship's head. Times of Twilight, Rising, Setting and Meridian Passage Times of Heavenly bodies.

- **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. Use of Polaris to find the observers latitude. Position line and its direction. Formation and solution of PZX triangle. Derivation of longitude from the LHA and GHA. Intercept terminal point through which to draw P/L (Mareq. St. Hilaire method). Pre-computation of altitude and azimuths of heavenly bodies for position fixing, using star charts. Modern sight reduction tables. Astronomical and terrestrial position lines, visual bearings and radio line of position. Position of the observer from two or more position lines obtained simultaneously.

**Recommended Books**

3. Navigation for Watch-keeper, L.W.J. Field

### New Course

#### NS-163 Seamanship – II

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**Remarks**


- **ROPES AND WIRES:** Types of whipping and their various uses. Types of Seizing and their uses. Stoppers and their uses. Splices and their uses. Methods of taking Soundings. Safety Precautions to be taken when constructing, rigging and using stages and Boson's Chair.

- **ANCHOR, WINDLASSES & STOWAGE OF CABLE:** The constructional features of anchors and cables also Knowledge of the Glossary anchoring terms.

**Recommended Books**

1. Nicholl's Seamanship & Nautical Knowledge by A.N. Cockeroff, 2004
2. Seamanship Techniques, D. J. House, 2000
3. The Theory and Practice of Seamanship by Danton, 2002
4. Mariners Hand Book, H. M. S. O.
5. Survival at Sea by Cdre.N.F. Keens
7. Personal Safety on Ships, D O T.
8. The Collision Regulations explained by C.H. Wright,
1981
12. A Pocket guide for cold water survival, I. M.O
14. Boat Work by L. G. Taylor
15. Search & Rescue Manual, I. M. O.
16. Manual on Oil Pollution, I. M. O.
17. Marine Pollution 1973, I. M. O.
18. Safety of Life at Sea, I. M.O. 1999
19. Prevention of Marine Pollution, I. M. O.
20. Tanker Safety & Pollution Prevention, I. M. O.
21. The Inert Gas System, I. M. O.

Seamanship(Practical)-II

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

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

BOAT WORK: Power boat handling lowering hoisting.


BOAT WORK: Sails - Sailing terms, Sail boat handling

PILOT LADDER: Detailed construction of pilot ladder.

Recommended Books
1. The Theory & Practice of Seamanship by DANTON, 2002
2. Nicholas Seamanship & Nautical Knowledge by A.N. Cockerall, 2004
3. Knots splices & fancy work. By C.L. Spencer

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<th>NS-164</th>
<th>Marine Meteorology</th>
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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 Tropical Revolving Storms. Beaufort wind scale. Introduction to met-reporting.

Remarks

New Course
Revised Course
Applicable to all Batches
Recommended Books


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**NS-165 General Ship Knowledge-II**

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- **Remarks**

a) Ship Stability
   - **Tones per cm Immersion (TPC):** Definition, derivation and effect of density on TPC. Draft Calculations and amount of cargo load/discharge. Hydrostatic curves for TPC and Displacement.
   - **Simpson Rules:** Simpson Rule in the computation of areas, volumes, Centroids.

b) Ship Construction
   - **Stresses in Ship's Structures:** Stresses on Ship's Structure due to Shearing & Bending forces/moments. Causes of Stresses in a ship's structure. Stresses due to Rough Sea on various parts of Ship. Stresses Created by uneven loading, concentration of mass. Local stresses. 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:** Use, care and maintenance of cargo gear, safety requirements. Introduction to horizontal & vertical systems.
   - **Cargo Stowage Organizations:** Cargo Plans, Distribution of Cargo to avoid Stresses. Calculations of Cargo Stowage. Loading/discharging heavy lifts. Prevention of over stowage and sequence of discharge.
   - **Ventilation and Sweat:** Factors to control sweat. Natural and Forced Ventilation systems and their operation. Controlling humidity. Special Cargoes.

**Recommended Books**

5. Ship Construction Sketches and Notes by J.F. Kemp, 1976
6. Reed's Ship Construction Vol-5 by F. Stoke, Bloomsbury Academic, 2004
7. Know Your Own Ship by B. Baxter
8. Ship Stability Notes and Examples by J.F. Kemp
9. Ship Construction by D.J. Eyres
10. Thomas Stowage by Capt. O. O. Thomas
11. Cargo Work by Capt. L. D. Conway
12. Cargo Access Equipment for Merchant Ships by I.L. Buxton
13. Tanker Cargo Handling by D. Rutherford
14. Code of safe practices for Solid Build Cargoes, I.M.O.
15. Code of Safe practices for Merchant Seamen H.M.S.O.
16. Code of Safe Practice for ships carrying timber deck cargoes I.M.O.
17. Grain Rules I.M.O.
18. Emergency Procedures for ships carrying dangerous goods. I.M.O.
20. International Safety Guide for Oil Tankers and Terminals, Int.Chamber of Shipping
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**Formal Oral Presentations:** Development of Persuasive, Informative and explanatory presentations. Selection of topic, collection of information; organizing information:  
a) Introduction  
b) Body  
c) Conclusion, Rehearsal of 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 (at least four essays of each type); analysis of the essays (according to each type), finding thesis statement, topic sentences and supports etc.; Exercises: Decide a topic, collect information about the topic (brain storming, mind mapping etc.), writing first draft of the essay, feedback on content, organization and language of the essay, Peer feedback (if appropriate for the group)

**Recommended Books**
3. Writing Academic English, Oshima Alice, &Houge A. Longman / Pearson, 2006

<table>
<thead>
<tr>
<th>ED-202 Computer Programming &amp; Applications</th>
<th>New Course</th>
<th>Revised Course</th>
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<td><strong>Cr. Hrs.</strong></td>
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</table>

**Language:** definition, structures, survey of some programming
languages, special and general-purpose languages, data types, comparative study by means of primitive and composite data structures, control structures by means of expression of algorithms. Maritime related application softwares (General tools, Maple, Matlab, CAD etc.)

**Recommended Books:**
2. Object-Oriented programming in C++ (4th Edition), Sams 2001

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<tr>
<th>NS-211 Seamanship – III</th>
<th>Cr. Hrs.</th>
<th>Contact Hrs.</th>
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**SHIP MANOEUVERING AND HANDLING:** Recounting the basic principles involved in executing various maneuvers in different weather/loading conditions as well as berthing/unberthing, anchoring, turning short round at High Seas and in Confined Waters. Methods of taking on board survivors from lifeboats and/or life rafts. Executing Maneuvers in different Emergency Situations in Sea Perils.

**SEARCH AND RESCUE:** Categorizing/Combating types of distress incidents and distinguishing the various agencies that will be involved as per International Aeronautical and Maritime Search and Rescue System (IAMSAR).

**EMERGENCY PROCEDURES:** Handling different situations in emergencies such as Steering Failure, Engine/Machinery Failure, Cargo/Lashing Damages at Sea or Passengers Safety requirements. Proper usage of Ship’s Life Saving Appliances and Pyrotechnics in Emergencies. The arrangements for towing, and being taken in tow in an emergency.

**Recommended Books**
1. Nicholl's Seamanship & Nautical Knowledge by A.N. Cockeroff, 2004
2. Seamanship Techniques, D. J. House, 2000
3. The Theory and Practice of Seamanship by Danton, 2002
4. Mariners Hand Book, H. M. S. O.
5. Survival at Sea by Cdre. N. F. Keens
7. Personal Safety on Ships, D O T.
8. The Collision Regulations explained by C.H. Wright, 1981
12. A Pocket guide for cold water survival, I. M.O
14. Boat Work by L. G. Taylor
15. Search & Rescue Manual, I. M. O.
16. Manual on Oil Pollution, I. M. O.
17. Marine Pollution 1973, I. M. O.
18. Safety of Life at Sea, I. M.O 1999
19. Prevention of Marine Pollution, I. M. O.
20. Tanker Safety & Pollution Prevention, I. M. O.
### NS-212 Coastal Navigation-I

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</table>

**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**

5. Basic Costal Navigation by Convd Dixon, CD, 1985
6. Modern Chart Work by W. H. Squair, WHS, 1992
7. Publications Containing Navigational information, H M S O

☐ New Course
☐ Revised Course
☐ Applicable to all Batches
a) **Ship Stability**


**Loading/Discharging and Shifting Weights:** Effects of loading/discharging/shifting of weights on Center of Gravity. Moments about the keel and centre line to obtain metacentric height. Forces through Center of Gravity(G), Center of Buoyancy (B) on listed ships. Effective Center of Gravity(G) due to suspended weights. Increase of draft with list. Use of the Ralston stability indicator.

**Transverse Stability (Small Angles):** Movement of Center of Buoyancy in a vessel heeled. Transverse metacentre, metacentric height (GM) and righting lever (GZ). Righting moments. 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. GZ curves. Difference in typical curves for stiff and tender ships at angle of heel and angle of loll. Effect of quartering and beam on Ship's stability.

b) **Ship Construction**


c) **Cargo Handling & Stowage (Cargo Operations)**


**Recommended Books**

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

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<th>NS-214 Watch-Keeping-I</th>
<th>Cr. Hrs.</th>
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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**
1. International Light, Shape & Sound Signal by D.A. Moore, B.H. Newness, 1993,
2. The Collision Regulations fully explained by C.H. Wright, 1981
3. Basic Principles to be observed in keeping a Navigational Watch, I.M.O.
NS-215 Radar Navigation

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**Remarks**

**New Course**

**Revised Course**

**Applicable to all Batches**

**Radar Basics:** Working of Radar, Installation and components with simple block diagram. ECHO Principle and its application. Radar horizon and the factors which affect its distance from the observer.

Safety precautions necessary in the vicinity of open equipment and the radiation hazards. Raster Scan, their advantages and 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.

**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. Active and passive Radar Responders. Comparison of the chart and PPI for radar conspicuous targets. Racons and Ramarks. Passage plan and 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.


**Application of COLREG at Sea:** Rules relating to Restricted visibility. Need for early action, appreciation of delay and recognition of change by the target vessel. Dangers of assumption made on scanty information. Hazards of small alterations. Advantages of safe speed. Responsibility of vessel in restricted visibility. Alteration of course to port to be avoided when safe and practical.

**Automatic Radar Plotting Aid:** ARPA and its limitations. Construction and use of PPC & PAD in collision avoidance. Practical & Exercises

**Recommended Books**
3. Worked Examples in Radar Plotting by I. W. Bagshaw, Brown, Son & Ferguson, 1979
### ED-251 Business Communication-II

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<th>Cr. Hrs.</th>
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**Remarks**

**Letter Writing, Memos and E-mails:** Letter, memo and email formats, appropriate language and style, Developing Word Documents using MS Office, Routine official messages and correspondence Using email for routine official correspondence.

**Writing Short Reports/ Briefs/ Progress Updates:** Formats for short reports (Informative and Analytical), Informative reports (for various situations), Analytical reports (for various situations), Brief progress reports or status updates, developing reports/ updates/ briefs using visuals (tables, lists, diagrams, charts, graphs, pictures etc), Sending digital reports through emails

**Maritime English:** Maritime vocabulary, maritime phrases, maritime correspondence

**Recommended Books**


### ED-252 International and Legal Maritime Studies (ILMS)

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**Remarks**

**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.


**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.

**ISM Code:** Explains the outline of ISM Code (International Safety Management) including the background and process of establishment Introduction to Maritime Law

**Basic Working Knowledge of the Relevant IMO Conventions Concerning Safety of Life at Sea and Protection of the Marine Environment:**

a. Law of the Sea,

b. Safety:
   i. International Convention on load Lines, 1966
   ii. SOLAS, 1974 as amended
   iii. SOLAS - Subdivision and stability
   iv. SOLAS - Fire protection, detection and extinction
   v. SOLAS - LSA and arrangements (LSA Code)
   vi. SOLAS - Carriage of grain
   vii. SOLAS - Carriage of dangerous goods
   viii. The International Ship and Port Facility
   ix. Security Code (ISPS Code)
   xi. Maritime Labour Convention (MLC) 2006

**Recommended Books:**


<table>
<thead>
<tr>
<th>ED-253</th>
<th>Personal &amp; Organizational Management</th>
<th>Cr. Hrs.</th>
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- New Course
- Revised Course
- Applicable to all Batches
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<tr>
<td><strong>Managing Self</strong></td>
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<tr>
<td>1. Self-awareness &amp; Self Esteem [strengths, weaknesses, talents, values, preferences, setting goals]</td>
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<tr>
<td>2. Motivation</td>
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<tr>
<td>3. Prioritization</td>
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<td>4. Time Management</td>
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<td>5. Stress Management</td>
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<tr>
<td>6. Professional Attitude &amp; Ethics</td>
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<tr>
<td>7. Personality &amp; Nonverbal communication [first impressions, personal appearance, body language, postures, gestures. Manners/etiquettes]</td>
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<tr>
<td><strong>Managing Team and collaboration</strong></td>
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<td>8. Interpersonal Communication [Ethics, principles and problems]</td>
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<td>9. Intercultural communication/Multicultural communication [basic norms/principles]</td>
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<td>10. Avoiding and managing conflict</td>
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<tr>
<td><strong>Managing Organization</strong></td>
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<tr>
<td>11. Management Function: Planning, organizing and controlling</td>
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<tr>
<td>12. Resource Management</td>
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<td>13. Leadership and decision making</td>
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<tr>
<td><strong>Recommended Books:</strong></td>
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<tr>
<td>2. Managing Organizational Change, A Multiple Perspective Approach by Ian Palmer</td>
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</table>
### OFFICER-ON-WATCH DUTIES AT SEA & HARBOUR:
Basic principles to be observed in keeping a Navigational Watch, look out and Additional duties required under different Circumstances such as Heavy Weather, Restricted Visibility, Ice Conditions and Navigating in Coastal and Pilotage Waters. Periodic checks of Navigational Equipment.

### PREVENTION OF POLLUTION OF THE MARINE ENVIRONMENT:
All objectives refer to the Marine Pollution Protocol (MARPOL 1973/78).

### GENERAL POLLUTION:
The regulations for the prevention of pollution by oil and Classifying Different Substances as per MARPOL Annexes. 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). The regulations concerning the control of discharge of oil, and the requirements of special areas with regards to reception facilities.

### INTERNATIONAL MARITIME ORGANIZATION:
What is I.M.O., its functions and working? Members & Associate member Countries. I.M.O. Conventions, Protocols, Agreements such as STCW, MARPOL, SOLAS. Implementations required under United Nations Conventions of Law of Sea (UNCLOS).

### THE AUTOMATIC PILOT:

### KEEPING A LOG:
Rules and Regulations and common practices regarding Keeping Different Logs on board ships.

### Recommended Books
1. Nicholl's Seamanship & Nautical Knowledge by A.N. Cockeroff, 2004
2. Seamanship Techniques, D. J. House, 2000
3. The Theory and Practice of Seamanship by Danton, 2002
4. Mariners Hand Book, H. M. S. O.
5. Survival at Sea by Cdre.N.F. Keens
7. Personal Safety on Ships, D O T.
8. The Collision Regulations explained by C.H. Wright, 1981
12. A Pocket guide for cold water survival, I. M.O
14. Boat Work by L. G. Taylor
15. Search & Rescue Manual, I. M. O.
16. Manual on Oil Pollution, I. M. O.
17. Marine Pollution 1973, I. M. O.
18. Safety of Life at Sea, I. M.O. 1999
19. Prevention of Marine Pollution, I. M. O.
20. Tanker Safety & Pollution Prevention, I. M. O.
21. The Inert Gas System, I. M. O.
### NS-262 Coastal Navigation-II

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**Remarks**

**Position Line by Astronomical Observations:** Position lines, Longitude by chronometer method. Position line, Marq St. Helaire Method. The use of a single position line to approach a position making are 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**
5. Basic Costal Navigation by Convad Dixon, CD, 1985
6. Modern Chart Work by W. H. Squair, WHS, 1992
7. Publications Containing Navigational information, HMSO

### NS-263 General Ship Knowledge-IV

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**Remarks**

**a) Ship Stability**

**Inclining Experiment:** Purpose of experiment and necessary conditions.


**Longitudinal Stability:** Definitions of trim, LCF, GML, trimming moment and MCTC. Change of Trim with Density.

**b) Ship Construction**

**Stern Structure:** Stern Frames. Transom stern. Oil/Water Lubricated stern tubes. Rudders & Propellers.


**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
c) Cargo Handling & Stowage (Cargo Operations)

**Carriage of Special Cargoes:** Tallying, Check lists, Precautions, Pilferage. Unitized Cargoes. Palletized cargo. Container and handling equipment. Lashing of containers.

**Carriage of Refrigerated Cargoes:** Preparations prior loading. Frozen and Chilled cargoes. Points to inspect in a Cargo:
  a) Prior loading  
  b) During loading  
  c) During Carriage.


**Recommended Books**

5. Ship Construction Sketches and Notes by J.F. Kemp, 1976
6. Reed's Ship Construction Vol-5 by F. Stoke, Bloomsbury Academic, 2004
7. Know Your Own Ship by B. Baxter
8. Ship Stability Notes and Examples by J.F. Kemp
9. Ship Construction by D.J. Eyres
10. Thomas Stowage by Capt. O. O. Thomas
11. Cargo Work by Capt. L. D. Conway
12. Cargo Access Equipment for Merchant Ships by I.L. Buxton
13. Tanker Cargo Handling by D. Rutherford
14. Code of safe practices for Solid Build Cargoes, I.M.O.
15. Code of Safe practices for Merchant Seamen H.M.S.O.
16. Code of Safe Practice for ships carrying timber deck cargoes I.M.O.
17. Grain Rules I.M.O.
18. Emergency Procedures for ships carrying dangerous goods. I.M.O.
20. International Safety Guide for Oil Tankers and Terminals, Int..Chamber of Shipping
21. Int. Association of Ports and Harbours
NS-264 Watchkeeping-II

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Remarks

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
2. The Collision Regulations fully explained by C.H. Wright, 1981
3. Basic Principles to be observed in keeping a Navigational Watch, I. M. O.

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NS-265 Electronic Navigation Systems

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Remarks


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 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 Radar, ARPA, ECDIS etc. 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
Automatic pilots. The off course alarms.

Various logs: Dynamic pressure or Pitot log, The impeller log, The Electromagnetic log, and The Doppler log.


Voyage Data Recorder (VDR): VDR, it's working. Requirements for carrying VDR.

Recommended Books
1. Electronic Aids to Navigation by Appleyard, Published by Routledge and Kegan Paul PLC, 1988
### New Course

**GT-121** Officer Like Qualities-I

**GT-171** Officer Like Qualities-II

**GT-221** Officer Like Qualities-III

**GT-271** Officer Like Qualities-IV

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1. Integrity and Truthfulness
2. Self and General Discipline
3. Participation in Sports
4. General Appearance and Bearing
5. Punctuality
6. Participation in Extracurricular Activities
7. Power of Expression (oral & written)
8. Manners and Social Conduct
9. Cooperation

### Revised Course

**GT-122** Functional English-I

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**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**

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**Remarks**

- **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**