

Three-Year B. Sc. Degree Program in Nautical Science

NEP 2020



Department of Nautical Science
School of Maritime Studies
The Neotia University
Sarisa, D.H. Road, 24 Pgs (South)
West Bengal – 743368

Three-Year B.Sc. Degree Program in Nautical Science

PROGRAMME OBJECTIVES:

- Prepare the graduates with a solid foundation in Nautical Science and Technology for a successful career in Merchant Navy Navigating Officer.
- Train the students to solve problems in Nautical Science and related areas by computation and experimentation, including understanding basic mathematical and scientific principles.
- Inculcate students with professional and ethical attitude, effective communication skills, team work skills and multidisciplinary approach.
- Provide opportunity to the students to expand their horizon beyond maritime education.
- Develop the students to adapt to the rapidly changing environment in the areas of Nautical science and scale new heights in their profession through lifelong learning.

PROGRAMME OUTCOMES:

On successful completion of the programme, the graduates will be able to:

- PO1:** Apply knowledge of Maritime courses and analyse a problem, identify, formulate and solve nautical problems using basic fundamental principles of mathematics and science.
- PO2:** Communicate effectively with shipping community for presentation, documentation of reports adopting the new design standards.
- PO3:** Assess the local and global impact of maritime situations on individuals, organization and society and the consequent responsibilities relevant to their professional nautical practice.
- PO4:** Comprehend safety, security and management principles and apply these to one's own work, as a member and leader in a team, to efficiently carry out shipboard operation
- PO5:** Apply the professional and ethical responsibilities and norms of shipping practice.
- PO6:** Relate the impact of the maritime situations in various environmental contexts and demonstrate the knowledge of, and need for sustainable development.
- PO7:** Use and learn the limitations involved in recent techniques, skills and modern nautical equipment necessary for shipping industry
- PO8:** To be engaged in lifelong learning to meet these contemporary issues.
- PO9:** Function effectively on multidisciplinary team.
- PO10:** Skill in ship business management.
- PO11:** Obtain knowledge in maritime law ,international conventions
- PO12:** Contribute sustainable development of the society and environment.

PROGRAMME SPECIFIC OUTCOMES:

- PSO1:** Attain proficiency in all aspects of ship board operations and excel in problem solving by operating as a team to find solutions of various issues in that may arise onboard the ship.
- PSO2:** Operate effectively in a professional environment by providing knowledge and skill in ship handling, voyage planning, navigation, cargo operation, collision avoidance, maintenance, safe working practices on a stable ship by applying available modern tools and techniques.
- PSO3:** Achieve excellence in outstanding leadership in the nautical field and develop a passion for lifelong learning and research in advance fields.

COURSE CREDIT DETAILS OF FIRST SEMESTER

SL. NO.	COURSE NAME	CODE	CREDIT	HOURS	L	T	P
1	APPLIED MATHEMATICS – 1	N101	6	108	108	0	0
2	MARINE ENGINEERING AND CONTROL SYSTEM – 1	N102	3	54	54	0	0
3	NAUTICAL PHYSICS	N103	5	90	90	0	0
4	ENVIRONMENTAL SCIENCE – 1	N105	3	54	54	0	0
5	NAUTICAL CHEMISTRY	N107	3	54	54	0	0
6	HUMAN FACTORS AND SOFT SKILL – 1	N108	1	18	18	0	0
7	INDIAN CONSTITUTION	N109	1	18	18	0	0
8	ENGLISH AND COMMUNICATION SKILLS – 1	N111	2	36	36	0	0
9	MARINE ENGINEERING AND CONTROL SYSTEM – 1 PRACTICAL.	N102a	0.5	18	0	0	18
10	NAUTICAL PHYSICS PRACTICAL	N103a	1.5	54	0	0	54
11	SKILL TRAINING – 1	N106a	3	108	0	0	108
TOTAL			29	612	432	0	180

COURSE CREDIT DETAILS OF SECOND SEMESTER

SL. NO.	COURSE NAME	CODE	CREDIT	HOURS	L	T	P
1	APPLIED MATHEMATICS – 2	N201	6	108	108	0	0
2	MARINE ENGINEERING AND CONTROL SYSTEM – 2	N202	4	72	72	0	0
3	NAUTICAL ELECTRONICS	N203	3	54	54	0	0
4	ELECTRONICS AIDS TO NAVIGATION – 1	N204	6	108	108	0	0
5	ENVIRONMENTAL SCIENCE – 2	N205	2	36	36	0	0
6	COMPUTER SCIENCE	N207	3	54	54	0	0
7	HUMAN FACTORS AND SOFT SKILL – 2	N208	1	18	18	0	0
8	CLIMATE CHANGE – 1	N210	1	18	18	0	0
9	ENGLISH AND COMMUNICATION SKILLS – 2	N211	1	18	18	0	0
10	MARINE ENGINEERING AND CONTROL SYSTEM – 2 PRACTICAL	N202a	1	36	0	0	36
11	SKILL TRAINING -2	N206a	1	36	0	0	36
12	COMPUTER SCIENCE PRACTICAL	N207a	1.5	54	0	0	54
13	ENGLISH AND COMMUNICATION SKILLS – 2 PRACTICAL	N211a	1	36	0	0	36
TOTAL			31.5	648	486	0	162

COURSE CREDIT DETAILS OF THIRD SEMESTER

SL. NO.	COURSE NAME	CODE	CREDIT	HOURS	L	T	P
1	NAVAL ARCHITECTURE – 1	N301	6	108	108	0	0
2	ELECTRONICS AID TO NAVIGATION – 2	N303	4	72	72	0	0
3	SHIP OPERATION TECHNOLOGY – 1	N304	4	72	72	0	0
4	ENVIRONMENTAL SCIENCE – 3	N305	5	90	90	0	0
5	ARTIFICIAL INTELLIGENCE AND CYBER SECURITY – 1	N308	4	72	72	0	0
6	CLIMATE CHANGE – 2	N310	1	18	18	0	0
7	ENGLISH AND COMMUNICATION SKILLS – 3	N311	2	36	36	0	0
8	APPLIED MATHEMATICS – 3	N312	2	36	36	0	0
9	SKILL TRAINING -3	N306a	2	72	0	0	72
	TOTAL		30	576	504	0	72

COURSE CREDIT DETAILS OF FOURTH SEMESTER

SL. NO.	COURSE NAME	CODE	CREDIT	HOURS	L	T	P
1	NAVAL ARCHITECTURE – 2	N401	6	108	108	0	0
2	SHIPPING MANAGEMENT AND MARITIME LAW – 1	N402	6	108	108	0	0
3	VOYAGE PLANNING & COLLISION PREVENTION – 1	N403	5	90	90	0	0
4	SHIP OPERATION TECHNOLOGY – 2	N404	4	72	72	0	0
5	ARTIFICIAL INTELLIGENCE AND CYBER SECURITY – 2	N408	1	18	18	0	0
6	CLIMATE CHANGE – 3	N410	1	18	18	0	0
7	ENGLISH AND COMMUNICATION SKILLS – 4	N411	2	36	36	0	0
8	VOYAGE PLANNING & COLLISION PREVENTION – 1 PRACTICAL	N403a	1.5	54	0	0	54
9	SHIP OPERATION TECHNOLOGY – 2 PRACTICAL	N404a	1.5	54	0	0	54
10	SKILL TRAINING – 4	N406a	2	72	0	0	72
	TOTAL		30	630	450	0	180

COURSE CREDIT DETAILS OF FIFTH SEMESTER

SL. NO.	COURSE NAME	CODE	CREDIT	HOURS	L	T	P
1	NAVAL ARCHITECTURE – 3	N501	5	90	90	0	0
2	SHIPPING MANAGEMENT AND MARITIME LAW – 2	N502	6	108	108	0	0
3	VOYAGE PLANNING & COLLISION PREVENTION – 2	N503	5	90	90	0	0
4	SHIP OPERATION TECHNOLOGY – 3	N504	4	72	72	0	0
5	NAVIGATION – 1	N505	6	108	108	0	0
6	ARTIFICIAL INTELLIGENCE AND CYBER SECURITY – 3	N508	1	18	18	0	0
7	ENGLISH AND COMMUNICATION SKILLS – 5	N511	2	36	36	0	0
8	GENDER SENSITIZATION	N512	1	18	18	0	0
9	VOYAGE PLANNING & COLLISION PREVENTION – 2 PRACTICAL	N503a	1	36	0	0	36
10	NAVIGATION-1 PRACTICAL	N505a	1	36	0	0	36
11	BRIDGE SIMULATOR – 1	N507a	0.5	18	0	0	18
TOTAL			32.5	630	540	0	90

COURSE CREDIT DETAILS OF SIXTH SEMESTER

SL. NO.	COURSE NAME	CODE	CREDIT	HOURS	L	T	P
1	VOYAGE PLANNING & COLLISION PREVENTION – 3	N601	5	90	90	0	0
2	NAVIGATION – 2	N602	6	108	108	0	0
3	SHIP OPERATION TECHNOLOGY – 4	N603	5	90	90	0	0
4	LANGUAGE / COMPREHENSION / INDUSTRY INTERACTION	N611	2	36	36	0	0
5	VOYAGE PLANNING & COLLISION PREVENTION – 3 PRACTICAL	N601a	1.5	54	0	0	54
6	NAVIGATION – 2 PRACTICAL	N602a	1	36	0	0	36
7	SHIP OPERATION TECHNOLOGY – 4 PRACTICAL	N603a	1.5	54	0	0	54
8	BRIDGE SIMULATOR – 2	N604a	0.5	18	0	0	18
9	SKILL TRAINING -5	N606a	0.5	18	0	0	18
10	SHIP VISIT		0.5				
TOTAL			23.5	504	324	0	180

COURSENAME	COURSE CODE	L-T-P	HOURS
APPLIED MATHEMATICS – 1	N101	108-0-0	108

COURSE OBJECTIVES:

- To understand differential calculus and its application in Nautical Science.
- To understand methods of solution of ordinary differential equation.
- To understand the vector Algebra and Vector analysis.
- To Understand and apply Complex Variable and Complex Analysis.
- To Understand Trigonometry.
- To apply Spherical Trigonometry to solve the real world problem.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	Understand differential calculus and its application in Nautical Science.
CO2	Understand methods of solution of ordinary differential equation.
CO3	Understand the vector Algebra and Vector analysis.
CO4	Understand and apply Complex Variable and Complex Analysis.
CO5	Understand Trigonometry.
CO6	Apply Spherical Trigonometry to solve the real world problem.

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	Differential Calculus a) Commutative property of partial derivatives (without proof), Partial derivatives of first and higher orders. b) Lagrange's and Cauchy's mean value theorem (with proof), Differential functions and Rolle's theorem (with proof) for differential functions, Indeterminate forms and L'Hospital's rule for Indeterminate forms.	12	CO1	BL1, BL2, BL3 and BL4
2	Differential Equations a) Exact differential equations and those, which can be made exact by use of integrating factors. b) Linear Differential Equations of the nth order with constant coefficients c) Complimentary function and Particular integral when the function of the independent variable on R.H.S. is e^{ax} , x^n , $V(x)$, $\sin(ax+b)$ and $\cos(ax+b)$. d) Variation of parameters in differential equations.	14	CO2	BL1, BL2, BL3

3	<p>Vector Algebra a) Vector Functions, Scalar and Vector Triple Products. Differentiation of a, application to curves in space. b) Principal triad, Serret-Frenet formulas.</p> <p>Vector Analysis a) Line integral, gradient, divergence and curl and their properties, b) Green's theorem for the plane c) Gauss Divergence theorem d) Stokes theorem on integration of differential forms</p>	25	CO3	BL1, BL2, BL3, BL4
4	<p>Complex Variables: a) Definition, Cartesian, Polar & exponential form b) De-Moivre's Theorem / Power & Roots of complex number.</p> <p>Complex Analysis: a) Functions of complex variable, continuity (only statement) derivability of a function Analytic. Regular function. Necessary conditions for $f(z)$ to be analytic. (Statement of sufficient conditions). b) Cauchy Riemann equation in polar co-ordinates, Cauchy's integral formula, Taylor's expansion.</p>	23	CO4	BL1, BL2, BL3 and BL4
5	Circular measures, Length of arc of circle, Conversion of angles in radian and degrees.	9	CO5	BL1, BL2
6	Properties of a spherical triangle and oblique spherical triangle. Cosine formula, Haversine formula, Sin formula and four part formula and their application to Navigational problems. b) Polar triangle and application of their properties. Right angle and quadrantal triangles. Napier's Rules and their application to Navigational problems.	25	CO6	BL1, BL2, BL3

CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1										1		
CO2	3	3	1										1		
CO3	3	3											1		
CO4	3	3	1										1		
CO5	3	2	1										1		
CO6	3	3											1		
Average	3.00	2.67	1.00										1.00		

REFERENCE

Required Textbook(s)

1. Higher Engineering Mathematics by Dr. Grewal B. S.
2. Vector analysis by Murray R. Spiegel.

3. Spherical Trigonometry by Capt. H. Subramaniam.

Required Readings(s)

1. Vector Algebra by Shanti Narayan.
2. Vector Calculus by Shanti Narayan.
3. Differential Calculus by Shanti Narayan.

Recommended Reading(s)

1. Elements of Applied Mathematics by Vol: I - Wartikar P.N. & Wartikar J.N.
2. Text book of Applied Mathematics – Vol: II - Wartikar P.N. & Wartikar J.N.
3. Plane Trigonometry - Loney S.L.

Other Learning Resources for use:

1. Class note given by me.
2. Nptel lectures and videos.
3. Solution of the book Spherical Trigonometry by Capt. H. Subramaniam

COURSENAME	COURSE CODE	L-T-P	HOURS
MARINE ENGINEERING AND CONTROL SYSTEM – 1	N102	54-0-0	54

COURSE OBJECTIVES:

To impart knowledge of different engineering terms and acquire knowledge of

- Ship's engine room piping systems.
- Various types of Pumps and their applications.
- Refrigeration and Air Conditioning system.
- Ship's generators & electrical components.
- Various sensors and their practical application

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	Refresh different engineering terms and their use in marine engineering. Understand their importance in marine engineering. Analyses performance of machineries and evaluate their efficiencies, such as, engine power, thrust etc.
CO2	Understand the marine fuel system, different coefficient, such as, fuel coefficient, admiralty coefficient. Knowledge in marine fuel system enhances the power generation.
CO3	Understand the working principal of different pumps is used in ship for different purposes. Analyses performance of different pumps & importance of periodical maintenance of pumps to improve performance.
CO4	Requirement of compressed air on board, Machinery to produce compressed air, understand the importance of air compressor, analyses the its performance also its periodical maintenance.
CO5	Use of refrigeration and air conditioning system on board. Working principal & analyses their performances. Apply engineering knowledge to maintain their optimum performance.
CO6	Understand the importance of engine room pipe line diagram. Knowledge on engine room different pipe line diagrams helps to encounter different emergency situations on board.
CO7	Understand the procedure of fresh water generating process from seawater. Working principal of evaporation and reverse osmosis system for fresh water generation. Importance of their periodical maintenance.
CO8	Understand the importance of fresh water consumption on board. Conversant with Storing and distribution system of fresh water on board.
CO9	Students will be well-equipped to operate, maintain, and troubleshoot electrical systems, including generators, alternators, emergency generators, distribution systems, and navigational light systems, contributing to the safety and efficiency of maritime operations.
CO10	Students will have a strong foundation in the principles and practical application of sensors in the field of nautical science, enabling them to use sensors effectively and contribute to safe, efficient, and environmentally responsible maritime operations.

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	Marine Engineering Terms: Definitions of different engineering terms being used in marine engineering. Such as, Mass, Force, Work, Power, Energy, Stress, Strain, Efficiency of a machine, Indicated power, shaft power, propeller power & thrust.	4	CO1	BL1, BL2, BL3
2	Fuel consumption: Definitions of Admiralty coefficient, Fuel coefficient, Thermal efficiency and specific fuel consumption. Also Different factors that affect fuel consumption.	4	CO2	BL1, BL2, BL3
3	Types of pumps Use of different single & multi stage pumps on board, working principal of dynamic & positive displacement pump. Working principal of centrifugal, gear & screw pump and their periodic maintenance procedure. Use of fire & emergency fire pump on board.	6	CO3	BL1, BL2, BL3
4	Compressor & fan: Operational and constructional details of blowers and compressors used on board ships. Uses of compressed air and distribution of air.	4	CO4	BL1, BL2, BL3
5	Refrigeration & Air conditioning: Use of refrigeration and air conditioning system on board. Working principal of vapor compression and brine cooling system.	5	CO5	BL1, BL2, BL3
6	Bilge, ballast, fire, cargo & other pipelines: Importance of different engine room pipeline diagrams, Procedure & understanding of engine room pipeline tracing.	4	CO6	BL1, BL2, BL3
7	Fresh Water Generator & Reverse Osmosis System: Fresh water generation from seawater either by evaporation or reverse osmosis process. Working principle, problem encountered and periodical maintenance.	4	CO7	BL1, BL2, BL3
8	Domestic fresh water distribution system: Domestic fresh water storing & distribution system, i.e domestic fresh water pump & hydrophore system. Procedure of maintaining hydrosphere pressure for uninterrupted supply of fresh water.	4	CO8	BL1, BL2, BL3
9	Electrical Engineering: Basic principles of working, construction of Generator (both AC and DC), parallel running & load sharing of generator, and application of Emergency Generator in the field of Marine Engineering. Various elements and their application for marine electrical distribution systems and details ideas about Navigation light Systems.	5	CO9	BL1, BL2, BL3

10	Sensors: Construction, working principal of different type of sensors and their practical application in the field of nautical science.	14	CO10	BL1, BL2, BL3
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CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2				2					3	3	2	
CO2	3	3	3	3	2	2	2						3	3	2
CO3	3	2	3	3	3	2	3	2			2	3	3	3	2
CO4	3	3	3	3	3		2	2	2		3	3	3	3	
CO5	3	2	3	3	3		3				3	3	2	2	
CO6	3	3	3	2	3		2		2		3	2	3	2	2
CO7	3	3	3	3	2	2		2			3	3	2	3	2
CO8	3	3	2	2			3				2	2	2	3	2
CO9	3	3	3	3	3	2	3	3			2	2	2	3	2
CO10	3	3	2	3	2	1	3	2	2		2	2	2	3	2
Average	3.00	2.80	2.70	2.78	2.63	1.80	2.56	2.20	2.00		2.50	2.56	2.50	2.70	2.00

REFERENCE

- | | |
|---|--|
| 1. Marine Auxiliary machinery | D.W. Smith |
| 2. Marine Auxiliary machinery | H.D. McGeorge |
| 3. Marine Engineering Practice | IME Publication |
| 4. Basic Marine Engineering | J. K. Dhar |
| 5. Marine Electrical Equipment and Practice | H.D. McGeorge |
| 6. Sensors and Signal Conditioning | Ramon Pallas-Areny and John G. Webster |

COURSENAME	COURSE CODE	L-T-P	HOURS
NAUTICAL PHYSICS	N103	90-0-0	90

COURSE OBJECTIVES:

- The course objective is to provide students in the Bachelor of Nautical Physics program with a comprehensive understanding of the fundamental principles of physics and electronics essential for navigating the maritime environment and ensuring the safety of maritime operations

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	Students will have a comprehensive understanding of fundamental mechanics, including Newton's Laws, principles of relative motion, gravitation, circular motion, work, energy, conservation laws, center of mass, rotational motion, and mechanical systems like pulleys, with the ability to apply these principles to real-world maritime scenarios.
CO2	Students will have a comprehensive understanding of Archimedes' Principle, pressure in fluids, buoyancy, floating objects, atmospheric pressure, hydrodynamics, Bernoulli's equation, and surface tension, with the ability to apply these concepts to various aspects of fluid mechanics and maritime engineering.
CO3	Students will have a comprehensive understanding of elasticity, oscillations, and wave behavior, with the ability to apply these principles to mechanical systems and wave phenomena, facilitating problem-solving in engineering and physics.
CO4	Students will possess a comprehensive understanding of the principles of thermodynamics, heat transfer mechanisms, gas behavior, heat engines and refrigerators, and the concept of entropy, enabling them to apply these principles to analyze and solve real-world problems related to energy and heat.
CO5	Students will possess a comprehensive understanding of acoustics, encompassing the principles of sound, its velocity, modulation factors, characteristics, interference, phase comparison, and applications in radar and navigation systems, allowing them to apply this knowledge in practical acoustical and technological contexts.
CO6	Students will have a comprehensive understanding of optics, including principles of light propagation, reflection, refraction, diffraction, and optical phenomena like shadows, eclipses, and mirages, as well as practical applications of optical devices like optical fibers, prisms, periscopes, lenses, telescopes, binoculars, and lasers, enabling them to apply these concepts and technologies in various optical contexts and technologies.
CO7	Students will have a thorough understanding of magnetism, including its theory, Earth's magnetism, magnetic materials, elements, ship magnetism, and various compass types, allowing them to apply this knowledge to navigation and magnetic phenomena.
CO8	Students will have a comprehensive understanding of electricity, including safety measures, handling static electricity, circuit principles, energy, electrical appliances, chemical effects, and batteries, preparing them for safe and efficient electrical management in a maritime environment.

CO9	Students will possess a comprehensive understanding of the magnetic effect, covering the relationship between magnetism and electricity, electromagnetic induction, transformers, DC motors, AC generators, AC circuit analysis, resonance, power factor, and three-phase AC systems, allowing them to apply this knowledge effectively in various electrical and magnetic contexts.
CO10	Students will have a comprehensive understanding of modern physics, covering radioactivity, nuclear emissions, detection, nuclear reactions, and associated hazards, enabling them to apply this knowledge in contexts involving nuclear materials, technologies, and safety precautions.

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	Review of Fundamental mechanics and associated formulas. b) Review of Newton's Laws of motion c) Explains the Principal of relative motion and its application to Radar Plotting, ship motions d) States the Law of Gravitation e) Defines Circular motion, Centripetal and Centrifugal forces f) Explains Work, Power and Energy, Potential and Kinetic energy Conservation of energy, Conservation of linear momentum g) Describes Centre of Mass and Centre of Gravity, Effect of movement of masses, Rotational Motion, Torque, Angular Momentum, Conservation of angular momentum h) Explains the Concept of Gyroscope, Governors, Machines i) Describes Mechanical Advantage, velocity ratio, Efficiency, Effect of friction, Pulley systems – Block and Tackle, Differential pulley, Weston Diff pulley.	6	CO1	BL1, BL2, BL3
2	Explains the following in detail: a) Archimedes Principle and application to ships, Up thrust, Buoyancy, b) Pressure at a depth, Thrust and Application to hydraulics c) Floating objects - Ships, Submarines, Floating Dock, Iceberg, Balloon, Hydrometer. Plimsoll line. d) Atmospheric Pressure, Barometer. e) Hydrodynamics:- Streamlines, Turbulence. f) Bernoulli's equation: Stability and spin, Aerofoil, lift, rotating cylinder ship. g) Surface Tension: Capillarity, Angle of contact, Excess Pressure inside a bubble, Air bubbles in an oil tank.	7	CO2	BL1, BL2, BL3
3	Modulus of elasticity, Hooke's Law, Cantilever, Bending of Beams, Shearing force, Rigidity. b) Oscillations: S.H.M. and its features, Typical examples - A Helical spring, a pendulum. Damped & undamped oscillations, Forced	7	CO3	BL1, BL2, BL3, BL4

	oscillations (vibrations), Resonance. c) Waves: Longitudinal and Transverse Waves A travelling simple harmonic wave & its features.			
4	Clear understanding of the following: a) Principles of Thermodynamics First law of Thermodynamics, Second law of Thermodynamics - Carnot cycle. b) Transfer of Heat: Conduction, Convection and Radiation. Expansion of solids, liquids and gases and their effect on liquid cargoes c) Equation of state for gases, isothermal and adiabatic processes d) The Heat engine and refrigerator, Concept of Entropy. e) Vapor pressure	10	CO4	BL2, BL3, BL4
5	Sound: a) Explains Principle of acoustics b) Defines Velocity of sound, Effect of pressure, temperature and humidity on velocity of sound, Pitch, Quality & Loudness, The Decibel Doppler effect, Doppler log c) Describes Interference of two travelling waves - Beats d) Explains Phase comparison -use in Decca and Loran. Echo, e) Understanding of Principle of Radar, Echo sounder, SONAR, Refraction of sound waves, Effect of wind & Temperature.	7	CO5	BL2, BL3, BL4
6	Light: Explain the following: a) Principle of Optics b) Propagation of light, Total internal Reflection, Refraction and Diffraction, c) Reflection of light at plane and curved surfaces d) Rotation of a plane mirror e) Shadows, Eclipses, Principle of The Sextant f) Optical fibre, , refraction through a prism, the azimuth mirror, g) Diffraction due to a single slit and a circular aperture, Limit of resolution h) Periscope. Lenses, Image and Mirage formation, Telescope, prism Binocular. i) Interference - Coherent beams, Polarization, Lasers its applications.	10	CO6	BL1, BL2, BL3
7	Magnetism Describes the following related to Magnetism: a) Theory of magnetism, Earth as a Magnet, 'magnetic poles' & 'magnetic equator', angle of dip. b) Ferromagnetic materials, flux density, field strength, intensity of magnetization, permeability, magnetic susceptibility c) Magnetic elements and their variation. Magnetism of the ship and its components. Induced and Permanent Magnetism d) Magnetic Compasses - wet and dry card compasses.	7	CO7	BL1, BL2, BL3
8	Electricity: a) Basics of Electricity b) AC and DC voltages: Concept, dangerous levels, precautions. c) Static electricity and its hazards, Danger of Electrostatic charging of petroleum, precautions during loading and unloading. d) Principle of DC circuits, insulation, earthing. e) Work, energy, power in a circuit. Heating effect of electric current - heaters, fuses, arc lamps, welding f) Electrical appliances on board a ship.	9	CO8	BL1, BL2, BL3

	Principles and precautions g) Chemical effect - corrosion and electrolysis. Cathodic protection. h) Batteries - Cells, accumulators, batteries. Care and rating of accumulators.			
9	Magnetic Effect: a) Relation between magnetism and electricity b) Magnetic field due to a stationary coil, Electromagnet, Circular lifting magnet. c) Principles of Electro-magnetic induction. Faraday's Law of induction and Lenz's Law d) Transformer. DC motors. e) The AC generator, AC sinusoidal voltage and current. Average and effective values, AC circuits composed of R, L and C (series and parallel), series and parallel resonance, power factor. Three phase AC. The induction motor.	7	CO9	BL1, BL2, BL3
10	Modern Physics: a) Radioactivity and radioactive materials b) Emissions from natural radioactive nuclei, radioactive series. c) Detection of radiation, radiation units. Radiation damage, d) Nuclear fission and Fusion, Nuclear Reactors. Nuclear Powered Ships. Nuclear hazards and precautions.	5	CO10	BL1, BL2, BL3

CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	3	3	1	1	1	1	1	1	3	3	3
CO2	3	3	3	3	3	3	1	1	1	1	1	1	3	3	3
CO3	3	3	3	3	3	3	1	1	1	1	1	1	3	3	3
CO4	3	3	3	3	3	1	1	1	1	1	1	1	3	3	3
CO5	3	3	3	3	3	1	1	1	1	1	1	1	3	3	3
CO6	3	3	3	3	3	1	1	1	1	1	1	1	3	3	3
CO7	3	3	3	3	3	1	1	1	1	1	1	1	3	3	3
CO8	3	3	3	3	3	1	1	1	1	1	1	1	3	3	3
CO9	3	3	3	3	3	1	1	1	1	1	1	1	3	3	3
CO10	3	3	3	3	3	1	1	1	1	1	1	1	3	3	3
Average	3.00	3.00	3.00	3.00	3.00	1.60	1.00	1.00	1.00	1.00	1.00	1.00	3.00	3.00	3.00

REFERENCE

1. Concept of Physics (Vol I & II)- Verma, H. C- Bharati Bhawan
2. A Handbook of Degree Physics-Dasgupta, C.R-Book Syndicate
3. Murray R. Spiegel, *Theory and Problems of Theoretical Mechanics (Schaum's Outline)*. McGraw Hill Education (India) Private Limited, 2006.
4. Gupta, Kumar & Sharma, *Classical Mechanics*.PragatiPrakashan-Meerut. 2012.
5. David Kleppner& Robert Kolenkow, *An Introduction to Mechanics*. TMH, 2007.
6. H.P. Roy & A.B. Gupta, *Thermal Physics Heat & Thermodynamics*. Books & Allied Ltd, 2009.
7. Chattopadhyay &Rakshit, *Vibrations, Waves, and Acoustics*. Books & Allied Ltd, 2010.

COURSENAME	COURSE CODE	L-T-P	HOURS
ENVIRONMENTAL SCIENCE – 1	N105	54-0-0	54

COURSE OBJECTIVES:

- To understand differential calculus and its application in Nautical Science.
- To understand and apply numerical methods of finding area and volume.
- To understand double, triple integrations and infinite series and their usage.
- To understand and apply Laplace Transform to solve real life problem.
- To understand and apply numerical methods and statistics to solve nautical science related problem.
- To apply Spherical Trigonometry to navigate through sea.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	After successful completion of this course, cadet should be able to understand the composition of earth's atmosphere, Adiabatic lapse rate, condensation and precipitation phenomenon
CO2	Energy Budget and temperature inversion and heat exchange process.
CO3	Cadets should understand the concept of atmospheric pressure, how to find true wind direction and speed
CO4	Detail knowledge on oceanography, tide. Tidal streams, types of tide
CO5	Principals and construction of various meteorological instrument

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	Composition of earth's atmosphere, vertical layers of atmosphere, troposphere, stratosphere, mesosphere, thermosphere Vertical temperature profile through the lower 100km of earth's atmosphere, DALR, SALR, Fohn wind effect Air pollution, ozone depletion. Water vapour & its properties, absolute & relative humidity, diurnal & seasonal variation of water vapour Condensation and precipitation, dew, mist, fog, haze. Development & classification of clouds, Water vapor, change of states, Visibility, supercooling, frost point	15	CO1	BL1, BL2, BL3, BL4
2	Radiation laws, emission, reflection, absorption and scattering, solar & terrestrial radiation Insolation, Greenhouse effect and global warming, heat exchange processes. Environmental lapse rate and temperature inversion.,	05	CO2,	BL1, BL2, BL3, BL4,

3	Condensation and precipitation, dew, mist, fog, haze. Development & classification of clouds. Wind circulation around high & low pressure. Buys' ballot laws. Beaufort's wind scale and estimation of wind force from sea state. Relation between apparent & true wind and simple calculation. Coriolis force, geostrophic wind force.	10	CO3	BL1, BL2, BL3, BL4, BL5
4	Sea water temperature, salinity, density and their relationship, types of wave, tidal stream, tide producing forces, types of tide, surface and sub surface circulation of water in the oceans. Storm surges and tsunamis	12	CO4	BL1, BL2, BL3, BL4
5	The principles, construction and uses of various meteorological equipment, observational methods in sea environment.	12	CO5	BL1, BL2, BL3, BL4,

CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1		3	2	3	2	3							3	2	
CO2		2	3		3	3							3	3	
CO3			3			3							3	3	
CO4		3	3	2	2	3							3	3	
CO5		3	3	3		3							3	2	
Average		2.75	2.80	2.67	2.33	3.00							3.00	2.60	

REFERENCE

Required Textbook(s)

1. Capt. H. Subramaniam – "Marine Meteorology"
2. H. Reehi – Tropical Meteorology
3. HMSO – Meteorology of Mariners
4. HMSO – Mariner's Observer's Hand Book

Recommended Reading(s)

1. Atmosphere, weather & climate – R.G Barry & R.J. Chorley
2. General Meteorology – H.R. Byers

COURSENAME	COURSE CODE	L-T-P	HOURS
NAUTICAL CHEMISTRY	N107	54-0-0	54

COURSE OBJECTIVES:

After successful completion of this course, cadet should be able:

- To understand the basic concepts and principles of chemistry.
- To improve the ability of problem solving and to critical decisions related to chemistry.
- To understand the importance of chemistry in both daily life and marine life.
- To understand the detailed scope of chemistry in atoms and the atomic theories, the periodic table and some atomic properties, chemical bonding, molecular geometry, gases and gas laws, liquids, solids, solutions and their physical properties, thermochemistry, principles of chemical equilibrium, cargo containment and ship board applications, metals and metallurgy, structure, reactivity and applications of basic organic compounds.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	Understanding of the structure of the atom and chemical bonding and the periodic table
CO2	Understanding physical properties of chemicals and different gas laws and their applications in LPG carriers and Reefer ships
CO3	Understanding principle uses / applications / hazards / containment of chemicals onboard
CO4	Understanding properties of matter / different types of chemical reactions and products
CO5	Understanding properties of metals and non-metals
CO6	Understanding hazards of inorganic cargoes
CO7	Understand metallurgical processes
CO8	Understanding IUPAC nomenclature of organic compounds
CO9	Understanding sources and uses of common and relevant organic compounds
CO10	Understanding properties and Applications of organic compounds of different functional groups
CO11	Understanding hazards of organic Cargoes

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	<p>Structure of the atom: Molecules, chemical bond and formation of compounds: Protons, electrons and neutrons, atomic number, electronic configuration of atoms, atomic mass and isotopes, definition of valency, the electrovalent bond and the coordinate bond</p> <p>The periodic table: atomic behavior and atomic structure. The periodic law and its relationship to the electronic structure of the atoms: Properties of</p>	5	CO-1	BL1, BL2, BL3, BL4, BL5, BL6

	atoms			
2	<p>Physical properties of chemicals: Appearance, odour, Melting point, Effect of pressure Lower and upper flammable limits, Relation between point, vapour pressure and flammability, Effervescence, Solubility, Flash point, closed cup method for determining Flash point, auto ignition temperature, Pour point, Viscosity, volatile and non volatile cargoes.</p> <p>Properties of gases: Gas Laws, Relevance of gas laws to LPG carriers and Reefer ships</p>	2	CO-2	BL1, BL2, BL3, BL4, BL5, BL6
3	<p>Properties of chemicals: Principal uses of selected chemicals Compatibility between normal chemicals carried on board.</p> <p>Cargo containment: materials and coating Health hazards / Biochemical aspects of some of the cargo carried toxicity, Corrosively / Construction and chemical reaction in storage batteries / cells on ships.</p>	5	CO-3	BL1, BL2, BL3, BL4, BL5, BL6
4	<p>Matter and its properties: Solids, liquids and gases; Elements and compound and Mixtures; Law of indestructibility of matter.</p> <p>Chemical reactions and product: Physical change, information conveyed by equations, evolution and absorption of energy in chemical reactions endothermic and exothermic reactions.</p> <p>Types of chemical reactions: displacement reactions, decomposition reaction, double decomposition reactions, polymerization, role of catalyst, role of inhibitors.</p>	8	CO-4	BL1, BL2, BL3, BL4, BL5, BL6
5	<p>Metals and non-metals: Properties of metals and non-metals, preparation of non-metals and metallurgy.</p> <p>Chemistry of Groups 0-VIII: General features and applications.</p>	4	CO-5	BL1, BL2, BL3, BL4, BL5, BL6
6	<p>Hazards of inorganic cargoes carried on board vessels with respect to Flammability, toxicity, Reactivity and solubility.</p>	2	CO-6	BL1, BL2, BL3, BL4, BL5, BL6
7	<p>Extractions and manufacturing processes of Iron, Copper and Aluminum etc. Manufacturing process of stainless steel, cast and forged iron / steel.</p>	4	CO-7	BL1, BL2, BL3, BL4, BL5, BL6
8	<p>Nomenclature of Organic Compounds: Nomenclature, Empirical formulas, Molecular formula & molecular weight.</p>	2	CO-8	BL1, BL2, BL3, BL4, BL5, BL6
9	<p>Sources and uses of organic compounds: Recovery of benzene, toluene, naphtha, phenol etc. from coal, cellulose derivatives from plants,</p>	2	CO-9	BL1, BL2, BL3, BL4, BL5, BL6

	starch derivatives and petroleum derivatives including LPG.			
10	Properties and Applications of organic compounds: Alkanes: Methane, Butane, Propane, n-butane, iso-butane, n-pentane, n-hexane. Alkenes: Ethyne, propylene, butylene's propylene, pentylene hexylene. Alkynes: Ethyne, propyne, butyne. Halogenated hydrocarbons: Methiodide, ethyliodide, propyliodide. Alcohol's & phenols: Methyl alcohol, ethyl alcohol, glycerol. Aldehydes: Formaldehyde, acetaldehyde, propionaldehyde, butyraldehyde, acetone, ethyl methyl ketone. Aliphatic carboxylic acids: Formic acid, acetic acid, propionic acid, oxalic acid. Aliphatic ethers: Diethyl ether, ethyl methyl ether. Aliphatic amines: Methanamine, ethanamine	18	CO-10	BL1, BL2, BL3, BL4, BL5, BL6
11	Associated Hazards of organic cargoes with respect to Flammability, Toxicity, Reactivity and Solubility.	2	CO-11	BL1, BL2, BL3, BL4, BL5, BL6

CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3												3	3	3
CO2	3		3										3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3		3										3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO7	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO8	3		3										3	3	3
CO9	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO10	3		3										3	3	3
CO11	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Average	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

REFERENCE

Required Textbook(s)

- Solomon's Organic Chemistry by Solomon
- Organic Chemistry by Peter Sykes
- Arun Bahl (A Textbook of Organic Chemistry: S. Chand., 2004)
- C. L. Dubey (Nautical Chemistry: for Deck Officers: Marine Aid Publication)
- Shashi Chawla (A Text book of Engineering Chemistry: Dhanpat Rai., 2004)

COURSENAME	COURSE CODE	L-T-P	HOURS
HUMAN FACTORS AND SOFT SKILL – 1	N108	18-0-0	18

COURSE OBJECTIVES:

- Understand the nature of ship's job.
- To Understand various traits on board and their effect.
- To Understand responsibilities of various rank on board
- To Understand SWOT analysis
- To know about social etiquettes
- To know how to interact with foreigners.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	After successful completion of this course, cadet should be able to understand nature of ship job and demands of carrier, various personal traits and importance of personal hygiene, functions and responsibilities of various rank.
CO2	SWOT, social norms, Social etiquettes, interaction with foreigners, conflict management

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	Nature of job, list of traits, essentials of personal hygiene, functions and responsibilities, different rank's responsibilities, importance of physical and mental fitness. Communication	09	CO1	BL1, BL2, BL3, BL4
2	SWOT analysis, time management, segregation of important and non important work, social norms on maritime profession, table manners, hygiene, interaction with foreigners, conflict management, Team building.	09	CO2,	BL1, BL2, BL3, BL4,

CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1		3	2	3	2	3							3	2	
CO2		2	3		3	3							3	3	
Average		2.50	2.50	3.00	2.50	3.00							3.00	2.50	

REFERENCE

5. English and Human factor – IMU/BNA-017 - IMU
6. Hariharan, K.V. Shipping business in India. – Oxford University Press 2004
7. Soft Skills – Dr.K.Alex

COURSENAME	COURSE CODE	L-T-P	HOURS
INDIAN CONSTITUTION	N109	18-0-0	18

COURSE OBJECTIVES:

- The student will be able to recall salient features of the Constitution of India.
- The students will be able to explain the underlying philosophy behind Indian Constitution.
- Enumerate about the various Fundamental Rights and duties and the Directive Principles that are fundamental in the governance of the country.
- Understanding the role of the state in protecting the rights of the citizens..
- Applying and articulate the concept from the knowledge gained in enforcing the Fundamental Rights.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	The student will be able to recall salient features of the Constitution of India
CO2	The students will be able to explain the underlying philosophy behind Indian Constitution.
CO3	Enumerate about the various Fundamental Rights and duties and the Directive Principles that are fundamental in the governance of the country.
CO4	Understanding the role of the state in protecting the rights of the citizens.
CO5	Applying and articulate the concept from the knowledge gained in enforcing the Fundamental Rights.

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	Salient features of the Indian Constitution	3	CO1	BL1, BL2
2	Preamble of the Constitution: Significance and Judicial Interpretation	3	CO2	BL1, BL2
3	Fundamental Rights: <ul style="list-style-type: none"> • Right to Equality, • Right to Freedom, • Right to Life and Personal Liberty, • Constitutional Safeguards against Arbitrary Arrest and Detention, • Right against Trafficking and bonded labours, • Freedom of Religion and Restrictions, • Constitutional Remedies to Enforce Fundamental Rights, • Public Interest Litigation. 	6	CO3, CO4, CO5	BL1, BL2, BL3
4	Directive Principles of State Policy	3	CO3	BL1, BL2
5	Fundamental Duties	3	CO3	BL1, BL2

CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1	1	1	1	1	1	2	2	1	2	2	1	1	1
CO2	1	1	1	1	1	1	1	2	2	1	2	2	1	1	1
CO3	1	1	1	1	1	1	1	2	2	1	2	2	1	1	1
CO4	1	1	1	1	1	1	1	2	2	1	2	2	1	1	1
CO5	1	1	1	1	1	1	1	2	2	1	2	2	1	1	1
Average	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	1.00	2.00	2.00	1.00	1.00	1.00

REFERENCE**Required Textbook(s)**

1. Jain M. P., Indian Constitutional Law, Wadhwa and Company, Nagpur, 5th edition (2007)
2. Pandey J. N., Constitutional Law of India, Central Law Agency, 44th edition (2007)
3. Granville Austin, Working A Democratic Constitution: A History of the Indian Experience, Oxford, (2000)
4. Durga Das Basu, Shorter Constitution of India, Vol. 1 & 2 14th edition Lexis NexisButterworthsWadhwa, Nagpur, (2009)

COURSENAME	COURSE CODE	L-T-P	HOURS
ENGLISH AND COMMUNICATION SKILLS – 1	N111	36-0-0	36

COURSE OBJECTIVES:

This course aims to enhance students' reading and writing skills across various contexts and genres. It covers reading comprehension, interpreting visual data, formal writing, and domain-specific writing. Students will also develop the ability to write concisely and effectively.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	Learn to demonstrate advanced reading and comprehension skills in various contexts, including global, contextual, and inferential comprehension.
CO2	Develop strong writing skills, enabling them to communicate effectively in various professional contexts.
CO3	Communicate effectively in English, both verbally and in writing, with a focus on clarity, accuracy, and fluency
CO4	Demonstrate an improved vocabulary, grammar, and pronunciation for enhanced English language skills.

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	Reading Comprehension A: Reading and comprehending from texts B: Reading and Comprehending advertisements C: Reading and Comprehending Domain-specific Articles D: Reading and Comprehending General Articles E: Reading and comprehending short news items F: Reading & comprehending blogs/ social media posts G: Task based assessment of reading on all areas to be covered	14	CO1, CO3, CO4	BL2, BL3, BL4
2	Written Communication A: Writing tasks with focus on task fulfillment, coherence and cohesion. B: Learning to write a personal profile C: Learning to write short messages D: Learning to write simple sentences and short paragraphs through prompts E: Learn to fill in application forms F: Learning to write a gist /précis/ summary G: Learning to write short emails H: Learning to write short apology / thank you	16	CO2, CO3, CO4	BL3, BL4, BL5, BL6

	message			
3	Soft Skills A: Emotional Intelligence B: Collaboration & Team Working Skills – how to effectively communicate within a team C: Effective techniques of communicating with a diverse workforce	6	CO3, CO4	BL4, BL5

CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	2	1	1	2						1	1	1
CO2	3	2	1	2	1	1	2						1	1	1
CO3	3	2	1	2	1	1	2						1	1	1
CO4	2	1	1	1	1	1	1						1	1	1
Average	2.75	1.75	1.00	1.75	1.00	1.00	1.75						1.00	1.00	1.00

REFERENCE

1. Kulbushan Kumar, R S Salaria, Effective Communication Skills, Khanna Publishing House, Delhi.
2. Practical English Usage. Michael Swan. OUP. 1995.
3. Remedial English Grammar. F.T. Wood. Macmillan. 2007
4. On Writing Well. William Zinsser. Harper Resource Book. 2001
5. Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
6. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
7. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
8. Universal English Prof. Prasad Kataria Publications, 2019

COURSENAME	COURSE CODE	L-T-P	HOURS
MARINE ENGINEERING AND CONTROL SYSTEM – 1 PRACTICAL	N102a	0-0-18	18

COURSE OBJECTIVES:

- To understand differential calculus and its application in Nautical Science.
- To understand and apply numerical methods of finding area and volume.
- To understand double, triple integrations and infinite series and their usage.
- To understand and apply Laplace Transform to solve real life problem.
- To understand and apply numerical methods and statistics to solve nautical science related problem.
- To apply Spherical Trigonometry to navigate through sea.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	Conduct cutting and filing jobs
CO2	Conduct Drilling and welding jobs
CO3	Conduct gas welding and Brazing jobs
CO4	Plumbing jobs as G.I pipe threading and fixing of valve or blank.
CO5	Lathe work obs as simple turning operation and reduction of diameters in steps
CO6	Removal of valves with flanges from the pipe line ; maintenance and fixing back on the pipeline
CO7	Contactora, fuse, Overload relay, MCB .
CO8	DOL starter for 3-phase motor.
CO9	Star-delta starter for thre-phase motor.
CO10	Temperature sensor (RTD or Thermocouple)
CO11	Flow sensor
CO12	Level sensor .
CO13	Hydraulic system components : Tank ; pump ; filter ; regulator
CO14	Pneumatic system components : Compressor ; AFR ; DC Valve
CO15	Explosion meter
CO16	Draft gauge
CO17	Oxygen analyser

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	Practical demonstration and conducting Cutting and filing jobs	1	CO1	BL1, BL2 BL3
2	Practical demonstration and Conducing Drilling and welding jobs	1	CO2	BL1, BL2 BL3
3	Practical demonstration and Conducing gas welding and Brazing jobs	1	CO3	BL1, BL2, BL3, BL4
4	Plumbing jobs as G.I pipe threading and fixing of valve or blank.	1	CO4	BL1, BL2 BL3
5	Lathe work obs as simple turning operation and reduction of diameters in steps	2	CO5	BL1, BL2, BL3, BL4

6	Removal of valves with flanges from the pipe line ; maintenance and fixing back on the pipeline	1	CO6	BL1, BL2 BL3
7	Description with figure : contactor, fuse, Overload relay, MCB	1	CO7	BL1, BL2 BL3
8	Working of DOL starter for 3-phase motor.	1	CO8	BL1, BL2, BL3, BL5
9	Working of Star-delta starter for thre-phase motor.	1	CO9	BL1, BL2, BL3, BL5
10	Write-up : figure with description of any temperature sensor (RTD or Thermocouple)	1	CO11	BL1, BL2, BL3, BL5
11	Write-up : figure with description of any flow sensor .	1	CO12	BL1, BL2, BL3, BL5
12	Write-up: figure with description of any Level sensor .	1	CO12	BL1, BL2, BL3, BL5
13	Write-up : Hydraulic system components : Tank ; pump ; filter ; regulator .	1	CO13	BL1, BL2, BL3, BL5
14	Write-up : Pneumatic system components : Compressor ; AFR ; DC Valve .	1	CO14	BL1, BL2, BL3, BL5
15	Explosion meter : Figure ; description (demonstration & write-up).	1	CO15	BL1, BL2, BL3, BL5
16	Draft gauge : Figure ;description (demonstration & write-up).	1	CO16	BL1, BL2, BL3, BL5
17	Oxygen analyser : Figure ; description (demonstration & write-up)	1	CO17	BL1, BL2, BL3, BL5

CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3			3			3	3		2	2	3	2	3
CO2	3	3	2	3	3				3		2	2	3	2	3
CO3	3	3			3		2		3		2	2	3	2	3
CO4	3	3	2	3	3		2	3	3	3		3	3	2	3
CO5	3	3			3		2		3		2	3	3	2	3
CO6	3	3	2		3		3	2	3		2	2	3	2	3
CO7	3	3	2		3		3		3		2	2	3	2	3
CO8	3	3	2		3		3	2	3		2	2	3	2	3
CO9	3	3	2	3	3		3		3		2	2	3	2	3
CO10	3	3	2		3	2	3	2	3		2	2	3	2	3
CO11	3	3	2		3		3		3		2	2	3	2	3
CO12	3	3	2		3		3		3		2	2	3	2	3
CO13	3	3	2		3		3		3		2	2	3	2	3
CO14	3	3	2	3	3		3		3		2	2	3	2	3
CO15	3	3	2		3	2	3		3		2	2	3	2	3
CO16	3	3	2		3		3		3		2	2	3	2	3
CO17	3	3	2		3		3		3		2	2	3	2	3
Average	3.00	3.00	2.00	3.00	3.00	2.00	2.80	2.40	3.00	3.00	2.00	2.12	3.00	2.00	3.00

REFERENCE

1. Engineering Drawing -

Bhat

COURSENAME	COURSE CODE	L-T-P	HOURS
NAUTICAL PHYSICS PRACTICAL	N103a	0-0-54	54

COURSE OBJECTIVES:

The course outcome is to provide hands-on experience, reinforcing theoretical physics concepts and enhancing experimental and analytical skills relevant to the field.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	Students will possess proficiency in using a variety of measuring instruments, the ability to analyze data graphically, a basic understanding of probability and statistics, and the skills needed for error analysis in experimental work, thereby ensuring precise and accurate scientific investigations.
CO2	Students will be proficient in creating scientific graphs, including variable identification, range determination, scale establishment, axis labeling, data point plotting, and graph generation, for effective data representation.
CO3	Determination of Young's modulus of a beam.
CO4	Determination of velocity of ultrasonic wave in water.
CO5	Determination of wavelength of monochromatic light.
CO6	Determination of acceleration (g) due to gravity and gravitational constant (G).
CO7	Determination of wavelength of monochromatic light by interference phenomenon.
CO8	Calculation of surface tension of water at ambient temperature.
CO9	Mini Project or PowerPoint Presentation is to enable students to apply theoretical knowledge to real-world scenarios, enhance practical and communication skills, and foster critical thinking while assessing their understanding and preparing them for advanced studies in the field.

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	Demonstration lectures on use of vernier, micrometer, spectrometer, barometer, common balance ,etc.; graph plotting. Basic ideas of Probability & Statistics. Error analysis, significant figures, limits of accuracy of an Experiment-associated choice of equipments. Measuring instruments (e.g. Galvanometer, Multimeter CRO) to be used in the laboratory.	6	CO1	BL1, BL2, BL3
2	Drawing a scientific graph: Identify the variables, Determine the variable range, Determine the scale of the graph, Number and label each axis and title the graph, Determine the data points and plot on the graph, Draw the graph.	6	CO2	BL1, BL2, BL3

3	Experiment using a single cantilever (loaded at one end). Determination of Young's Modulus	6	CO3	BL1, BL2, BL3, BL4
4	Experiment using a single cantilever (loaded at one end). Determination of Young's Modulus	3	CO3	BL2, BL3, BL4
5	Calculation of Velocity of sound in liquid: Ultrasonic Interferometer	3	CO4	BL2, BL3, BL4
6	Calculation of Velocity of sound in liquid: Ultrasonic Interferometer	3	CO4	BL1, BL2, BL3
7	Study of Laser: Interference and diffraction due to n- slit, Calculation of wavelength of monochromatic light.	3	CO5	BL1, BL2, BL3
8	Study of Laser: Interference and diffraction due to n- slit, Calculation of wavelength of monochromatic light.	3	CO5	BL1, BL2, BL3
9	Determination of Acceleration Due to Gravity	3	CO6	BL1, BL2, BL3
10	Determination of Acceleration Due to Gravity	3	CO6	BL1, BL2, BL3
11	Interference of light: Newton's Rings	3	CO7	BL1, BL2, BL3
12	Interference of light: Newton's Rings	3	CO7	BL1, BL2, BL3
13	Calculation of Surface tension of liquid by capillary rise method	3	CO8	BL1, BL2, BL3
14	Calculation of Surface tension of liquid by capillary rise method	3	CO8	BL1, BL2, BL3
15	Mini project/ PowerPoint presentation	3	CO9	BL1, BL2, BL3

CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	3	3	1	1	1	1	1	1	3	3	3
CO2	3	3	3	3	3	3	3	1	1	1	1	1	3	3	3
CO3	3	3	3	3	3	3	1	1	1	1	1	1	3	3	3
CO4	3	3	3	3	3	1	1	1	1	1	1	1	3	3	3
CO5	3	3	3	3	3	1	1	1	1	1	1	1	3	3	3
CO6	3	3	3	3	3	1	1	1	1	1	1	1	3	3	3
CO7	3	3	3	3	3	1	1	1	1	1	1	1	3	3	3
CO8	3	3	3	3	3	1	1	1	1	1	1	1	3	3	3
CO9	3	3	3	3	3	3	3	1	1	1	1	1	3	3	3
Average	3.00	3.00	3.00	3.00	3.00	1.89	1.44	1.00	1.00	1.00	1.00	1.00	3.00	3.00	3.00

REFERENCE

1. An Advanced course in Practical Physics- Chattopadhyay, D-Books and Allied
2. Advanced Practical Physics- Mazumdar, K. G.-Sreedhar Publishers
3. Lab Manual to be supplied.
4. A treatise on General Properties of matter – H.J. Chatterjee & R. Sengupta
5. Thermal Physics – H.P. Roy & A.B. Gupta
6. Heat & Thermodynamics – M.W. Zemansky
7. Waves & Oscillations – N.K. Bajaj
8. A Textbook of Light – K.G. Mazumdar
9. Hand Book of Degree Physics Vol. II – C.R. Das

COURSENAME	COURSE CODE	L-T-P	HOURS
SKILL TRAINING – 1	N106a	0-0-108	108

COURSE OBJECTIVES:

- After successful completion of this course, cadet should be able understand the relevant rules and regulations of ship safe operation of ship.
- To understand the information from chart & list of lights and other publications.
- To Understand & make passage planning.
- To Understand the Buoyage system for safe navigation in port and coastal water.
- To understand and usage tidal system in port

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	Knowledge and safe practise of swimming
CO2	Knowledge and safe practise of Oarsman ship
CO3	Understanding and practical knowledge of Rope work
CO4	Understanding and practical knowledge of General Seamanship
CO5	Understanding and practical knowledge of watch keeping
CO6	Use of personal LSA and Safety precaution

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	Capability to swim 100 metres without stop, in any style single or multiply. Remain afloat for 5 minutes Resuscitation techniques: Mouth to Mouth.	12	CO1	BL1, BL2, BL3, BL4
2	Recommended PPE to be worn/used -Ability to follow and carry out the following orders a) Stand By Oars b) Toss Oars c) Let fall Oars d) Out Oars e) Give way together f) Oars g) Hold water h) Back water i) Boat Oars Knowledge and use of steering oar.	13	CO2	BL1, BL2, BL3
3	1) List the kind of ropes used onboard the Ship - Explain the construction and lay of the ropes - Explain the care and maintenance of the vegetable ropes and synthetic ropes. - Identify ropes by their diameter, lay, strands etc.	34	CO3	BL1, BL2, BL3

	<ul style="list-style-type: none"> - List the precaution necessary, when opening a new coil of or wire rope. 2) Ability to tie the following Knots, bend & hitches. Advantage and disadvantages: <ul style="list-style-type: none"> -Bowline – Plain and with bight -Reef - Clove - Sheepshank - Carrick -Monkey fist - Stage - Timber - Tie two disparate rope ends together and to fixed structure. uses. Demonstrate his ability to make various types of whipping the ends of the ropes and explain its. Use types of rope splicing & wire splicing <ul style="list-style-type: none"> -Make splice- Eyes splice, Back splice, Short splice, Long splice, Cut splice & Chain splice, Liver pool splice in wire rope. Safety) regulation regarding identification of broken strands in the wire rope. Limits after which a wire rope is to be condemned - Measuring the diameter of rope and wire rope with a vernier. <ul style="list-style-type: none"> - Measuring the circumference of the rope without any instruments -Factory Act (Dock Inspecting a fibre rope for damage. <ol style="list-style-type: none"> a) The right and wrong way of using bulldog grips b) Make an eye with bulldog grips c) Join two wires with bulldog grips 			
4	<ul style="list-style-type: none"> - Identify parts of a Mast - PPE to be worn while working aloft or on a mast. Permit to work for working aloft. - Code of safe working practises - 3 points climbing - Climb a mast. <p>-Familiarity with International Maritime Pilots Association safety procedures</p> <ol style="list-style-type: none"> b) COSWP, PPE and safety procedures c) Inspecting, Rigging, Lowering, Lifting and stowing away a Pilot ladder d) How to judge the height of the ladder above the sea level e) Maintenance of the pilot ladder f) Climbing up and down a ladder g) Method of keeping the pilot ladder flushed alongside shipside. <p>Canvas work</p> <ol style="list-style-type: none"> a)Safety, PPE & Tools required. b) Types of seams (Flat, Round &Herring Boning) 	40	CO4	BL1, BL2, BL3

	<p>c) Demonstrate the covering of lifebuoy</p> <p>Hand lead: -Carrying a lead line -Calling out sounding -Arming the lead -Drying out the line -Taking a sounding -Marking of Hand lead line -Meaning of benefit of the lead a) Meaning & purpose of sounding. b) Difference between a sounding tape and a sounding rod. c) Procedure for taking sounding of tanks and ullages. Use water finding paste d) Using sounding table.</p> <p>Use of a sledge hammer, precautions in its use. a)How to hold a sledge hammer b) Practice to be given on use of a sledge hammer c) PPE.</p> <p>Block & Tackles a) Safety during handling Block & Tackles. b) Use of various block & tackles, types of various block & tackles c) Over hauling & maintenance of block. Difference between block & tackles. d) Demonstrate the reeving of threefold purchase e) Explain the purpose of using the blocks and tackles on the Ships. f) State that blocks, may be single sheave Block, Double sheave Block or triple -sheave blocks. g)Differentiate the Standing part , Hauling part, Running parts, Reading Drafts & Load lines a) Read draft in metres b) Draw a Load line and Plimsoll mark (Port & Stbd) c) Positions of Freeboard mark, draft marks and Load lines on Ships. d) Various markings on the hull of the ship other than draft marks eg: Ships Name, POR, IMO Number.</p>			
5	<p>a) Know the cardinal and sub cardinal points. b) Box the compass clockwise and anticlockwise.</p>	5	CO5	BL1, BL2, BL3, BL4.
6	<p>Use of personal LSA a)Wearing TPA b) Wearing Lifejacket c) Wearing Immersion suit d) Use of EEBD. Maintenance and safety check.</p>	4	CO6	BL1, BL2, BL3.

CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	3	3								3	2	3
CO2	3	3	3	3	3								3	3	3
CO3	3	3	3	3	3								3	3	2
CO4	3	3	3	3	3								3	3	2
CO5	3	3	3	3	3								3	2	2
CO6	3	3	3	3	3								3	2	2
Average	3.00	3.00	2.83	3.00	3.00								3.00	2.50	2.33

REFERENCE**Required Textbook(s)**

- 1) Training manual for Nautical science skill set requirements

Required Readings(s)

- 1) Theory and practice of Seamanship
- 2) Seamanship Notes
- 3) Nicholls Seamanship
- 4) Seamanship Techniques
- 5) Life Boat & Life Raft
- 6) Survival at Sea
- 7) LSA Code
- 8) FSS Code

G. Danton
 Kemp and Young
 Brown, Son and Ferguson
 D J House
 Capt. S.K. Puri
 Wright C.H
 IMO
 IMO

COURSENAME	COURSE CODE	L-T-P	HOURS
APPLIED MATHEMATICS -2	N201	108-0-0	108

COURSE OBJECTIVES:

- To understand differential calculus and its application in Nautical Science.
- To understand and apply numerical methods of finding area and volume.
- To understand double, triple integrations and infinite series and their usage.
- To understand and apply Laplace Transform to solve real life problem.
- To understand and apply numerical methods and statistics to solve nautical science related problem.
- To apply Spherical Trigonometry to navigate through sea.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	Understand differential calculus and its application in Nautical Science.
CO2	Understand and apply numerical methods of finding area and volume.
CO3	Understand and solve double, triple integrations and infinite series and their usage.
CO4	Understand and apply Laplace Transform to solve real life problem.
CO5	Understand and apply numerical methods and statistics to solve nautical science related problem.
CO6	Apply Spherical Trigonometry to navigate through sea.

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	Beta & Gamma Functions Beta & Gamma functions & their properties, relation between Beta & Gama. Functions related problems and applications. Error functions definition and applications. Differentiation under integral sign related problems and applications.	12	CO1	BL1, BL2, BL3 and BL4
2	Simpson's Rules Derivation of Simpson's first, second and five-eighth rules and their use in the computation of areas, volumes and centroids.	8	CO2	BL1, BL2, BL3
3	Multiple Integral Double & Triple integrals, their geometrical interpretation and evaluation. Evaluation of double integrals by change of order and change to polar form. Applications of double & triple integrals to areas and volume, Centre of Mass, Moment of Inertia.	12	CO3	BL1, BL2, BL3, BL4
4	Infinite Series Infinite series, Convergence of infinite series, Cauchy's root test, p-series, comparison series, ratio test. Raabe's test, De Morgan's test, Logarithmic test, Cauchy's integral test.	8	CO3	BL1, BL2, BL3 and BL4

5	Laplace Transforms Function of bounded variation (statement only). Laplace transforms of various functions and shifting properties. Expressions (with Proofs) for; (i) $L\{t^n f(t)\}$ (ii) $L\{f(t)\}$ (iii) $L\{\int_0^t f(u)du\}$ (iv) $L\{d^n f(t)\}$. Unit step functions, Heaviside, Impulse functions and their Laplace transform. Laplace transform of periodic functions. Evaluation of inverse Laplace Transforms, partial fraction methods, Application to solve initial and boundary value problems involving ordinary differential equations with one dependent variable.	28	CO4	BL1, BL2, BL3 and BL4
6	Numerical Methods Finite differences of first and higher order, forward, backward, central differences, difference tables, shift operator - E, averaging operator, and differences of polynomials. Interpolation: Newton's forward and backward difference interpolation formulas, Sterling interpolation formula, Numerical integration, trapezoidal rule	14	CO5	BL1, BL2, BL3
7	Statistics Frequency distribution, Measures of central tendency. Mean, Median and Mode, Measures of variability, Range, Percentiles, Variance, Standard Deviation. Probability, probability distributions, Binomial and Poisson's distributions, Normal distribution.	10	CO5	BL1, BL2, BL3 and BL4
8	Spherical Trigonometry Properties of a spherical triangle and oblique spherical triangle. Cosine formula, Haversine formula, Sin formula and four part formula and their application to Navigational problems. Polar triangle and application of their properties. Right angle and quadrantal triangles. Napier's Rules and their application to Navigational problems.	16	CO6	BL1, BL2, BL3 and BL4

CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	1										1		
CO2	3	3	1										1		
CO3	2	3											1		
CO4	3	3	1										1		
CO5	2	2	1										1		
CO6	3	3											1		
Average	2.50	2.67	1.00										1.00		

REFERENCE

Required Textbook(s)

1. Elements of Applied Mathematics – Vol: I - Wartikar P.N. & Wartikar J.N.
2. Text book of Applied Mathematics – Vol: II - Wartikar P.N. & Wartikar J.N.
3. Vector Algebra - Shanti Narayan
4. Vector Calculus - Shanti Narayan

Required Readings(s)

1. Differential Calculus - Shanti Narayan
2. Engineering Mathematics - Bali Saxena Iyengar
3. Plane Trigonometry - Loney S.L.
4. Higher Engineering Mathematics - Dr. Grewal B.S.

Recommended Reading(s)

1. Differential Equations - Raisinghania
2. Engineering Mathematics - Bhatia M.L.
3. Engineering Mathematics - Baphana R.M.
4. Vector Methods and Vector Calculus - Vaishista
5. Differential equations - Murray P.A.
6. Differential Calculus - Das & Mukherjee

Other Learning Resources for use:

1. Class note given by me.
2. Nptel lectures and videos.
3. Solution of the book Spherical Trigonometry by Capt. H. Subramaniam

COURSENAME	COURSE CODE	L-T-P	HOURS
MARINE ENGINEERING AND CONTROL SYSTEM-2	N 202	72-0-0	72

COURSE OBJECTIVES:

- To learn about the basics of Marine Engineering and control system.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	Understand the significance and parameters of Mechanical Marine Equipment Boilers
CO2	Understand Marine Mechanical Equipment Diesel Engine and their construction and function also can under the layouts of Important Pipe lines of Main Diesel Engine on board
CO3	Understand the working principal of marine propeller. Analyse the efficiency of propeller. Understand the working principal of controllable pitch propeller and requirement of periodical maintenance.
CO4	Understand the impotence of engine room watch keeping both physically and in UMS condition. Gather knowledge about different machineries in the engine room and apply them for daily operation.
CO5	Importance steering operation for ship's movement. Understand SOLAS regulation on steering system, daily checks & periodical maintenance.
CO6	Understand construction and function of Marine Mechanical supporting equipment and all shipboard Deck Machineries.
CO7	Understand Boiler control, Diesel Engine temp control, Rudder control and viscosity of F.O to engine control system
CO8	Understand mainly Bridge control system for Marine Engine,/pitch propeller control and different types of alarming systems in ship

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	Boilers: Types of boilers Describe working of water tube, smoke tube boiler & exhaust gas boiler Procedure of flashing a boiler from cold. Safety features in boiler Waste hear recovery Quality of boiler feed water information like PH, TDS , μ S/sec, PPM of dissolved Oxygen in water.	9	CO1	BL1, BL2 BL3
2	B. Diesel Engines: Working principle of 2 and 4 stroke engines. Compare and contrast their working.	7	CO2	BL1,BL2, BL3

	<p>Introduction to supercharging Causes of scavenge fires and remedial actions Causes of crankcase explosions Limitation in number of starts Block diagram Fuel oil system from bunker tank to injection Lubricating oil system Cooling water system</p>			
3	<p>Propeller : Define Pitch, slip, efficiency Calculate apparent slip & real slip given RPM, mean pitch and percentage slip Calculate indicated power, effective power, shaft power, delivered power. Operation of controllable pitch propeller How propeller thrust is transmitted to the hull</p>	9	CO3	BL1, BL2 .BL3, BL4
4	<p>Engine room Watch keeping Describe safety measures to ensure a safe engineering watch when carrying dangerous cargo.</p>	4	CO4	BL1, BL2 .BL3
5	<p>Steering gear: Two Ram, Four Ram, Rotary vane with diagram. Telemotor system Fail safe Safety, communication & emergency arrangements. Testing and IMO regulatory requirements for same. IMO requirements for auxiliary steering gear. Change over to bridge control to local control in the steering gear compartment. Standard emergency steering procedures.</p>	9	CO5	BL1, BL2 .BL3, BL4
6	<p>Mechanical supporting equipment : Construction and operation of Fin stabilizer Hold Washing system for cargo ship: Description and line diagram Sewage treatment plants – Chemical and biological systems. Ballast water treatment systems. Oily water separators and oil filtering equipment Incinerators – Block diagram Deck Machinery Advantages and disadvantages of steam, electric and hydraulic systems Routine maintenance of deck machinery (Windlass, Mooring winch, Cranes, cargo pumps)</p>	15	CO6	BL1, BL2 .BL3
7	<p>Control schemes used on the ship : Rudder control: diagram with description. Boiler: Drum level & steam pressure control in boiler: diagram with description. Diesel engine temperature control system: diagram with description. Viscosity of fuel oil to engine control system: diagram with description.</p>	10	CO7	BL5, BL6

8	Bridge Control Describe with block diagram Bridge Control systems for main engine/ controllable pitch propeller List indicators and alarms provided for bridge control and lateral thrusters	9	CO8	BL5,BL6
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CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3			3				3		2	2	3	2	
CO2	3	3			3				3		2	2	3	2	
CO3	3	3			3		2		3		2	2	3	2	2
CO4	3	3			3		2	3	3	3		3	3	2	
CO5	3	3			3		2		3		2	3	3	2	
CO6	3	3	2		3		3		3		2	2	3	2	
CO7	3	3	2		3		3		3		2	2	3	2	
CO8	3	3	2		3		3		3		2	2	3	2	
Average	3.00	3.00	2.00		3.00		2.50	3.00	3.00	3.00	2.00	2.25	3.00	2.00	2.00

REFERENCE

- | | |
|--|-----------------------|
| 1. Engineering Drawing | - Bhatt |
| 2. Engineering Knowledge for Deck Officers | - Reed |
| 3. General Engineering Knowledge | - Reed |
| 4. Mechanical Engineering Science | - Hannah and Hiller |
| 5. Marine Auxiliary Machinery | - Souchette and Smith |

COURSENAME	COURSE CODE	L-T-P	HOURS
NAUTICAL ELECTRONICS	N203	54-0-0	54

COURSE OBJECTIVES:

- After successful completion of this course, cadet should be able understand the use of Electronics in the Shipping industry.
- To apply its use in Engine Control Room.
- To apply its use in Marine Navigation & Bridge Equipment's.
- To understand how to safe use such electronic aids.
- To recognize its importance in Communication & Automation system. Intends to refresh Cadets theoretical knowledge on the subject of Electronics as earlier studied in School

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	Understand Resistors-Resistors are the basic of all electronic components & basic of Electronics.
CO2	Understand Capacitor- The capacitor with its two terminal & use on-board. Understand the basic of All Electronics Equipment on board.
CO3	Understand Transistor & its use in Marine Communication

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	Understanding Electronics: a) Introduction to Electronics b) Semiconductors of p and n type, p-n junction c) Diodes - their characteristic, half-wave, full wave & bridge rectifiers, voltage regulation. Ripple, Capacitor filter, Zener Diode, its uses as a voltage regulator. 3-Terminal IC voltage regulator. d) Thermistors: -Use in temperature control. Transistors: - pnp, npn, 3 modes of operation, current gains α and β . Photoelectric effect, opto-electronic devises- LDR, LED. 7-Segment displays, photo diode, photo transistor.	20	CO1, CO2,	BL1, BL2, BL3, BL4
2	Communication: General Wave Phenomena: a) Introduction to communication b) Satellites and their uses in communication, weather forecasting, etc c) Principles of Radio transmission: The radio spectrum, principle of radio transmission, principle of radio receiver, Modulation-AM,FM, modulation index, Demodulation,	25	CO1, CO2,	BL1, BL2, BL3, BL4

	d) Radio waves and their properties, Ground wave, sky wave, Ionosphere, sky wave propagation factors, dead space & skip distance, fading, e) Antennas - types and applications. f) Block diagram of radar and satellite communication, g) GPS - Basic principle, its advantages and limitations			
3	Communication: General Wave Phenomena	9	CO1, CO2, CO3	BL1, BL2, BL3, BL4

CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	3	3	3	3	3	3	3	2	3	2	3
CO2	3	3	3	3	3	2	2				3	2	3	3	
CO3	3	3	3	3	3	2	2	2	2		3	2	3	3	
Average	3.00	3.00	3.00	3.00	3.00	2.33	2.33	2.50	2.50	3.00	3.00	2.00	3.00	2.67	3.00

REFERENCE

Required Textbook(s)

- | | |
|--|--|
| 1. Electrodynamics | Satya Prakash |
| 2. Electronics | Chattopadhyay & Rakshit |
| 3. Basic Electronics | V.K. Mehta. |
| 4. Communication Electronics | N.D. Deshpande, D.A. Deshpande, P.K. Rangole |
| 5. Electronic Communications | D Roddy J Coolen |
| 6. Electronic Communication System | G. Kennedy |
| 7. Electronic – A Text Lab Manual | Zbar |
| 8. Operational Amplifiers And Linear Integrated Circuits | Coughlin And Driscoll |
| 9. Electronic Device And Circuit Theory | Boylestad And Nashelsk |
| 10. Electronics Device & Circuits | J.B. Gupta |

Required Readings(s)

Modern Electronic Navigational Aids Lata Publications

COURSENAME	COURSE CODE	L-T-P	HOURS
ELECTRONIC AID TO NAVIGATION – 1	N 204	108-0-0	108

COURSE OBJECTIVES:

- After successful completion of this course, cadet should be able to understand the use of Electronics aid in carrying out safe Navigation.
- Apply its use in Marine Navigation & Bridge Equipment's.
- To understand how to safely use such electronic aids.
- To recognize its importance in Communication & Automation system.
- Electronic navigation is a form of navigation that ships staff can use, which rely on technology powered by electricity & electronics. Methods of electronic navigation include: Satellite navigation, satellite navigation systems, Radio navigation, the application of radio frequencies to determine a position which controls vessels passage over high seas.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	Understand Resistors-Resistors are the basic of all electronic components & basic of Electronics.
CO2	Understand Capacitor- The capacitor with its two terminal & use on-board. Understand the basic of All Electronics Equipment on board.
CO3	Understand Transistor & its use in Marine Communication

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	1.1 The Magnetism of the Earth and the Ship's Deviation (Revision of N103) 30 - explains magnetism and the magnetic theory of ferromagnetic materials hrs - defines a simple magnet, , the law of attraction and repulsion of magnets - explains the poles of a magnet and the magnetic field around a magnet - Understanding and relationship between field strength flux density - magnetic induction of metals and difference between 'hard' and 'soft' iron - explains the meaning of the terms: magnetic intensity: permeability, magnetic susceptibility - Explains the magnetic field of the earth, magnetic poles, magnetic equator and 'angle of dip' - explains the horizontal and vertical components earth's total field and states that a compass needle which is constrained to the horizontal can respond only to the	30	CO1, CO2,	BL1, BL2, BL3, BL4

	<p>horizontal components of the earth's field and the field due to the ship's magnetism</p> <ul style="list-style-type: none"> - Explains meaning of 'magnetic variation' and explains why it is a slowly changing quantity - describes the effect of introducing a disturbing magnetic force into the vicinity of a compass needle - Explains the direction and strength of a magnetic field as represented by a vector - finds the field at a point resulting from two given fields by means of a vector diagram - states that a compass needle will align itself with the resultant field - defines the magnetic moment of a bar magnet as the product of the pole strength and the length of the magnet - states that, for a suspended magnet vibrating in a magnetic field, T^2 is proportional to $1/H$, where T is the period of vibration and H is the field strength - Finding the relative strengths of two fields may be found. <p>1.2 The Magnetic Compass</p> <ul style="list-style-type: none"> - the construction of a liquid card magnetic - sketches a section through the compass to show the float chamber, the pivot support and the arrangement of magnets - Explains the method by which the card is kept practically horizontal in all latitudes - describes the composition of the liquid and explains how allowance is made for changes in volume of the liquid - Explains how to remove an air bubble from the compass bowl - describes how to check that the card is turning freely on its pivot - explains the following: lubber line, binnacle and the arrangement of correcting devices provided 			
2	<p>2.1 The Gyro-Compass 15</p> <ul style="list-style-type: none"> - description of a free gyroscope and its parts hrs - explains that the spin axis of a free gyroscope maintains its direction in space - meaning of gyroscopic inertia and precession - resulting from a torque about axes perpendicular to the spin axis - precession due to friction at gimbals' pivots - states that the rate of precession is proportional to the applied torque - defines 'tilt' and 'drift' - explains the apparent movement of a free gyroscope on the earth's surface, given its position and initial attitude - explains how the free gyroscope follows the path of a celestial body 	15	CO1, CO2,	BL1, BL2, BL3, BL4

	<ul style="list-style-type: none"> - explains how a free gyroscope can be made north-seeking by the use of gravity control and describes the resulting oscillations of the axis - describes how settling of the axis is achieved by the use of damping in azimuth and damping in tilt thus producing a gyro-compass - explains that control and damping can be achieved by replacing the ballistic elements with electrical signals, provided by tilt sensors, to produce torques about the vertical and horizontal axes - explains the following w.r.t. gyro-compass: <ul style="list-style-type: none"> - the method of support, damping arrangements and the method of maintaining the heading indication in line with the axis of the gyro and the transmission of heading to repeaters - Explains the starting of the gyro-compass and method to minimize settling time by slewing and leveling it to the correct heading - states explains the necessary time for the compass to settle after switching on prior to sailing - lists the settings to be made or adjusted while the compass is in use - explains how the repeater system is switched on and aligned with the master gyro-compass - describes the use of gyro input to the direction-finder and how gyro heading input is supplied to a radar installation - describes the alarms fitted to a gyro-comp 			
3	<p>Radio wave propagation 5 hrs Introduction of radio wave propagation and its uses for operation of navigation & electronic aids. Wave propagation, Atmosphere, Ionised layers – D, E and F. Radio Frequency, Freq. Spectrum and its uses of various radio equipments, Ground, sky and direct waves, Skip distance, Skip zone, , CW & MCW. Phase difference of radio waves. Basic principles of hyperbolic navigation system 10</p> <ol style="list-style-type: none"> a) Describe a hyperbola and its relevance to position fixing hrs b) Draw a hyperbolic pattern associated with two foci, with the baseline divided into an exact number of equal divisions c) Principle of the hyperbolae being position lines d) Describe the cause of ambiguity and reduced accuracy in the baseline extension area e) Illustrate the method of ascertaining position by combining two hyperbolic patterns 	15	CO1, CO2, CO3	BL1, BL2, BL3, BL4

4	<p>3.2 Enhanced Loran (e-Loran) Hrs</p> <ul style="list-style-type: none"> - basic Loran-C and e-Loran system, draws a block diagram of a Loran-C receiver, showing how time differences are measured - describes how ambiguity in a position line is resolved and why third-cycle matching is used - describes typical radii of coverage areas - identification of the Loran chart and the additional information printed thereon - selection of chain and relation of the time differences obtained to the correct station pair - Basic operating principles of eLoran and the principal difference between eLoran and traditional Loran-C system. - explains the use of eLoran when satellite services are disrupted. 	32	CO1, CO2, CO3	BL1, BL2, BL3, BL4
5	<p>3.3 BNWAS</p> <ul style="list-style-type: none"> - Working principle, Block diagram and regulations concerning the same. <p>3.4 ECDIS</p> <ul style="list-style-type: none"> - Working principle and regulations regarding the same. <p>3.5 Fluxgate Compass</p> <ul style="list-style-type: none"> - Defines singles axis and dual axis - Explains basic operation - Explains TMC - Describes solid state type 	10	CO1, CO2, CO3	BL1, BL2, BL3, BL4
6	<p>4.1 The Automatic Pilot 06</p> <ul style="list-style-type: none"> - the principle of an automatic pilot system hrs - lists and explains the functions of the manual settings - procedures for change-over from automatic to manual steering and vice versa - explains what is meant by an adaptive automatic pilot and briefly explains how it functions - describes the course monitor and the off-course alarm and other alarms fitted to the system - describes the operation of the course recorder log - states that the automatic pilot should be included in the steering gear testing prior to the ship's departure - regulation regarding the use of the automatic pilot and the recommendation on performance, standards for automatic pilots <p>4.2 AIS</p> <ul style="list-style-type: none"> - use of AIS to maintain safety of navigation <p>4.3 VDR & SVDR</p> <p>Uses of VDR and SVDR. Schematic diagrams. Information stored</p>	6	CO1, CO2, CO3	BL1, BL2, BL3, BL4

CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	3	3	3	3	3	3	3	2	3	2	3
CO2	3	3	3	3	3	2	2				3	2	3	3	
CO3	3	3	3	3	3	2	2	2	2		3	2	3	3	
Average	3.00	3.00	3.00	3.00	3.00	2.33	2.33	2.50	2.50	3.00	3.00	2.00	3.00	2.67	3.00

REFERENCE**Required Textbook(s)**

1. ELECTRONIC NAVIGATION CAPT BHATIA
2. RADIO ELECTRONICS CAPT. ERROL FERNANDES
3. RADAR WATCH KEEPING CAPT. H. S. SUBRAMANIAM
4. SAFE NAVIGATION WITH ECDIS CAPT ASHOK MULLOTH
5. SHIPS MAGNETIC COMPASS CAPT T K JOSEPH & CAPT S S REWARI

Required Readings(s)

1. ELECTRONICS DEVICE & CIRCUITS BY J.B.GUPTA
2. ADVANCED ELECTRONIC NAVIGATION BY EDRICH FERNANDES
3. BRIDGE EQUIPMENT BY BERGER
4. SHIPS COMPASS BY GRANT

COURSENAME	COURSE CODE	L-T-P	HOURS
ENVIRONMENTAL SCIENCE – 2	N205	36-0-0	36

COURSE OBJECTIVES:

- To Understand the Wind and Pressure Systems over the Oceans
- To Understand Structure of Depressions
- To Understand Anticyclones and Other Pressure Systems
- To Understand Tropical Revolving Storms
- To know the Shipborne meteorological instruments

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	After successful completion of this course, cadet should be able understand the Wind and Pressure Systems over the Oceans, monsoon regime, formation of land and sea breezes, characteristics and location of the doldrums, intertropical convergence zone, trade winds, sub-tropical oceanic highs, westerly' sand polar easterlies
CO2	Air Masses, their definition, formation and structure, Weather experienced during the passage of an idealized warm front and an idealized cold front with suitable diagrams, family of depressions, Identification of at rough of low pressure on a surfaces ynopticorprognostic chart, Weather associated with the passage of at rough
CO3	Cadets should understand the concept of Seven Isobaric Patterns
CO4	Detail knowledge on Regions and seasons for TRS, Local names for TRS, Formation, Signs, Movement of a TRS, Factors associated with a weakening TRS, Typical TRS tracks, Avoiding a TRS, SOLAS requirements regarding TRS
CO5	Principals and construction of various meteorological instrument

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	Circulation cells which would exist on a rotating earth, not inclined to its orbit of rotation around the sun, and with a homogeneous surface– explain with sketches Mean surface pressure and wind distribution over the earth's surface in January and July Characteristics and location of the doldrums, intertropical convergence zone, trade winds, sub-tropical oceanic highs, westerly's and polar easterlies Description a monsoon regime Areas which experience at ruemonsoon regime such as India, Brazil, China Sea etc. Qualitative explanation of the causes of monsoon regimes Qualitative explanation of the weather associated with the January and July monsoons of the Indian Ocean, China Sea, north coast of Australia and west coast of Africa	20	CO1	BL1, BL2, BL3, BL4

	<p>Monsoon type weather along the north-east coast of Brazil</p> <p>Formation of land and sea breezes</p>			
2	<p>Air Masses, their definition, formation and structure</p> <p>'Source region', its characteristics, Characteristics of arctic, polar, tropical and equatorial air-mass types</p> <p>'Warmfront', 'coldfront', their symbols and identification on a weather map.</p> <p>Weather experienced during the passage of an idealized warm front and an idealized cold front with suitable diagrams</p> <p>Depressions, their identification on a surface synoptic or prognostic chart</p> <p>Life cycle of a polar front depression, diagram of a polar front depression, for both northern and southern hemispheres, showing isobars, warm and cold fronts, wind circulation and warm sector.</p> <p>Cross-section through a polar front depression, on the pole ward and equatorial side of the centre, showing fronts, cloud and precipitation areas and the usual movement of a polar front depression</p> <p>Weather changes experienced when a frontal depression passes with its centre on the pole ward side of an observer in the northern hemisphere and in the southern hemisphere</p> <p>The process leading to the occlusion of a polar front depression</p> <p>Family of depressions Identification of at rough of low pressure on a surface synoptic or prognostic chart</p>	17	CO2,	BL1, BL2, BL3, BL4,
3	<p>Seven Isobaric Patterns</p> <p>Anticyclone, draw a synoptic pattern of an anticyclone, for both northern and southern hemispheres, showing isobars and wind circulation</p> <p>Identification of an anticyclone on a surface synoptic or prognostic chart and the weather associated with anticyclones</p> <p>A ridge of high pressure, draws a synoptic pattern for a ridge, showing isobars and wind directions and describes a typical weather sequence during the passage of a ridge between depressions across the observer's position</p> <p>Explain a Col, draws a synoptic pattern for a Col, showing isobars and wind directions and the weather associated with a Col</p> <p>Identification of ridges and cols on a surface synoptic or prognostic chart</p>	09	CO3	BL1, BL2, BL3, BL4, BL5

4	Regions and seasons for TRS. Local names for TRS Formation, Signs, Movement of a TRS Factors associated with a weakening TRS Typical TRS tracks Avoiding a TRS	08	CO4	BL1, BL2, BL3, BL4
5	Aneroid barometer thermometer hygrometer anemometer draws a typical vertical temperature profile through the lower 100 km of the earth's atmosphere	15	CO5	BL1, BL2, BL3, BL4,

CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1		3	2	3	2	3							3	2	
CO2		2	3		3	3							3	3	
CO3			3			3							3	3	
CO4		3	3	2	2	3							3	3	
CO5		3	3	3		3							3	2	
Average		2.75	2.80	2.67	2.33	3.00							3.00	2.60	

REFERENCE

Required Textbook(s)

Capt. H. Subramaniam– “Marine Meteorology”

H. Reehi – Tropical Meteorology

HMSO – Meteorology of Mariners

HMSO – Mariner’s Observer’s Hand Book

Required Readings(s)

Atmosphere, weather & climate – R.G Barry &R.J.Chorley

General Meteorology – H.R.Byers

COURSENAME	COURSE CODE	L-T-P	HOURS
COMPUTER SCIENCE	N207	54-0-0	54

COURSE OBJECTIVES:

- To understand the basic concepts of computer hardware and software.
- To understand the basic concepts of computer network and their classification.
- To understand the programming concept and will develop the programming ability in 'C' language.
- To develop the concept of operating system and application software.
- To build up the knowledge in ship management system

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	Understanding the basic concepts of computer hardware and software
CO2	Understanding the basic concepts of computer network and their classification
CO3	Understanding the programming concept and will develop the programming ability in 'C' language
CO4	Developing the concept of operating system and application software
CO5	Developing the working knowledge of application software (mainly MS-Office)
CO6	Understanding the concept in database management system
CO7	Developing the knowledge in ship management system

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	<p>1. Computer Fundamentals: Evolution of computer: Development of computers, Parts of a computer and their functions, computer peripherals, Input/Output devices, computer memory. Classification of computers on different norms such as generations, technology, etc. Different functional: Primary and Secondary memory, Computer Arithmetic: Binary, Octal, Decimal & Hexadecimal number systems, Units of memory and run-time measurements, Data organization: drivers, files, directories</p> <p>2. Computer Network Fundamentals: Client-server model, application of computer network. Types of computer network: LAN, MAN, WAN and related devices. Topologies. Introduction of internet: E-mail, HTTP, TCP/IP, webpage, URL, application of internet</p>	18	CO1, CO2	BL1, BL2, BL3, BL4, BL5, BL6
2	<p>Programming concept Computer language, their classification and compilation, C character set</p>	18	CO3, CO4	BL1, BL2, BL3, BL4, BL5, BL6

	<p>Data types, constants and variables Operators: Arithmetic, Logical Control & loop statements: if, nested if, switch, while loop etc Arrays: Single & two dimensional Functions: User defined and standard library functions Operating System fundamental Introduction of operating system Types of operating system: DOS, WINDOWS, kernel, BIOS, booting Multitasking, multi sharing, time sharing, batch processing Security threats, computer worms, Trojan horses, Viruses, Cyber security, Antivirus, firewall</p>			
3	<p>Application Software Introduction to application software Application of MS-office (Word, Excel, Powerpoint) Excel spreadsheet, presentation graphics Application in database management Ship maintenance management systems Introduction, SFI coding for standardization of component register Maintenance: component, job details, planned maintenance, work orders, survey and certificate, maintenance history counters Stock: stock level management, spare parts transaction, bar code printing</p>	18	CO5, CO6, CO7	BL1, BL2, BL3, BL4, BL5, BL6

CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3												3	3	3
CO2	3		3										3	2	2
CO3	3	3	2	2	3	3	3	3	3	3	3	2	1	3	3
CO4	2		3										3	3	3
CO5	3	1	3	3	3	3	3	3	3	3	3	3	2	3	3
CO6	3	3	3	3	3	2	3	2	3	3	3	3	3	1	3
CO7	3	3	3	3	3	3	3	3	1	3	3	3	3	3	3
Average	2.86	2.50	2.83	2.75	3.00	2.75	3.00	2.75	2.50	3.00	3.00	2.75	2.57	2.57	2.86

REFERENCE

Required Textbook(s)

Computer Fundamentals by Anita Goel.

Fundamentals of computer by Reema Thareja

Let Us C by Kanetkar

Computer Networks by Forouzan

Operating System Concepts by Silberschatz, Gagne and Galvin

COURSENAME	COURSE CODE	L-T-P	HOURS
HUMAN FACTORS AND SOFT SKILL – 2	N208	18-0-0	18

COURSE OBJECTIVES:

- Understand the Human factors and their duties on board ship.
- To Understand various soft skills required at work place.
- To Understand Company organizational chart
- To Understand Shipboard organizational chart
- To know about social etiquettes
- To Understand relevance and applicability of behavior science.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	After successful completion of this course, cadet should be able to understand the functions of various department in a shipping company, Works & responsibilities of each rank on board ship, Various department on board ship and their responsibilities.
CO2	Various concepts of soft skills at work place, Networking resilience, understanding human behaviour, behaviour science, self-esteem.

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	List of function of various department in a shipping company, DPA, Various department on board ship, duties and responsibility of various ranks onboard ship. Cadet's role onboard and expectation from them.	09	CO1	BL1, BL2, BL3, BL4
2	Various soft skill concept at work place, how to build a positive image in front of a prospective employers, building networking resilience, different approach of human behaviour, self-esteem.	09	CO2,	BL1, BL2, BL3, BL4,

CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1		3	2	3	2	3							3	2	
CO2		2	3		3	3							3	3	
Average		2.50	2.50	3.00	2.50	3.00							3.00	2.50	

REFERENCE

Required Textbook(s)

8. English and Human factor – IMU/BNA-017 - IMU
9. Hariharan, K.V. Shipping business in India. – Oxford University Press 2004
10. Soft Skills – Dr.K.Alex

COURSENAME	COURSE CODE	L-T-P	HOURS
CLIMATE CHANGE – 1	N210	18-0-0	18

COURSE OBJECTIVES:

- To investigate the impact of the various activities of individual or the surrounding as well as encouraging students to take actions for the betterment of the environment.
- To provide a rationale for pollution mitigation and propose action in key sectors.
- To investigate the mechanism of greenhouse effect through discussions, experiments, observation and case studies for better understanding the topics.
- To analyze principal challenges and opportunity for environmental problems.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	Explain and evaluate the evidence for human-caused climate change.
CO2	Explain and quantify the impacts of climate change on human well-being and the natural world.
CO3	Apply quantitative analysis of concepts relevant for climate change.
CO4	Causes of climate change, including the sources of greenhouse gas emissions.
CO5	Evaluate the issue of climate change from the perspective of individual

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	Introduction to Environment and Climate Change Component of the environment, Atmosphere, Global carbon cycle– biogeochemistry, Weather and climate change, Climate change science: early discoveries and Causes, Impacts of climate change: Atmosphere, oceans, and aquatic ecosystem	7	CO1, CO2, CO4	BL1, BL2, BL3 and BL4
2	Global warming and climate change Greenhouse gases and its sources, greenhouse gas effect, Global Heat budget, Cause and effects of GHG Emissions, Physical evidences of climate change.	5	CO2, CO3, CO4	BL1, BL2, BL3 and BL4
3	Effects of Climate Change Evidences of warming and change in atmosphere/ ocean circulations, global warming, Ozone layer depletion, Acid Rain, Photochemical Smog, Sea level rising, Ice melting, Floods and droughts, Case study-based model	6	CO2, CO3, CO5	BL1, BL2, BL3 and BL4

CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2		1		3							3			
CO2	1		1		3							3			
CO3	2		1		3							3			
CO4	2		1		3							3			
CO5	2		1		3							3			
Average	1.80		1.00		3.00							3.00			

REFERENCE**Required Textbook(s)**

Masters GM and Ela WP. Introduction to Environmental Engineering and Science. 3rd edition. PHI learnings New Delhi

Rao CS. Environmental Pollution Control Engineering, New Age International Publication

Required Readings(s)

Masters GM and Ela WP. Introduction to Environmental Engineering and Science. 3rd edition. PHI learnings New Delhi

Rao CS. Environmental Pollution Control Engineering, New Age International Publication

Schmittner A. Introduction to Climate Science

Tiwari G.N. (2003) Greenhouse Technology for Controlled Environment, New Delhi

Recommended Reading(s)

Qu JJ and Motha RP. Climate Change and Sustainable Earth. Cambridge Scholars Publishing

Sathaye J. and Meyers S.D. Greenhouse Gas Mitigation Assessment: A Guidebook

Houghton J, Global Warming: The Complete Briefing, 5th Edition, 2015, Cambridge Univ. Press.

Climate and Global Environmental Change by L.D. Danny Harvey, Prentice Hall publication

Climate Change- An Indian Perspective by S.K.Das , Foundation books

Thomas S. (2003) Policy Instruments for Environment and Natural Resource Management, RFF Publication, Washington DC.

Intergovernmental Panel on Climate Change Assessment Report (AR5, AR6, AR7)

Other Learning Resources for use:

Class note given by me.

NPTEL lectures and videos.

COURSENAME	COURSE CODE	L-T-P	HOURS
ENGLISH AND COMMUNICATION SKILLS – 2	N211	18-0-0	18

COURSE OBJECTIVES:

- To give ample practice and opportunities to the students to enhance their learning and sharpen their skills of listening and speaking in English,
- To develop verbal aptitude and an overall understanding of the different skills of communication.
- To train the students to handle various situations of communication through various activities with exposure to real life situations.
- To guide the students to build confidence and build credible social connections.
- To encourage the students to cultivate communication competence and accept challenges to gain confidence

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	To develop the capacity to listen and comprehend in everyday situations and communicate accordingly in English.
CO2	To have a clear understanding of the importance of vocabulary and develop enough competence to comprehend different reading materials.
CO3	To appreciate the basic tenets of communication and apply the basic communication practices in different types of communication like speaking in organization and societal needs.
CO4	To comprehend the basics of domain-specific communication and the basics of necessary soft skills to enhance personality development

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	Communication Networks- Inter- office communication	1	CO1	BL1, 3
2	What is conversation control – reflection and empathy: two sides of effective oral communication – effective listening – effective listening-types of listening – barriers to attentive listening	1	CO1, CO3	BL1,3
3	Methods and modes of communication- objectives of communication-barriers to communication	1	CO1, CO3	BL1,3
4	Defining Intercultural Communication- Cultural Differences and Communication	1	CO1	BL1,3
5	Reading Aloud - from texts, short stories, plays, magazines, journals, newspapers, notices, advertisements, manuals, brochure, instructions and online materials etc.	2	CO2	BL1,2,3

6	Understanding visuals, graphs, figures and notes on instructions	1	CO4	BL1, BL2, BL4
7	Interpreting the Text - Summarizing/Precis/Paraphrasing	1	CO2	BL1, BL2, BL3, BL4
8	Reading and Comprehending Short stories – varied question types – vocabulary - Reading social media posts	1	CO2	BL1, BL2, BL3, BL4
9	Intra- office communication- Memos and Circulars.	1	CO1, CO3	BL1, BL2, BL3
10	Intra- office communication- Notices, Agenda and Minutes	1	CO1, CO3	BL1, BL2, BL3
11	Business Report writing	1	CO1, CO3	BL1, BL2, BL3
12	Writing an advertisement - Note-taking	1	CO1, CO3	BL1, BL2, BL3
13	Learning to write professional emails - of Complaint-Making Inquiries -Placing Orders- Asking & Giving Information	1	CO1, CO3	BL1, BL2, BL3
14	Non-Verbal Communication	2	CO4	BL1, BL2, BL3
15	Self-analysis	1	CO4	BL5
16	Assessment	1	CO1, CO2, CO3, CO4	BL5

CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	3	1	1	1	1	1	2	2	1	1	2	1	1	3
CO2	1	3	1	1	1	1	1	2	2	1	1	2	1	1	3
CO3	1	3	1	1	1	1	1	2	2	1	1	2	1	1	3
CO4	1	3	1	1	1	1	1	2	2	1	1	2	1	1	3
Average	1.00	3.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	1.00	1.00	2.00	1.00	1.00	3.00

REFERENCE

Learning Resources:

- (i) Kulbushan Kumar, R S Salaria, Effective Communication Skills, Khanna Publishing House, Delhi.
- (ii) Practical English Usage. Michael Swan. OUP. 1995.
- (iii) Remedial English Grammar. F.T. Wood. Macmillan.2007
- (iv) On Writing Well. William Zinsser. Harper Resource Book. 2001
- (v) Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
- (vi) Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
- (vii) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
- (viii) Universal English Prof. Prasad Kataria Publications, 2019
- (ix) A modern Approach to Verbal & Non-Verbal Reasoning. R.S. Aggarwal. S. Chand Limited

Other Learning Resources for use:

Class note.

COURSENAME	COURSE CODE	L-T-P	HOURS
MARINE ENGINEERING AND CONTROL SYSTEM – 2 PRACTICAL	N202a	0-0-36	36

COURSE OBJECTIVES:

- To learn about the Practical aspects of Marine Engineering and control system

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	Conduct cutting and filing jobs
CO2	Conduct Drilling and welding jobs
CO3	Conduct gas welding and Brazing jobs
CO4	Plumbing jobs as G.I pipe threading and fixing of valve or blank.
CO5	Lathe work obs as simple turning operation and reduction of diameters in steps
CO6	Removal of valves with flanges from the pipe line; maintenance and fixing back on the pipeline
CO7	Drawing sheets for the types of ships; ship dimensions; Elevation and end view
CO8	Drawing sheet for schematic arrangements; propeller shafting; crude oil washing systems
CO9	Drawing sheets for Merchant ship power plant
CO10	Drawing sheets for engine lubrication system; engine cooling systems
CO11	Drawing sheets for types of propellers
CO12	Understand the Level control Loop
CO13	Understand the pressure control Loop
CO14	Understand the application of PLC for a process control
CO15	Understand Cascade control loop
CO16	Understand the ratio control Loop
CO17	Signalling scheme

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	Practical demonstration and conducting Cutting and filing jobs	3	CO1	BL1, BL2, BL3
2	Practical demonstration and Conducting Drilling and welding jobs	3	CO2	BL1, BL2, BL3
3	Practical demonstration and Conducting gas welding and Brazing jobs	3	CO3	BL1, BL2, BL3, BL4
4	Plumbing jobs as G.I pipe threading and fixing of valve or blank.	3	CO4	BL1, BL2, BL3
5	Lathe work obs as simple turning operation and reduction of diameters in steps	3	CO5	BL1, BL2, BL3, BL4
6	Removal of valves with flanges from the pipe line; maintenance and fixing back on the pipeline	3	CO6	BL1, BL2, BL3

7	Drawing sheet for the types of ships; ship dimensions; Elevation and end view	1	CO7	BL1, BL2, BL3
8	Drawing sheet for schematic arrangements; propeller shafting; crude oil washing systems	1	CO8	BL1, BL2. BL3 BL5
9	Drawing sheets for Merchant ship power plant	1	CO9	BL1, BL2. BL3 BL5
10	Drawing sheets for engine lubrication system; engine cooling systems	2	CO11	BL1, BL2. BL3 BL5
11	Drawing sheets for types of propellers	2	CO12	BL1, BL2. BL3 BL5
12	Level control Loop-Write up(Demonstration; figure of set-up; description)	1	CO12	BL1, BL2. BL3 BL5
13	Pressure control Loop -Write up (Demonstration; figure of set-up; description)	2	CO13	BL1, BL2. BL3 BL5
14	Application of PLC for a process control (Demonstration; figure of set-up)	2	CO14	BL1, BL2. BL3 BL5
15	Cascade control loop-write up (Block diagram; one application diagram)	2	CO15	BL1, BL2. BL3 BL5
16	Ratio control Loop -write up (Block diagram; description for fuel to air ratio control in boiler)	2	CO16	BL1, BL2. BL3 BL5
17	Signaling scheme; light signal; Hooster-write-up.	2	CO17	BL1, BL2. BL3 BL5

CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3			3			3	3		2	2	3	2	3
CO2	3	3	2	3	3				3		2	2	3	2	3
CO3	3	3			3		2		3		2	2	3	2	3
CO4	3	3	2		3		2	3	3	3		3	3	2	3
CO5	3	3			3		2		3		2	3	3	2	3
CO6	3	3	2		3		3	2	3		2	2	3	2	3
CO7	3	3	2		3		3		3		2	2	3	2	3
CO8	3	3	2		3		3		3		2	2	3	2	3
CO9	3	3	2		3		3		3		2	2	3	2	3
CO10	3	3	2		3	2	3	2	3		2	2	3	2	3
CO11	3	3	2		3		3		3		2	2	3	2	3
CO12	3	3	2		3		3		3		2	2	3	2	3
CO13	3	3	2		3		3		3		2	2	3	2	3
CO14	3	3	2		3		3		3		2	2	3	2	3
CO15	3	3	2		3	2	3		3		2	2	3	2	3
CO16	3	3	2		3		3		3		2	2	3	2	3
CO17	3	3	2		3		3		3		2	2	3	2	3
Average	3.00	3.00	2.00	3.00	3.00	2.00	2.80	2.50	3.00	3.00	2.00	2.12	3.00	2.00	3.00

REFERENCE

COURSENAME	COURSE CODE	L-T-P	HOURS
SKILL TRAINING -2	N206a	0-0-36	36

COURSE OBJECTIVES:

- After successful completion of this course, cadet should be able understand the relevant rules and regulations of ship safe operation of ship.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	Understanding and practical Knowledge of Boat work safe practise of swimming / Oarsmanship and power boat handling
CO2	Understanding and practical Knowledge of general seamanship
CO3	Understanding and practical knowledge of watch keeping
CO4	Understanding and practical knowledge of Deck maintenance
CO5	Understanding and safe practical knowledge of Cargo Stowage & handling
CO6	Use of personal LSA and common FFA Safety precaution

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	<p>Capability to swim 100 metres without stop, in any style single or multiply. Remain afloat for 5 minutes Resuscitation techniques: Mouth to Mouth. Recommended PPE to be worn/used -Ability to follow and carry out the following orders a) Stand By Oars b)Toss Oars c)Let fall Oars d)Out Oars e) Give way together f) Oars g)Hold water h)Back water i) Boat Oars Knowledge and use of steering oar- Stopping distance and turning ability - Boxing the compass - issue /operate Engine order - how to make fast the Boat alongside with rope and cast off the same - Leaving berth / alongside - Man overboard/ Heaving to - Know the procedure to launch, lower & hoist the life boat. Safety during the Boat handling.</p>	8	CO1	BL1, BL2, BL3. BL4

	<ul style="list-style-type: none"> - Ensure that each member of the boat crew wear PPE - Knowledge of righting of a capsized life boat. - Knowledge of parts of a boat & Oars - Use of Bowsing Tackle, tricing pendent & toogle painter etc - Identification of storage of life Boat equipment in the Boat. - Knowledge and use of FPD and rescue strops. 			
2	<p>Use types of rope splicing & wire splicing</p> <ul style="list-style-type: none"> - Make splice- Eyes splice, Back splice, Short splice, Long splice, Cut splice & Chain splice, Liver pool splice in wire rope a) Identify parts of a Mast b) PPE to be worn while working aloft or on a mast. Permit to work for working aloft. c) Code of safe working practises d) 3 points climbing e) Climb a mast. 	6	CO2	BL1, BL2, BL3.
3	<ul style="list-style-type: none"> f) Arrive on the bridge 15 minutes before time. g) check the course being steered h) Compare the gyro & magnetic compass. i) See what ships /light buoy are in sight j) Inform duty officer that you have taken charge. k) Standard procedure to report 	5	CO3	BL1, BL2, BL3, BL4
4	<p>Surface preparation.</p> <ul style="list-style-type: none"> a) Prior to painting, the surface of the plates must be thoroughly chipped of rust, or old paint, then washed cleaned and dried. b) Tools used for chipping are chipping hammers, scrappers, wire brushes, chipping Machines, etc. c) Safety procedure, PPE Swedish SA standards regarding grading of metal surface. <ul style="list-style-type: none"> a) Safety procedure and PPE, for usage of power tools. b) Use and maintenance of power tools. c) Importance of using dry air when running pneumatic machines. d) Requisitioning of spares for descaling machines. <ul style="list-style-type: none"> a) Steel plates must be protected against exposure to air, to b) This is done by painting the steel plates and structures. c) Types of paints. d) Tools used for painting on the ship are paint brushes, roller brushes, and spray machines e) Knowledge and precaution required about using spray painting machine. 	6	CO4	BL1, BL2, BL3, BL4

	<p>a) States types of oils and greases used on board in ER and on Deck. (cylinder oil, grease, crankcase oil, gear oil, hydraulic oil.</p> <p>b) Lubrication plan/ cycle</p> <p>c) Identify grease nipples, grease and oil equipment.</p> <p>d) PPE</p> <p>e) Demonstrates use of grease guns</p> <p>f) Use oil can for filling in oil in crankcase of a machine.</p> <p>g) States precautions to take while working on or near an operating machinery.</p> <p>h) State risk involved if oil or grease falls on hot surface.</p> <p>a) PPE – Purpose& use.</p> <p>b) Ear protector, Safety helmet, Gloves, Safety shoes, Safety belt & harness, Life jacket.</p> <p>c) Breathing apparatus.</p> <p>d) Eye and face Protector.</p> <p>e) Use of PPE in the following situation-</p> <ul style="list-style-type: none"> -Over side - Deck cargo watch - Aloft - Tank entry - Regular deck maintenance - Operating machinery like grinders, chipping machines etc. - Operation of lathe, welding and gas cutting. <p>a) Permit for working over the side.</p> <p>b) Be properly clad in Boiler suit, safety Helmet, Life-Jacket, Safety shoes, Hand gloves etc.</p> <p>c) Have a stage rigged up on the shipside, where work has to be carried out.</p> <p>d) Have a rope ladder fixed up securely close to the stage.</p> <p>e) Have necessary equipment for working over the side (e.g. chipping hammers, scrapers, Paints, brushes etc.) in a bucket with a heaving line.</p> <p>f) Have a person standing by on deck for any assistance or emergency</p> <p>g) A Stage on shipside for painting</p> <p>h) Self lowering / Hoisting Bosun’s chair’</p> <p>i) Jacob’s ladder or Rope ladder</p> <p>Make a full set of alphanumeric on chart paper.</p> <p>Safety First, NO Smoking, Prohibited Area etc</p>			
5	<p>Identify various types of Slings, uses and identify their SWL.</p> <p>a) Various hitches, Advantage and disadvantages.</p> <p>b) Danger of walking under a load</p> <p>c) Inspecting slings.</p>	5	CO5	BL1, BL2, BL3

	<p>Demonstration: Safety method of lifting a heavy weight.</p> <p>a) COSWP on lifting heavy load</p> <p>b) Practically lift a heavy load correctly</p> <p>c) Consequences of improper lifting of heavy loads.</p> <p>Why? Mousing a hook, seizing a shackle.</p> <p>Practically Mousing & Seized Oil and Grease wires.</p> <p>a) Why wires are lubricated.</p> <p>b) Heart of a wire. It's utility.</p> <p>c) Types of lubricant used and PPE required for wire Lubrication work.</p>			
6	<p>Use of personal LSA</p> <p>a) Wearing TPA</p> <p>b) Wearing Lifejacket</p> <p>c) Wearing Immersion suit</p> <p>d) Use of EEBD. Maintenance and safety check.</p> <p>Use of common FFA</p> <p>a) Familiarity with Fire plan and Fire safety manual.</p> <p>b) Types of fire extinguishers</p> <p>c) Fire extinguishers maintenance and mandatory check.</p> <p>d) Fire alarm system and types of sensors.</p>	6	CO6	BL1, BL2, BL3, BL4,

CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	3	3								3	2	3
CO2	3	3	3	3	3								3	3	3
CO3	3	3	3	3	3								3	3	2
CO4	3	3	3	3	3								3	3	2
CO5	3	3	3	3	3								3	2	2
CO6	3	3	3	3	3								3	2	2
Average	3.00	3.00	2.83	3.00	3.00								3.00	2.50	2.33

REFERENCE

Required Textbook(s)

1. Training manual for Nautical science skill set requirements.

Required Readings(s)

- | | |
|--------------------------|-------------------------|
| 1. Seamanship Notes | Kemp and Young |
| 2. Nicholls Seamanship | Brown, Son and Ferguson |
| 3. Seamanship Techniques | D J House |
| 4. Life Boat & Life Raft | Capt. S.K. Puri |
| 5. Survival at Sea | Wright C.H |
| 6. LSA Code | IMO |
| 7. FSS Code | IMO |

COURSENAME	COURSE CODE	L-T-P	HOURS
COMPUTER SCIENCE PRACTICAL	N207a	0-0-54	54

COURSE OBJECTIVES:

After successful completion of this course, cadet should be able:

- To understand the basic concepts of computer hardware and software.
- To understand the basic concepts of computer network and their classification.
- To understand the programming concept and will develop the programming ability in 'C' language.
- To develop the concept of operating system and application software.
- To build up the knowledge in ship management system.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	Understanding the basic use of Microsoft office including word, excel, PowerPoint
CO2	Understanding the basic concepts of computer network and their configuration
CO3	Understanding the programming concept and will develop the programming ability in 'C' language
CO4	Developing the concept of AutoCAD software

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	Design a report using word processor	6	CO1	BL1, BL2, BL3
2	Design a spreadsheets using MS-Excel	6	CO1	BL1, BL2, BL3
3	Design a presentation graphics using MS-Powerpoint	6	CO1	BL1, BL2, BL3
4	Study and configure TCP/IP protocol and LAN	6	CO2	BL1, BL2, BL3, BL4
5	Configure and share the files and printers in the network	6	CO2	BL1, BL2, BL3, BL4
6	A 'C' program for arithmetic operations on numbers using switch case	6	CO3	BL2, BL3, BL4, BL5
7	A 'C' program to calculate the division obtained by the students	6	CO3	BL2, BL3, BL4, BL5
8	AutoCAD tutorial	6	CO4	BL1, BL2, BL3, BL4
9	Typing skill at 40 words/min	6	CO1	BL1, BL2

CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3												2	3	3
CO2	3		3										3	2	2
CO3	3	2	2	2	3	3	3	2	3	1	3	1	1	3	3
CO4	2		3										3	3	2
Average	2.75	2.00	2.67	2.00	3.00	3.00	3.00	2.00	3.00	1.00	3.00	1.00	2.25	2.75	2.50

REFERENCE**Required Textbook(s)**

- Title: Introduction to Computers Author: Peter Norton Publisher: Tata Mcgraw Hill
- BCSL-013 Computer Basics & PC Software Lab Author: Seema BhatiaPub: Gullybaba Publishing House (P) Ltd

Required Readings(s)

- Intro to Computer Science Vol I & II: Jains - BPB Publication
- Elements of CAD/CAM Y C Rao
- CAD/ CAM Principles & Application P N Rao, McGraw Hill 3rd Ed
- Mastering C K R Venugopal & S R Prasad, Tata McGraw Hill
- Ansi C B W Kernigham & Dennis M Ritchie, PHI
- Let us C Y Kanetkar, BPB
- Computer Fundamentals: Concepts, Systems & Applications Author: Pradeep K. Sinha& Priti Sinha Publisher: BPB Publications

COURSENAME	COURSE CODE	L-T-P	HOURS
ENGLISH AND COMMUNICATION SKILLS – 2 PRACTICAL	N211a	0-0-36	36

COURSE OBJECTIVES:

- To give ample practice and opportunities to the students to enhance their learning and sharpen their skills of listening and speaking in English,
- To develop verbal aptitude and an overall understanding of the different skills of communication.
- To train the students to handle various situations of communication through various activities with exposure to real life situations.
- To guide the students to build confidence and build credible social connections.
- To encourage the students to cultivate communication competence and accept challenges to gain confidence

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

COURSE OUTCOMES (CO)	ATTRIBUTES
CO1	To develop the capacity to listen and comprehend in everyday situations and communicate accordingly in English.
CO2	To have a clear understanding of the importance of vocabulary and develop enough competence to comprehend different reading materials.
CO3	To appreciate the basic tenets of communication and apply the basic communication practices in different types of communication like speaking in organization and societal needs.
CO4	To comprehend the basics of domain-specific communication and the basics of necessary soft skills to enhance personality development

UNIT WISE DETAILED CONTENT:

UNIT / MODULE NO.	DESCRIPTION OF TOPIC	LECTURE HOURS	CO	COGNITIVE LEVELS OF ATTAINMENT AS PER BLOOMS TAXIMONY
1	Attentive Listening practice - Focusing on listening in different situations– announcements, descriptions, narratives, instructions, discussions, demonstrations	2	CO1	BL1, BL3
2	Listening to radio & TV program / Commercials	2	CO1, CO3	BL1, BL3
3	Listening to short stories through audiobooks/ video/ podcasts	2	CO1, CO3	BL1, BL3
4	Audio recording of a conversation - associated exercise	2	CO1	BL1, BL3
5	Classroom conversation	2	CO2	BL1, BL2, BL3
6	Learning to use vocabulary to talk with confidence about life and interests	2	CO4	BL1, BL2, BL4
7	Building grammar to talk about past and present	2	CO2	BL1, BL2, BL3, BL4

8	Describing places	2	CO2	BL1, BL2, BL3, BL4
9	Talking to peers and other adults	2	CO1, CO3	BL1, BL2, BL3
10	Factors influencing way of speaking –setting, topic, social relationship, attitude and language	2	CO1, CO3	BL1, BL2, BL3
11	English for use in everyday situations	2	CO1, CO3	BL1, BL2, BL3
12	Information Gap Activities	2	CO1, CO3	BL1, BL2, BL3
13	Conversation in pairs	2	CO1, CO3	BL1, BL2, BL3
14	Sharing opinions / views on an interesting topic	2	CO4	BL1, BL2, BL3, BL6
15	Using blank versions of comic strips to tell/ write a story	2	CO4	BL6
16	Storytelling / Create a story / Imagine a story	2	CO4	BL6
17	Use of Correct Body Language – Gestures, Postures, Paralinguistics	2	CO4	BL4
18	Assignment - Internal Viva	2	CO4	BL5

CO-PO-PSO MAPPING:

COURSE OUTCOME (CO)	PROGRAMME OUTCOME (PO)												PROGRAMME SPECIFIC OUTCOME (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	3	1	1	1	1	1	2	2	1	1	2	1	1	3
CO2	1	3	1	1	1	1	1	2	2	1	1	2	1	1	3
CO3	1	3	1	1	1	1	1	2	2	1	1	2	1	1	3
CO4	1	3	1	1	1	1	1	2	2	1	1	2	1	1	3
Average	1.00	3.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	1.00	1.00	2.00	1.00	1.00	3.00

REFERENCE

Learning Resources:

1. Kulbushan Kumar, R S Salaria, Effective Communication Skills, Khanna Publishing House, Delhi.
2. Practical English Usage. Michael Swan. OUP. 1995.
3. Remedial English Grammar. F.T. Wood. Macmillan. 2007
4. On Writing Well. William Zinsser. Harper Resource Book. 2001
5. Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
6. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
7. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
8. Universal English Prof. Prasad Kataria Publications, 2019
9. A modern Approach to Verbal & Non-Verbal Reasoning. R.S. Aggarwal. S. Chand Limited

Other Learning Resources for use:

Audio-visual aids