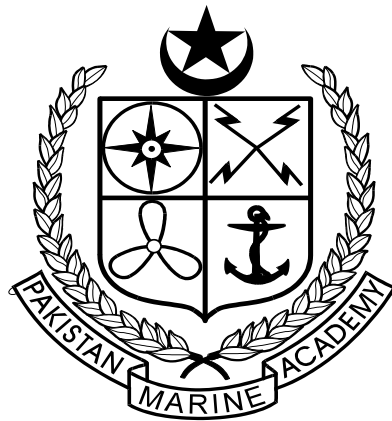


# PAKISTAN MARINE ACADEMY



## **SCHEME OF STUDIES**

### **ASSOCIATE DEGREE PROGRAMME IN**

### **MARINE ENGINEERING (ADME)**

## INTRODUCTION TO THE PROGRAMME & DETAILS

**Name of the Programme :** Associate Degree in Marine Engineering (ADME)

**Programme Nature :** Full time (Residential)

**Offered at :** Pakistan Marine Academy, Karachi

### **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 31<sup>st</sup> 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, 2016

**Duration of the Programme:** 2 years/4 semesters

## SCHEME OF STUDIES

for

### ASSOCIATE DEGREE PROGRAMME IN MARINE ENGINEERING

1<sup>st</sup> Year

**Semester-I**

Course Code	Course Title	Cr Hrs
	<b>Academic</b>	
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
	<b>Professional</b>	
EG-151	General Engineering Knowledge-I	2
EG-152	Workshop(Theory & Practice)-I	3
EG-153	Applied Mechanics-I	1
EG-154	Applied Thermodynamics-I	1
EG-155	Electro Technology-I	2
EG-156	Machine Drawing-I	3
EG-157	Internal Combustion Engines-I	1
EG-158	Naval Architecture & Ship Construction-I	1
GT-161	Computer Familiarization-I	1
	<b>General Training</b>	
GT-162	Officer Like Qualities-I	2
	<b>TOTAL</b>	<b>28</b>

**Semester-II**

Course Code	Course Title	Cr Hrs
	<b>Academic</b>	
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
	<b>Professional</b>	
EG-251	General Engineering Knowledge-II	2
EG-252	Workshop(Theory & Practice)-II	3
EG-253	Applied Mechanics-II	1
EG-254	Applied Thermodynamics-II	1
EG-255	Electro Technology-II	2
EG-256	Machine Drawing-II	3
EG-257	Internal Combustion Engines-II	1
EG-258	Naval Architecture & Ship Construction-II	1
GT-261	Computer Familiarization-II	1
	<b>General Training</b>	
GT-262	Officer Like Qualities-II	2
	<b>TOTAL</b>	<b>28</b>

## 2<sup>nd</sup> Year

### Semester-III

Course Code	Course Title	Cr Hrs
	<b>Academic</b>	
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
	<b>Professional</b>	
EG-351	General Engineering Knowledge-III	2
EG-352	Workshop(Theory & Practice)-III	3
EG-353	Applied Mechanics-III	2
EG-354	Applied Thermodynamics-III	2
EG-355	Electro Technology, Instrumentation Control System-III	2
EG-356	Machine Drawing-III	3
EG-357	Internal Combustion Engines-III	1
EG-358	Naval Architecture & Ship Construction-III	1
GT-361	Computer Familiarization-III	1
	<b>General Training</b>	
GT-362	Officer Like Qualities-III	2
	<b>Total</b>	<b>30</b>

### Semester-IV

Course Code	Course Title	Cr Hrs
	<b>Academic</b>	
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
	<b>Professional</b>	
EG-451	General Engineering Knowledge-IV	2
EG-452	Workshop(Theory & Practice)-IV	3
EG-453	Applied Mechanics-IV	2
EG-454	Applied Thermodynamics-IV	2
EG-455	Electro Technology, Instrumentation Control System-IV	2
EG-456	Machine Drawing-IV	3
EG-457	Internal Combustion Engines-IV	1
EG-458	Naval Architecture & Ship Construction-IV	1
GT-461	Computer Familiarization-IV	1
	<b>General Training</b>	
GT-462	Officer Like Qualities-IV	2
	<b>Total</b>	<b>30</b>

## **SUMMARY OF THE PROGRAMME**

- Total number of Credit Hours 116
- Duration of the Associate Degree 2 years
- Semester Duration 20 weeks
- Semesters 4
- Course Load per Semester 28-30 Cr Hrs
- Average number of Courses per Semester 14 Courses/Semester

# COURSES FOR ASSOCIATE DEGREE PROGRAMME IN MARINE ENGINEERING

## 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*, 2<sup>nd</sup> Edition, McGraw Hill (Re-print in 2005)
3. Wallace, J. M., 2004, *Study Skills in English*, 2<sup>nd</sup> Edition, Cambridge University Press

### ED-102      Pakistan Studies

Pakistan Movement – Brief; The importance of Gwadar 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*, 2<sup>nd</sup> 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. 1<sup>st</sup> and 2<sup>nd</sup> law of thermodynamics, Entropy Entropy and 3<sup>rd</sup> 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 Barns 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, 9<sup>th</sup> Edition International Student Version by david Halliday, Robert Resnick, Jearl Walker  
ISBN 9780321696892, June 2010, ©2011
2. University Physics, 13<sup>th</sup> 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 Larving Horman Shames (Fourth Edition) Prentice Hall (1997)

### **EG-151 General Engineering Knowledge-I**

**CORROSION:** Principles of corrosion, Electrolytic corrosion, Cathodic protection, Sacrificial anodes, Boiler defects (deformation, wastage cracks etc).

**BOILERS:** Various types of boilers(Scotch, water tube economizers etc), Boiler Mountings, Package Boiler, Boiler Combustion, Starting of Boiler from cold, Boiler Water Test, Water treatment, Steam distribution system. Construction of boiler gauge glass. Maintenance and repair of boiler.

**TURBINE THEORY:** Convergent and divergent theory, Impulse and Re-action turbine, Gas turbines, gearing

### **Recommended Books**

**Text:** Reed's General Engineering Knowledge, Volume-VIII, by Leslie Jackson, 4<sup>th</sup> Ed, 1986

- Reference:**
1. Marine Steam boilers by J.H. Milton , 4<sup>th</sup> Edition 1980
  2. Introduction to Marine Engineering by D.A. Taylor , 2<sup>nd</sup> Edition 1990
  3. Hydraulic Power Transmission Marine Machinery by C. M. Joy, 1975
  4. Various other reference books, periodicals and magazines.



## **EG-152      Workshop Theory & Practice-I**

INTRODUCTION TO MANUFACTURING PROCESS: Machine or process selection, Basic Concepts of manufacturing Processes, Basic concepts of Engineering Materials

FOUNDRY EQUIPMENT AND PROCEDURES: Definition of Casting Process, Tools and equipment for molding, Molding processes, Molding Sand, Gates and Risers, Sand conditioning Equipments, Sand Testing

PATTERNS FOR CASTINGS: Type of Patterns, Patterns Allowance, Patterns colors. Material used in making pattern

### **Recommended Books**

**Text:** Workshop Technology Part I, II & III by W.A.J Chapman, CBS Publishers & Distributors, 2001

**Reference:** 1. General Engineering, Paramount W.P  
2. Manufacturing Processes by My RON L Beggeman.

### **Workshop Practice-I**

BENCH WORK: Filling and drilling, Methods of metal cutting, Riveting, Tapes & dies

GRINDING: Grinding flat surfaces, Grinding of cutting tools

### **Recommended Books**

1. Workshop Technology by W.A.J Chapman, CBS Publishers & Distributors, 2001
2. General Engineering Workshop practice, Paramount
3. Models, Jobs as per drawing. Various

## **EG-153      Applied Mechanics-I**

STATICS: Resultant and equilibrate, triangle of forces, polygon of forces. Concurrent and parallel forces, Bow's Notation, component of a force, non coplanar forces. Slings, jib cranes, reciprocating engine mechanism.

KINEMATICS: Speed, linear velocity and acceleration, velocity time graph, angular velocity and acceleration, relative velocity, instantaneous centre. Projectiles.

DYNAMICS: Mass, weight, force of gravity, Newton's laws of motion. Inertia, acceleration force Atwood, machine, Fletcher's trolley, Impulse and momentum, turning moment.

### **Recommended Text Book**

1. Reeds Applied Mechanics for Engineers (Vol. II) by William Embleton, 1994

## **EG-154      Applied Thermodynamics-I**

UNITS AND COMMON TERMS: Mass, Force, weight, Works, Power, Energy, Volume, Specific volume, density, Pressure, absolute pressure, Gauge pressure, Temperature, absolute temperature, System, boundary and surroundings

HEAT: Heat and work energy, Inter conversion, Mechanical equivalent of heat, Specific Heat of solids and liquids, Calorimetry, Latent Heat, fusion and evaporation,

THERMAL EXPANSION: Expansion of metals, Linear, superficial, cubical expansions, Expansion of liquids, apparent, cubical expansion, Restricted thermal expansion.

HEAT TRANSFER: Conduction and Co-efficient of, Thermal conductivity. Conductance of composite Walls, Convection and convective heat. Transfer coefficient. Over all heat transfer Coefficient 'U' , Radiation, Stefan Boltzmann law.

### **Recommended Books**

**Text** Heat and Heat Engines for Marine Engineers by W. Embleton, (Reeds Series Vol. III), Thomas Reed, 1982

**Reference** Basic Engineering Thermodynamics by Rayner & Joel, 1996

### **EG-155 Electro Technology-I**

ELECTRIC CIRCUITS AND OHM'S LAW: Nature of electricity, Conductors and insulators, Resistance, Units of Resistance, Internal Resistance circuits, Law of Resistance and ohm's law

SOURCES OF ELECTRICITY, ELECTRICAL UNITS WORK, POWER, ENERGY: Thermocouple, Photoelectric effect photocell, Absolute and gravitational units, M.K.S. system, Work power and Energy.

ELECTRIC CIRCUITS NET WORK THEOREMS: Conductance, Conductivity-effect of Temperature on resistance, Value of ALPHA at different temperature, Resistance with temperature, Rheostat, Potentiometer, Kirchhoff's Current, Law – Kirchhoff's voltage law.

ELECTRIC CURRENT AND CIRCUITS: Division of currents in parallel, Circuits Grouping of cells-theory of shunt, Ammeters-sources of currents, Parallel, circuits complex circuits, Whetstone bridge

### **Recommended Books**

**Text:** Reed's Basic Electro Technology for Engineers by Edmund G. H. Kraal, (Vol. VI.), 1996

#### **Reference:**

1. A Text Book of Electrical Technology(S.I.Units) by B.L. Theraja, S. Chand & Company Ltd, 2012
1. Reed's Instrumentation and Control System by L. Jackson & Thoman D. Morton, 1999

### **EG-156 Machine Drawing-I**

BASIC KNOWLEDGE AND TECHNIQUE: Lettering Figuring and dimensioning, Cords Arcs, Tangents Helix, Involutives and Cycloids. Development of Cone and Pyramids.

ISOMETRIC PROJECTIONS: Conception of isometric projection. First Angle and third angle view.

FREE HAND SKETCHING FROM MODELS AND SETTING OUT TEMPLATES: V – Block, Nuts, Bolts and rivets. Various setting out templates.

### **Recommended Books**

**Text:** Engineering Drawing Book for Marine Engineers by H.G. BECK (Reed's Vol.III), 1978

**Reference:** Mac gibbon pictorial Drawing book by James G Holburn, James Munro, Limited, 1965

## **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, &Houge A., 2006, Writing Academic English, Longman / Pearson

### **ED- 202 Islamic Studies/Ethical Behaviour**

**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 VALUSES 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 Qayyum Natiq, 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- uddin Noori
5. Toward understanding Islam (Diniyat) by Abul Alla Maudoodi
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., 3<sup>rd</sup> Edition, Reprinted in 1974
2. "Philosophy: the Basic" Warburton N., Routledge, London, 4<sup>th</sup> 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 device s, The effects of dirt ad moisture, Principles of electric generations and motors, Outline of shipboard power supplies, Emergency sources, safety precautions for electrical equipment's including spar4s 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)-II**

#### **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, 9<sup>th</sup> Edition International Student Version by David Halliday, Robert Resnick, Jearl Walker  
ISBN 9780321696892, June 2010, ©2011
2. University Physics, 13<sup>th</sup> 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 -204 Mathematics-II**

Differential Calculus Functions, Graph of a function, Limit of function, Continuity of function, Gradient and rate of change, Maximum and minimum points, L'Hopital's 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

### **EG-252 Workshop Theory & Practice-II**

PRODUCTION OF IRON AND STEEL: Blast furnace, Cupola furnace. Electric induction furnace. Type of Cast iron. Effect of adding alloying elements.

WELDING PROCEDURES : Historical Development, General welding conditions, Welding joints, Electrical Resistance Welding Processes, Gas Welding processes.

HOT WORKING OF METAL: Rolling, Hammer or Smith Forging, Drop Forging, Press & Upset Forging, Pipe & Tube Manufacture.

COLD WORKING OF METAL: Effect of Cold Working, Advantages & Limitation, Cold working processes

### **Recommended Books**

**Text:** Workshop Technology Part I, II & III by W.A.J Chapman, CBS Publishers & Distributors, 2001

**Reference:** 1. General Engineering, Paramount W.P  
2. Manufacturing Processes by My RON L Beggeman.

### **Workshop Practice-II**

WELDING, SOLDERING AND BRAZING: Gas Welding, Electric Welding, Tools and methods for Soldering and brazing

DRILLING: Drilling machines speeds and feed, different type of drills and their uses.

### **Recommended Books**

1. Workshop Technology by W.A.J Chapman, CBS Publishers & Distributors, 2001
2. General Engineering Workshop practice, Paramount
3. Models, Jobs as per drawing. Various

### **EG-253 Applied Mechanics-II**

WORK, POWER AND ENERGY: Work graphical representation, power, power transmission, Transmission of power by belt, transmission of power by gear. Kinetic and potential energy.

CENTRIPETAL ACCELERATION: Centripetal and centrifugal force, Side skidding and overturning of vehicles. Balancing conical pendulum governors, Stress in flywheel rims. Simple harmonic motion, Simple Pendulum, vibration of spring.

SLIDING FRICTION: Coefficient of friction inclined planes. Parallel forces to pull forces up and down, horizontal and least forces. Efficiency of square thread.

## Recommended Text Book

1. Reeds Applied Mechanics for Engineers (Vol. II) by William Embleton, 1994

### EG-254 Applied Thermodynamics-II

LAW OF PERFECT GASES: Boyle's Law, Charles's Law. Characteristic gas equation. Specific and Universal gas constant. Avogadro's Law and Dalton's law of Partial pressures. Specific heats of gases Relationship and Ratio of specific heats. Internal Energy and non-flow energy equation

EXPANSION AND COMPRESSION OF PERFECT GASES: Isothermal, adiabatic Polytropic process, Relationship between pressure, temperature and volume in adiabatic and polytropic processes. Work transfer in non flow process (closed system, Relationship between heat energy supplied and work done.

INTERNAL COMBUSTION ENGINE ELEMENTARY PRINCIPLES: Cycles of operation, 4 stroke and 2 stroke engines Timing diagrams. Indicator diagrams and engine indicator. Mean effective pressure, Indicated and brake power, thermal efficiency and specific fuel consumption. IDEAL CYCLES: Ideal cycles and ideal thermal efficiency. Constant volume, diesel, dual combustion and Carnot Cycle

### Recommended Books

**Text** Heat and Heat Engines for Marine Engineers by W. Embleton, (Reeds Series Vol. III), Thomas Reed, 1982

**Reference** Basic Engineering Thermodynamics by Rayner & Joel, 1996

### EG-255 Electro Technology-II

ELECTRO CHEMISTRY: Electrolysis, Electrolytic cells, The Electrochemical equivalents, Primary and Secondary cells, the simple voltaic cell. Constructional details of batteries.

MAGNETISM – ELECTROMAGNETISM: The magnetism and magnetic fields, Flux and flux density, electro magnetism, Magnetic circuits. Permeability, Relative Permeability ( $\mu_r$ ), absolute permeability ( $\mu_0$ ) Laws of Magnetic force, Field strength, Relation between B,H and I , Weber and Ewing Molecular theory, Diamagnetic para magnetic materials, Magnetic Hysteresis.

ELECTROMAGNETIC INDUCTION- AC. FUNDAMENTALS: Relation between Magnetic and Electricity production of induced emf and current. Faraday's Laws of Electro-magnetic induction Direction of induced emf and current-Lenz's Law Dynamically induced emf-Statically induced emf-self induction Mutual induction.

### Recommended Books

**Text:** Reed's Basic Electro Technology for Engineers by Edmund G. H. Kraal, (Vol. VI.), 1996

**Reference:**

2. A Text Book of Electrical Technology(S.I.Units) by B.L. Theraja, S. Chand & Company Ltd, 2012
2. Reed's Instrumentation and Control System by L. Jackson & Thoman D. Morton, 1999

## **EG-256          Machine Drawing-II**

SECTION OF SOLIDS AND SECTIONAL VIEW OBJECTS: Machine Block. Fuel control lever. Bilge suction strainer, Crane hook, cylinder, Relief valve.

DESCRIPTION VIEWS: Sectional view of different, Machinery parts.

DETAILS OF MACHINERY PARTS ASSEMBLY DRAWING: Cylinder relief valve, crane. Hook, control valve. Ship's discharge valve, sealed ball joint.

### **Recommended Books**

**Text:**                Engineering Drawing Book for Marine Engineers by H.G. BECK (Reed's Vol.III), 1978

**Reference:**        Mac gibbon pictorial Drawing book by James G Holburn, James Munro, Limited, 1965

## **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**

Gases: Gas laws ,Vanderwaal's equation, gas equation, critical phenomenon, liquefaction of gases, specific heat (molar heat capacity)

Liquid and solutions: 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, 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 treatment: 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: 8<sup>th</sup> Edition, 2008, Houghton Mifflin Company, New York.

### Reference Books:

1. Petrucci, Harwood, Herring, Principles and Modern Applications, General Chemistry 9<sup>th</sup> Edition, 2006
2. B.S.Bhal, G.D. Tulli, Avum Bahl, Essential of Physical Chemistry (Multi Colour Edition)
3. R. Goplan, Engineering Chemistry, 3<sup>RD</sup> 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: 7<sup>th</sup> Edition: 2005

## ED-304

## MATHEMATICS-III

**PLANE CURVES-I:** Equation of 2<sup>nd</sup> 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)

## EG-351 General Engineering Knowledge-III

**PNEUMATIC SYSTEM:** Basic methods of air compression, Reciprocating, rotary vane, rotary

Screw type of air compressor. Condition of air, oil removal, Moisture separators, Vortex Type, Directional Change Type, Coagulating Type. Uses of high-pressure and low pressure air, General Principles of Pneumatic Control, Flapper Nozzle, Booster relay, Control Valves, Diaphragm Motor

FUEL TECHNOLOGY: Solid fuels, Liquid fuels and fuel plant technology, Testing of liquid fuels and oils(Specific gravity, viscosity, calorific value, flash point, classification of dangerous fuels, limits of flammability, explosive limit, HEL, LEL, TLV, Fire point etc. Viscometer, viscosity of fuel controlled automatically. Theory of combustion of fuel, Air for Combustion, Clean Air Act. Precautions while fuel oil bunkering, Oil in Navigable Waters Act. Requirements for I.O.P.P. certification

STEERING GEARS: Steering and receiving telemotors. By pass valve, Telemotor fluid, charging system, Steering rules, Heleshaw pump, Electro Hydraulic steering gears(four Ram Systems), All electric steering gears

### **Recommended Books**

**Text:** Reed's General Engineering Knowledge, Volume-VIII, by Leslie Jackson, 4<sup>th</sup> ed, 1986

**Reference:**

1. Marine Steam boilers by J.H. Milton , 4<sup>th</sup> Edition 1980
2. Introduction to Marine Engineering by D.A. Taylor , 2<sup>nd</sup> Edition 1990
3. Hydraulic Power Transmission Marine Machinery by C. M. Joy, 1975
4. Various other reference books, periodicals and magazines.

### **EG-352 Workshop Theory-III**

DRILLING AND BORING MACHINES: Introduction to Drilling Boring and Reaming. Classification of Drilling Machine, Twist Drills, Kinds of Drills, Drill Performance.

LATHE MACHINE: Classification of Lathes, Lathes Construction & Operation, Taper Turning. Lathe Tools, Grinding & Setting Tools Processes.

THREAD & THREAD CUTTING: Types of screw Threads, Methods of making Threads, Cutting Threads on a Lathe, Taps & Dies

GRINDING & GRINDING MACHINE: Introduction to Grinding, Introduction to Abrasive, Manufacture of Grinding Wheels, Bonding Processes, Grinding Wheel Selections, Grinding Machines, Honing and Lapping

### **Recommended Books**

**Text:** Workshop Technology Part I, II & III by W.A.J Chapman, CBS Publishers & Distributors, 2001

**Reference:**

1. General Engineering, Paramount W.P
2. Manufacturing Processes by My RON L Beggeman.

### **Workshop Practice-III**

LATHE MACHINE: Mechanism of lathe. Metal turning, Screw cutting, Taper turning and other uses of lathe.

### **Recommended Books**

1. Workshop Technology by W.A.J Chapman, CBS Publishers & Distributors, 2001
2. General Engineering Workshop practice, Paramount
3. Models, Jobs as per drawing. Various

### **EG-353 Applied Mechanics-III**

MOMENTS: Moment of a force. first moment and applications. Couple, centre of gravity. Second moments, theorem of parallel axis.

LIFTING MACHINES: Velocity Ratio, Mechanical. Advantage, efficiency. Rope pulley blocks.

Wheel and axle. Differential pulley Blocks, Worm and worm wheel, Screw jack, warwick screw.

Screw jack, Hydraulic jack.

STRESS AND STRAIN: Stress and strain, Hook's law. Working stress, Factor of safety. Modulus of elasticity, tensile test. Compound bars. Restricted expansion. Resilience, Suddenly applied and shock loads.

### Recommended Text Book

1. Reeds Applied Mechanics for Engineers (Vol. II) by William Embleton, 1994

### EG-354 Applied Thermodynamics-III

RECIPROCATING AIR COMPRESSOR: Reciprocating air Compressor. Compression ratio, compression and delivery periods. Effect of clearance volume. Volumetric efficiency. P-V Diagram Work done on compressor per cycle and compressor power. Multistage compression, effect of inter-cooling, calculation on volume delivered.

STEAM: Saturation pressure and temperature of steam, effect of pressure on saturation temperature. Dry saturated steam, wet steam, dryness fraction. Calculation of specific enthalpy and specific. Superheated steam, use of steam table to determine properties of superheated steam. effect of throttling, determination of dryness fraction after throttling, use of throttling and separating calorimeter to determine dryness fraction.

RECIPROCATING STEAM ENGINE: General construction and working cycle. Indicator diagram. Mean effective pressure, power. Thermal efficiency. Rankine cycle.

TURBINES: Impulse and reaction turbine. Thermal efficiency of steam turbine. Expansion of steam through Nozzles. Velocity diagram for impulse turbine, Force on blades and power developed. Vector diagram for reaction turbine, Force on blades and power developed.

### Recommended Books

**Text** Heat and Heat Engines for Marine Engineers by W. Embleton, (Reeds Series Vol. III), Thomas Reed, 1982

**Reference** Basic Engineering Thermodynamics by Rayner & Joel, 1996

### EG-355 Electro Technology, Instrumentation & Control Systems-III

#### Electro Technology(70 %)

CAPACITANCE – INDUCTANCE: Inductance, Inductive, Reactance, Circuit with Pure resistance, Inductor In series-inductor in Parallel. Capacitive Reactance, type of Capacitors – Circuits with Pure capacitance, Capacitors in parallel, Charging and discharging of capacitors-time constant.AC.

MACHINE, AC. CIRCUITS AND SYSTEMS: Ac. Machine construction, Fleming's right hand rule, Maxwell's corkscrew rule.The Ac-Wave form cycle. Time Period-frequency – Amplitude Phase – Phase difference –Root mean Square (R.M.S.) Value-Average value-Form Vector – Power factor, Vector Representation of alternating Quantities. Power factor true Circuits, Power factor true Power, apparent power, Power factor improvement Kw, KVA and KVAR power factor Improvement. Electrical distribution system A/C.

THE D.C. MACHINES: General construction. The D.C. generator etc. Characteristics and Current effect. Types of generators Permanent magnet and self excited type, series wound

Generator-Shunt Wound Generators-Compound wound Generator-Separately Excited Generators-Load Characteristics. Electrical distribution system D/C.

### **Instrumentation And Control Systems-I(30 %)**

HISTORY CONTROL THEORY FUNDAMENTALS: History – Economy – Safety Why automation is necessary, Advantages and Disadvantages of automation. Nomenclature of the Instruments, sensors, Telemetry Transducers. Digital and analogue Instruments. Measuring Element, Detecting Element, Open loop and closed loop system.

TEMPERATURE MEASUREMENT: Bimetallic Thermometer, Resistance Thermometer, Thermistor Thermocouple Transducers.

PRESSURE MEASUREMENT: Water Manometer, Mercury Thermometer, pressure Gauge (Bourdon) Piezo electric Transducers.

LEVEL MEASUREMENT: Capacitor Level Gauge, Igema, Remote water level indicator, Pneumator Level indicator.

#### **Recommended Books**

**Text:** Reed's Basic Electro Technology for Engineers by Edmund G. H. Kraal, (Vol. VI.), 1996

#### **Reference:**

1. A Text Book of Electrical Technology(S.I.Units) by B.L. Thrawja, S. Chand & Company Ltd, 2012
2. Reed's Instrumentation and Control System by L. Jackson & Thoman D. Morton, 1999

### **EG-356 Machine Drawing-III**

TYPICAL FIRST ANGLE ORTHO-GRAPHIC PROJECTION ASSEMBLY OF VARIOUS PARTS:

Parallel slide stop valve. Feed check valve. Starting air pilot valve. Automatic valve.

#### **Recommended Books:**

**Text:** Engineering Drawing Book for Marine Engineers by H.G. BECK (Reed's Vol.III), 1978

**Reference:** Mac gibbon pictorial Drawing book by James G Holburn, James Munro, Limited, 1965

### **EG- 357 Internal Combustion Engines Knowledge(ICEK)-I**

INTERNAL COMBUSTION ENGINE: Basic Principle, Four-Stroke Diesel Engine. Various Parts and operation. Two-Stroke Diesel Engine. Various Parts and operation Difference between Petrol & Diesel Engine, Timing Diagrams of 4 & 2 Stroke D/Es.

STRUCTURE AND TRANSMISSION: Bed plates, column and entablature of various Diesel Engines. Crank Shafts. Cylinder Liners – Material Wear- down, Piston and Cross Heads

FUEL INJECTION: Various types of Fuels and Oils. Storage of Fuels. Fuel Injection (Atomization, Turbulence and penetration), Fuel Injectors and Fuel System

SCAVENGING AND SUPER CHARGING: Scavenging and supercharging. Comparison of Scavenging Process of Four & Two Stroke Diesel Engines, Types of super charging

Exhaust gas turbo charger, Basic Principles, Various parts, Function/Operation.

STARTING AND REVERSING: Means of starting Diesel engines, Starting air receiver. Safety Features fitted in the System. Various Components in the Systems.

CONTROLS: Function of Governor. Bridge control and unattended Machinery.

### Recommended Books

- Text:** 1. Reed's Motor Engineering Knowledge by Thomas Morton, 1994
- Reference:** 1. Marine Diesel Engine by C.C. Pounder, 5<sup>th</sup> Ed. 1972  
2. Marine Diesel Oil Engines Southern by Southern, 1968
3. Running and Maintenance of Marine Diesel Engines by John Lamb, 1967 4.  
Various Magazines, Periodicals. Engine Manual and Other Marine  
Engineering books for reference.

## EG-358 Naval Architecture & Ship Construction-I

### Naval Architecture

HYDROSTATICS: Density, relative density, Pressure exerted by liquid. Load on an immersed plane, Centre of Pressure

DISPLACEMENT T.P.C., COEFFICIENT OF FORMS: Arch med's Principle. Displacement, Buoyancy, Tones per centimeter immersion, Coefficient of Forms. Similar Figures.

CALCULATION OF AREA AND VOLUME: Simpson's First Rule.

CENTRE OF GRAVITY: Vertical centre of Gravity, Longitudinal centre of Gravity, Shift in Centre of Gravity due to addition of masses. Shift in centre of Gravity due to movement of masses. Effect of suspended Mass.

STABILITY OF SHIPS: Righting moment and righting lever. Transverse Metacentre, Metacentric Diagram, Inclining Experiment

TRIM: Change in mean draught due to change in density. Change in mean draught due to bulging.

RESISTANCE: Frictional Resistance, Residuary Resistance, Admiralty Coefficient. Fuel Coefficient.

PROPELLERS: Diameter and pitch or Propeller. Theoretical speed. Apparent slip and true slip. Thrust. Relation between powers, Measurement of pitch.

### Recommended Books

**Text:** Reed's Naval Architecture For Marine Engineers by E.A Stoke, 1991

### Ship Construction

SHIP TYPES AND TERMS: Passenger and Cargo Ships oil tankers, bulk carriers, colliers and container ships, Terms in general use.

STRESS IN SHIP: Structural stresses, Hogging and sagging. Local stresses, docking, Panting and pounding.

**WELDING AND SECTIONS USED:** Electric arc Welding and Riveting, Welding positions and sections used

**BOTTOM AND SHIPS FRAMING:** Double bottom constructions, duct keel and bilge keel. Frames and Beams

**SHELL AND DECKS:** Deck and Shell plating, Hatchways and hatch covers.

**BULKHEADS AND DEEP TANKS:** Water Tight doors and bulkheads, Non Water Tight bulkhead and pillars.

**FORE-END ARRANGEMENTS:** Steam plating and arrangements, To resist painting. Bulbous bow. Anchor and cable arrangement.

**AFTER AND ARRANGEMENTS:** Transom stern and stern frame. Rudders. Spectacle frame and propeller frames. Different types of propeller

**DIFFERENT TYPES OF SHIPS:** VLCC Tankers and liquid petroleum gas carries. OBO (ORE/Bulk/Oil) carriers and colliers

**FREE BOARD, TONNAGE AND CLASSIFICATION:** Freeboard marking and tonnage. Classification of ships, Life saving appliances, Surveys.

### **Recommended Books**

**Text:** Reed's Ship Construction for Marine Engineers by E.A. Stoke, 1999

**Reference:** Ships Construction Sketches by Kemp and Young, Butter Worth 1997

### **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 (10<sup>th</sup> 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: 8<sup>th</sup> Edition, 2008, Houghton Mifflin Company, New York.

##### **Reference Books:**

6. Petrucci, Harwood, Herring, Principles and Modern Applications, General Chemistry 9<sup>th</sup> Edition, 2006
7. B.S.Bhal, G.D. Tulli, Avum Bahl, Essential of Physical Chemistry (Multi Colour Edition)
8. R. Goplan, Engineering Chemistry, 3<sup>RD</sup> 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: 7<sup>th</sup> 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

## EG-451 General Engineering Knowledge-IV

**PNEUMATIC SYSTEM:** Basic methods of air compression, Reciprocating, rotary vane, rotary

Screw type of air compressor. Condition of air, oil removal, Moisture separators, Vortex Type, Directional Change Type, Coagulating Type. Uses of high-pressure and low pressure air, General Principles of Pneumatic Control, Flapper Nozzle, Booster relay, Control Valves, Diaphragm Motor

**FUEL TECHNOLOGY:** Solid fuels, Liquid fuels and fuel plant technology, Testing of liquid fuels and oils (Specific gravity, viscosity, calorific value, flash point, classification of dangerous fuels, limits of flammability, explosive limit, HEL, LEL, TLV, Fire point etc. Viscometer, viscosity of fuel controlled automatically. Theory of combustion of fuel, Air for Combustion, Clean Air Act. Precautions while fuel oil bunkering, Oil in Navigable Waters Act. Requirements for I.O.P.P. certification

**STEERING GEARS:** Steering and receiving telemotors. By pass valve, Telemotor fluid, charging system, Steering rules, Heleshaw pump, Electro Hydraulic steering gears (four Ram Systems), All electric steering gears

**PUMPS AND PUMPING SYSTEM:** Types of pumps, Reciprocating, Centrifugal, Screw, Rotary Vane, Gear pump), Emergency bilge pump, Bilge injection valve, Suction Head and Cavitations, Oily water Separator, Bilge and Ballast System, Domestic water hydrosphere system. Centralized priming system. Centralized cooling system. Rules for Bilge & ballast system. Maintenance and repair of pumps.

**SHAFTING AND LUBRICATION:** Stern tubes oil and water lubricated. Thrust Block, its lubrication, film lubrication, and boundary lubrication.

**REFRIGERATION:** Theoretical Principles, Properties of actual Refrigerant. Various compression system, Condenser, evaporator, valves, Insulations, Air conditioning, Humidity and Dew point, Maintenance and repair of refrigeration plant.

**FIRE:** Principle, prevention and Precaution of fires different types of fire extinguishing medium Systems used in extinguishing fire. Fire detection system. Fire man out fit. Breathing Apparatus set

**OIL PURIFICATION:** Microbial degradation of lub. Oil, Gravitation, separation filtration of oil fuels and Lubricating oil, Various fitting on services & Setting tanks.

## Recommended Books

**Text:** Reed's General Engineering Knowledge, Volume-VIII, by Leslie Jackson, 4<sup>th</sup> ed, 1986

**Reference:** 1. Marine Steam boilers by J.H. Milton, 4<sup>th</sup> Edition 1980

2. Introduction to Marine Engineering by D.A. Taylor , 2<sup>nd</sup> Edition 1990
3. Hydraulic Power Transmission Marine Machinery by C. M. Joy, 1975
4. Various other reference books, periodicals and magazines.

#### **EG-452 Workshop Theory-IV**

**ELECTRO FORMING AND COATING PROCESS:** Material used, Advantages and limitations, Electro plating processes, Hard Surfacing Techniques.

**INSPECTION MEASURING INSTRUMENTS AND GAUGES:** Introduction to quality control, Types of fits, Tolerance & allowance, Classification of Measuring Instruments, Linear, Angular Measurement, Surface measurements, Classification of gages, Statistical quality control

**HEAT TREATMENT OF STEEL :** Introduction to heat Treatment process. Annealing & Normalizing, Hardening & its classification, Tempering, Engineering applications.

#### **Recommended Books**

**Text:** Workshop Technology Part I, II & III by W.A.J Chapman, CBS Publishers & Distributors, 2001

- Reference:**
1. General Engineering, Paramount W.P
  2. Manufacturing Processes by My RON L Beggeman

#### **Workshop Practice-IV**

**MAINTENANCE AND REPAIR OF MARINE MACHINERIES:** Repair of Valves and pipe Fitting, Repair of pumps, Repairs of diesel Engines, Boiler and Boiler mountings, Dismantling & Assembly of Diesel Engine (Group Task).

#### **Recommended Books**

1. Workshop Technology by W.A.J Chapman, CBS Publishers & Distributors, 2001
2. General Engineering Workshop practice, Paramount
3. Models, Jobs as per drawing. Various

#### **EG-453 Applied Mechanics-IV**

**BENDING OF BEAMS:** Conditions of equilibrium, Simply supported beams and Cantilever. Concentrated and distributed Loading. Shearing Force and bending. Moment diagrams. Neutral Axis. Fundamental bending equation . Modulus of section. Deflection. Combined bending and direct stress.

**TORSION OF SHAFTS:** Fundamental torsion equation , Relationship between torque, Stress and power. Torsional resilience. Maximum and mean Torque. Coupling bolts. Reciprocating engine mechanism

**HYDRAULICS:** Density, specific gravity. Volumetric expansion. Pressure head, pressure on Immersed surfaces. Transmission of power, Centre of pressure.

**HYDRO DYNAMICS:** Flow through pipes. Bernoulli's equation. Effect of Friction. Meter Coefficient, Impact of water Jet. Centrifugal pump.

#### **Recommended Text Book**

1. Reeds Applied Mechanics for Engineers (Vol. II) by William Embleton, 1994

#### **EG-454 Applied Thermodynamics-IV**

STEAM BOILERS: Types of boilers and their construction. Capacity and equivalent evaporation. Boiler efficiency. Boiler feed water, dissolved solids and analysis of feed water.

COMBUSTION OF FUELS: Combustion of fuel, composition of fuel and chemical reactions.

Higher and lower and lower calorific values of a fuel and analytical method of determining it. Calculation of O<sub>2</sub> required for complete combustion. Theoretical minimum air and excess air supply. Composition of flue gases Orsat apparatus.

REFRIGERATION: Refrigeration cycle. Reversed heat engine or Heat pump cycle. Carnot refrigeration cycle and its coefficient of performance, vapour compression, refrigeration cycle, basic components and refrigerant. Pressure enthalpy diagram and use of refrigerant properties tables. Refrigerating effect and refrigeration capacity, power of compressor, Refrigerant flow rate, C.O.P of refrigerator and condenser capacity.

NUMERICAL PRACTICE: Numerical practice.

### **Recommended Books**

**Text** Heat and Heat Engines for Marine Engineers by W. Embleton, (Reeds Series Vol. III), Thomas Reed, 1982

**Reference** Basic Engineering Thermodynamics by Rayner & Joel, 1996

## **EG-455 Electro Technology, Instrumentation & Control Systems-IV**

### **Electro Technology(70 %)**

D. C MOTORS: Motor principle – Comparison of Generator and Motor Action, Fleming Right hand Rule, Significance of back emf, Voltage, current and speed Equation – Torque – speed of D.C

Motor-Characteristics of Series Motors Characteristics of shunt Motors-Compound.

TRANSFORMERS: Working Principle of transfer, Transformer construction core, Type transformer – shell type Transformer – E.M.F. equation-Voltage transformation relation, Transformer test, open circuit-Short circuit – estimation of small Transformers – Losses in Transformers-Efficiency – Auto transformers.

TERMIONIC AND SEMI CONDUCTOR DIODE: Thermionic devices – semi conductor, Diode, static characteristic, Diode as rectifier, intrinsic, Conductivity, Extrinsic conductivity, N – type Ge, P- type Ge, the Pn-Junction, forward bias, Reverse bias, Zener diode Transistor.

### **Instrumentation And Control Systems-II(30 %)**

OTHER MEASUREMENT: Speed, tachogenerator, photo electric cell, photo transistor, oil in water Sensor, smoke density detector, flame Gas analysis, oxygen analyzer, different Devices and instruments used in Automation, hydraulic, electric and Electronic circuits.

TELEMETERING: Force balance transducer (pneumatic), Electro pneumatic transducers, Variable contact resistance Transducer.

CONTROL THEORY FUNDAMENTALS: Automatic control system, types of Actual bridge control, oil purification System, instrumentation, calibration Testing and adjustment. Operation testing and fault rectification of automatic control system and alarm panel.

### **Recommended Books**

**Text:** Reed's Basic Electro Technology for Engineers by Edmund G. H. Kraal, (Vol. VI.), 1996

#### **Reference:**

1. A Text Book of Electrical Technology(S.I.Units) by B.L. Thrawja, S. Chand & Company Ltd, 2012
2. Reed's Instrumentation and Control System by L. Jackson & Thoman D. Morton, 1999

### **EG-456 Machine Drawing-IV**

TYPICAL ORTHOGRAPHIC PROJECTION DRAWINGS: Starting air valve. Connecting rod and bearing. Reducing valve. Four stroke piston.

### **Recommended Books**

**Text:** Engineering Drawing Book for Marine Engineers by H.G. BECK (Reed's Vol.III), 1978

**Reference:** Mac gibbon pictorial Drawing book by James G Holburn, James Munro, Limited, 1965

### **EG- 457 Internal Combustion Engines Knowledge(ICEK)**

VARIOUS SYSTEM IN DIESEL ENGINE: Jacket cooling water system, Piston cooling water system, Sea water cooling system, Lubricating oil system, Fuel oil system

FUEL OIL PROPERTIES, PURIFICATION STORAGE ETC.: Various physical and chemical properties of diesel and heavy fuel oil used on board. Purification and clarification of fuel oil. Maintenance and repair of purifiers. Storage of fuel on board.

STARTING AIR COMPRESSORS: Starting air compressors two stage and three stage. Parts of starting air compressor. Air Reservoir & mountings. Maintenance and repair of air compressor.

MEDIUM SPEED DIESEL ENGINES: Maintenance of Medium speed Diesel Engines. Developments of medium speed emergency procedure of diesel engines.

MISCELLANEOUS: Safety devices in diesel engines. Fuel Consumption and efficiency of Diesel engines. Heat balance Power developed and power card, draw card light spring diagram. Maintenance and repairs of diesel engine. Procedure to be adopted for operating main engine under emergency condition.

### **Recommended Books**

**Text:** 1. Reed's Motor Engineering Knowledge by Thomas Morton, 1994

#### **Reference:**

1. Marine Diesel Engine by C.C. Pounder, 5<sup>th</sup> Ed. 1972
2. Marine Diesel Oil Engines Southern by Southern, 1968
3. Running and Maintenance of Marine Diesel Engines by John Lamb, 1967
4. Various Magazines, Periodicals. Engine Manual and Other Marine Engineering books for reference.

### **EG-458 Naval Architecture & Ship Construction**

#### **Naval Architecture**

HYDROSTATICS: Density, relative density, Pressure exerted by liquid. Load on an immersed plane, Centre of Pressure

DISPLACEMENT T.P.C., COEFFICIENT OF FORMS: Arch med's Principle. Displacement, Buoyancy, Tones per centimeter immersion, Coefficient of Forms. Similar Figures.

CALCULATION OF AREA AND VOLUME: Simpson's First Rule.

CENTRE OF GRAVITY: Vertical centre of Gravity, Longitudinal centre of Gravity, Shift in Centre of Gravity due to addition of masses. Shift in centre of Gravity due to movement of masses. Effect of suspended Mass.

STABILITY OF SHIPS: Righting moment and righting lever. Transverse Metacentre, Metacentric Diagram, Inclining Experiment

TRIM: Change in mean draught due to change in density. Change in mean draught due to bulging.

RESISTANCE: Frictional Resistance, Residuary Resistance, Admiralty Coefficient. Fuel Coefficient.

PROPELLERS: Diameter and pitch or Propeller. Theoretical speed. Apparent stop and true slip. Thrust. Relation between powers, Measurement of pitch.

### **Recommended Books**

**Text:** Reed's Naval Architecture For Marine Engineers by E.A Stoke, 1991

### **Ship Construction**

SHIP TYPES AND TERMS: Passenger and Cargo Ships oil tankers, bulk carriers, colliers and container ships, Terms in general use.

STRESS IN SHIP: Structural stresses, Hogging and sagging. Local stresses, docking, Panting and pounding.

WELDING AND SECTIONS USED: Electric arc Welding and Riveting, Welding positions and sections used

BOTTOM AND SHIPS FRAMING: Double bottom constructions, duct keel and bilge keel. Frames and Beams

SHELL AND DECKS: Deck and Shell plating, Hatchways and hatch covers.

BULKHEADS AND DEEP TANKS: Water Tight doors and bulkheads, Non Water Tight bulkhead and pillars.

FORE-END ARRANGEMENTS: Steam plating and arrangements, To resist painting. Bulbous bow. Anchor and cable arrangement.

AFTER AND ARRANGEMENTS: Transom stern and stern frame. Rudders. Spectacle frame and propeller frames. Different types of propeller

DIFFERENT TYPES OF SHIPS: VLCC Tankers and liquid petroleum gas carries. OBO (ORE/Bulk/Oil) carriers and colliers

FREE BOARD, TONNAGE AND CLASSIFICATION: Freeboard marking and tonnage. Classification of ships, Life saving appliances, Surveys.

### **Recommended Books**

**Text:** Reed's Ship Construction for Marine Engineers by E.A. Stoke, 1999

**Reference:** Ships Construction Sketches by Kemp and Young, Butter Worth 1997

**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