VELS

INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)

(Deemed to be University under section 3 of UGC Act, 1956)

NAAC ACCREDITED WITH 'A' GRADE



SCHOOL OF MARITIME STUDIES

DIPLOMA IN MARINE ENGINEERING

Regulation 2021

Curriculum and Syllabus

Department of Marine Engineering

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Program Source Outcome

Department of Marine Engineering

To enable the student to emerge as:

PSO 01: Develop candidates' understanding, at an advanced level, of professional concepts and techniques in marine operations fields

PSO 02: Has specialized insight in maritime operations and its process

PSO 03: Can apply knowledge to new area related to maritime operations

PSO 04: Develop candidates' decision-making abilities

PSO 05: Enhance and develop technical skills and knowledge as relevant to the particular marine role of the individual

PSO 06: Enable candidates to lead innovation in marine organizations' operations and outputs

PSO 07: Enable candidates to manage change and deploy resources in efficient and effective ways

PSO 08: Enable candidates to use their professional skills and knowledge to support the development of the organizational capability of marine operations organizations

Program Source Outcome

PO1: Apply knowledge of mathematics, science and engineering in their specialization involving complex engineering problems.

PO2: Analyze a problem, identify, formulate and solve engineering problems using basic fundamental Principles of mathematics and science.

PO3: Design a system component or process to meet the desired needs and standards within realistic constraints such as public health and safety, social and environmental considerations.

PO4: Design and conduct experiments, as well as do research, analyze and interpret data and give clear solutions.

PO5: Use and learn the limitations involved in recent techniques, skills and modern engineering tools necessary for engineering practice.

PO6: Assess the local and global impact of engineering solutions on individuals, organization and society and the consequent responsibilities relevant to their professional engineering practice.

PO7: Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.

PO8: Understand the professional and ethical responsibilities and norms of engineering practice.

PO9: Work with multi-disciplinary teams, involve in team activities and accomplish a common goal.

PO10: Communicate effectively with engineering community for presentation, documentation of reports adopting the design standards.

PO11: Understand engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.

PO12: Meet contemporary issues and create advance technologies and will be engaged to lifelong learning in the broadest scale.

Program Specific Outcome

PSO1: Attain knowledge to carry out the watch keeping duties of an engineer officer on board a ship in a safely manner

PSO2: Attain Knowledge to maintain and operate machinery and equipment fitted on board ships at operational level

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VELS INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)
SCHOOL OF MARITIME STUDIES
DIPLOMA IN MARINE ENGINEERING

REGULATION 2021
CURRICULUM

Total No. of Credits: 140

SEMESTER - I							
Category	Code	Title of the Course	Total Hours	Hours / Week			Credits
				Lecture	Tutorial	Practical	
AECC	21ADMR11	Communication English - I	60	5	-	-	3
AECC	21ADMR12	Engineering Mathematics - I	60	5	-	-	5
CC	21CDMR11	Engineering Physics - I	60	5	-	-	3
CC	21CDMR12	Engineering Chemistry – I	60	5	-	-	3
CC	21CDMR13	Engineering Graphics – I	60	5	-	-	5
SEC	21PDMR11	Engineering Physics – I (Practical)	30	-	-	3	2
SEC	21PDMR12	Engineering Chemistry – I (Practical)	30	-	-	3	2
TOTAL			360	25	-	6	23
SEMESTER – II							
Category	Code	Title of the Course	Total Hours	Hours / Week			Credits
				Lecture	Tutorial	Practical	
AECC	21ADMR21	Communication English – II	60	5	-	-	3
AECC	21ADMR22	Engineering Mathematics - II	60	5	-	-	5
CC	21CDMR21	Engineering Physics – II	60	5	-	-	3
CC	21CDMR22	Engineering Chemistry – II	60	5	-	-	3
CC	21CDMR23	Engineering Graphics – II	60	5	-	-	5
SEC	21PDMR21	Engineering Physics –II (Practical)	30	-	-	3	2
SEC	21PDMR22	Engineering Chemistry – II (Practical)	30	-	-	3	2
SEC	21PDMR23	Basic Workshop (Practical)	30	-	-	3	2
TOTAL			390	25	-	9	25

SEMESTER – III							
Category	Code	Title of the Course	Total Hours	Hours / Week			Credits
				Lecture	Tutorial	Practical	
CC	21CDMR31	Marine Strength of Materials and Fluid Mechanics	60	5	-	-	5
AECC	21ADMR31	Marine Workshop Technology – I	60	5	-	-	5
SEC	21SDMR31	Ship Construction Technology	60	5	-	-	3
CC	21PDMR31	Marine Strength of Materials and Fluid Mechanics (Practical)	30	-	-	3	2
AECC	21PDMR32	Marine Workshop Technology – I (Practical)	30	-	-	3	2
SEC	21PDMR33	Ship Construction Technology (Practical)	30	-	-	3	2
SEC	21PDMR34	Computer Applications (Practical)	30	-	-	3	1
TOTAL			300	15	-	12	20
SEMESTER – IV							
Category	Code	Title of the Course	Total Hours	Hours / Week			Credits
				Lecturer	Tutorial	Practical	
AECC	21ADMR41	Marine Workshop Technology – II	60	5	-	-	5
AECC	21ADMR42	Personal Safety and Social Responsibilities	60	5	-	-	3
CC	21CDMR41	Marine Engineering Drawing	60	5	-	-	5
CC	21CDMR42	Electrical Drives & Control	60	5	-	-	3
AECC	21PDMR41	Marine Workshop Technology – II (Practical)	30	-	-	3	2
SEC	21PDMR42	Computer Aided Marine Engineering Drawing (Practical)	30	-	-	3	2
SEC	21PDMR43	Electrical Drives & Control (Practical)	30	-	-	3	2
TOTAL			330	20	-	9	22

SEMESTER – V							
Category	Code	Title of the Course	Total Hours	Hours / Week			Credits
				Lecture	Tutorial	Practical	
CC	21CDMR51	Marine Thermodynamics	60	5	-	-	5
CC	21CDMR52	Marine Diesel Engine and Power Plant	60	5	-	-	3
AECC	21ADMR51	Naval Architecture	60	5	-	-	5
DSEC	21DDMR51	Navigation and Oceanography	60	5	-	-	3
SEC	21SDMR51	Seamanship and Commercial Geography	60	5	-	-	3
CC	21PDMR51	Marine Diesel Engine and Power Plant (Practical)	30	-	-	3	2
DSEC	21PDMR52	Navigation and Meteorology (Practical)	30	-	-	3	2
GE	21PDMR53	Life and Employability Skill (Practical)	30	-	-	3	2
TOTAL			390	25	-	9	25
SEMESTER – VI							
Category	Code	Title of the Course	Total Hours	Hours / Week			Credits
				Lecturer	Tutorial	Practical	
CC	21CDMR61	Marine Auxiliary Machinery	60	5	-	-	5
DSEC	21DDMR62	Personal Survival Techniques	60	5	-	-	3
DSEC	21DDMR63	Rule of the Road	60	5	-	-	3
DSEC	21DDMR64	Marine Welding Technology	60	5	-	-	5
SEC	21SDMR61	Marine Auxiliary Machinery (Practical)	30	-	-	3	2
SEC	21SDMR62	Marine Welding Technology (Practical)	30	-	-	3	2
PROJ	21RDMR61	Project Work	30	-	-	3	5
TOTAL			330	20	-	9	25

VELS
KNOWLEDGE IS POWER

VELS INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)
SCHOOL OF MARITIME STUDIES
DIPLOMA IN MARINE ENGINEERING

REGULATION 2021

Pass Mark Structure

SEMESTER - I								
SL.	Code	Title of the Paper	Internal Marks		External Marks		Total Marks	
			Min.	Max.	Min.	Max.	Min.	Max
1.	21ADMR11	Communication English - I	--	40	24	60	40	100
2.	21ADMR12	Engineering Mathematics - I	--	40	24	60	40	100
3.	21CDMR11	Engineering Physics - I	--	40	24	60	40	100
4.	21CDMR12	Engineering Chemistry – I	--	40	24	60	40	100
5.	21CDMR13	Engineering Graphics – I	--	40	24	60	40	100
6.	21PDMR11	Engineering Physics – I (Practical)	--	40	24	60	40	100
7.	21PDMR12	Engineering Chemistry – I (Practical)	--	40	24	60	40	100
SEMESTER - II								
SL.	Code	Title of the Paper	Internal Marks		External Marks		Total Marks	
			Min.	Max.	Min.	Max.	Min.	Max
1.	21ADMR21	Communication English – II	--	40	24	60	40	100
2.	21ADMR22	Engineering Mathematics - II	--	40	24	60	40	100
3.	21CDMR21	Engineering Physics – II	--	40	24	60	40	100
4.	21CDMR22	Engineering Chemistry – II	--	40	24	60	40	100
5.	21CDMR23	Engineering Graphics – II	--	40	24	60	40	100
6.	21PDMR21	Engineering Physics –II (Practical)	--	40	24	60	40	100
7.	21PDMR22	Engineering Chemistry – II (Practical)	--	40	24	60	40	100
8.	21PDMR23	Basic Workshop	--	40	24	60	40	100

SEMESTER - III								
SL.	Code	Title of the Paper	Internal Marks		External Marks		Total Marks	
			Min.	Max.	Min.	Max.	Min.	Max
1.	21CDMR31	Marine Strength of Materials and Fluid Mechanics	--	40	24	60	40	100
2.	21ADMR31	Marine Workshop Technology – I	--	40	24	60	40	100
3.	21SDMR31	Ship Construction Technology	--	40	24	60	40	100
4.	21PDMR31	Marine Strength of Materials and Fluid Mechanics (Practical)	--	40	24	60	40	100
5.	21PDMR32	Marine Workshop Technology – I (Practical)	--	40	24	60	40	100
6.	21PDMR33	Ship Construction Technology (Practical)	--	40	24	60	40	100
7.	21PDMR34	Computer Applications (Practical)	--	40	24	60	40	100
SEMESTER – IV								
SL.	Code	Title of the Paper	Internal Marks		External Marks		Total Marks	
			Min.	Max.	Min.	Max.	Min.	Max
1.	21ADMR41	Marine Workshop Technology – II	--	40	24	60	40	100
2.	21ADMR42	Personal Safety and Social Responsibilities	--	40	24	60	40	100
3.	21CDMR41	Marine Engineering Drawing	--	40	24	60	40	100
4.	21CDMR42	Electrical Drives & Control	--	40	24	60	40	100
5.	21PDMR41	Marine Workshop Technology – II (Practical)	--	40	24	60	40	100
6.	21PDMR42	Computer Aided Marine Engineering Drawing (Practical)	--	40	24	60	40	100
7.	21PDMR43	Electrical Drives & Control (Practical)	--	40	24	60	40	100

SEMESTER - V								
SL.	Code	Title of the Paper	Internal Marks		External Marks		Total Marks	
			Min.	Max.	Min.	Max.	Min.	Max
1.	21CDMR51	Marine Thermodynamics	--	40	24	60	40	100
2.	21CDMR52	Marine Diesel Engine and Power Plant	--	40	24	60	40	100
3.	21ADMR51	Naval Architecture	--	40	24	60	40	100
4.	21DDMR51	Navigation and Oceanography	--	40	24	60	40	100
5.	21SDMR51	Seamanship and Commercial Geography	--	40	24	60	40	100
6.	21PDMR51	Marine Diesel Engine and Power Plant (Practical)	--	40	24	60	40	100
7.	21PDMR52	Navigation and Meteorology (Practical)	--	40	24	60	40	100
8.	21PDMR53	Life and Employability Skill (Practical)	--	40	24	60	40	100
SEMESTER – VI								
SL.	Code	Title of the Paper	Internal Marks		External Marks		Total Marks	
			Min.	Max.	Min.	Max.	Min.	Max
1.	21CDMR61	Marine Auxiliary Machinery	--	40	24	60	40	100
2.	21DDMR62	Personal Survival Techniques	--	40	24	60	40	100
3.	21DDMR63	Rule of the Road	--	40	24	60	40	100
4.	21DDMR64	Marine Welding Technology	--	40	24	60	40	100
5.	21SDMR61	Marine Auxiliary Machinery (Practical)	--	40	24	60	40	100
6.	21SDMR62	Marine Welding Technology (Practical)	--	40	24	60	40	100
7.	21RDMR61	Project Work	--	40	24	60	40	100

Total No. of Credits: 140

SEMESTER – I

Code	Subject	Lecture	Tutorial	Practical	Credits
21ADMR11	COMMUNICATION ENGLISH – I	5	0	0	3

Course Objective:

- Construct the with the increasing variety of options and opportunities emerging for Diploma students, fulfilling their communication needs become highly important.
- Construct Proficiency in communication can equip them to be confident and to cope with the employment and educational situation in any part of the world.
- Design Understand the Communication levels inspire higher aspiratory levels in the process of upward mobility in career and socio-cultural evolution of the young individuals.
- Design the end of the course the student should be able to express himself in oral and written communication effectively.

Course Outcome:

CO 01: Construct Grammar Nouns & Verbs
CO 02: Construct Listening, Plurals, Past Tense Endings and Reading
CO 03: Plan Grammar Adjectives & Proposition Listening
CO 04: Construct Speaking & Writing: Activities
CO 05: Design Task based factual, inferential Vocabulary & Experiential questions

Syllabus:

UNIT - I - NAMES & ACTIONS **12**

Grammar Nouns & Verbs - Listening, Plurals, Past Tense Endings - Reading:

UNIT - 2- DESCRIPTION & CONNECTIONS **12**

Grammar Adjectives & Proposition Listening: Speaking & Writing: Activities- Reading:

Task based factual, inferential Vocabulary & Experiential questions.

UNIT - 3:- RESOURCES & ENVIRONMENT **12**

Grammar Kinds of Sentences Phrases, Clauses Sentences Negative Sentences Articles- Listening- Reading: Writing Punctuation: Activity

UNIT - 4: Writing Visual to Verbal Paragraph (using linkers) Messages. **12**

UNIT - 5: Writing Ads Personal letters [Invitation, Permission & thanking] Develop hints. **12**

Total Hours: 60

Textbook:

1. English for Engineers and Technologists Vol. 1 and 2, Division of Humanities and Social Sciences, Anna University, Orient Longman Pvt. Ltd.,

Reference Book: Effective Technical Communication, by Rizvi M. Ashraf, Tata McGraw-Hill publishing company ltd., New Delhi.

Code	Subject	Lecture	Tutorial	Practical	Credits
21ADMR12	ENGINEERING MATHEMATICS – I	5	0	0	5

Course Objective:

- Construct the subject helps the students to develop logical thinking which is useful in comprehending the principles of all other subjects.
- Compose analytical and systematic approach towards any problem is developed through learning of this subject. Mathematics being a versatile subject can be used at every stage of human life.
- Construct the student will be able to acquire knowledge of algebra of complex numbers and its uses to solve equations having non-real solutions and knowledge of differentiation, principles and different methods, develop the ability to apply these methods to solve technical problems to execute management plans with precision.

Course Outcome:

CO 01: Construct algebra, determinates, matrices and binomial theory

CO 02: Construct complex numbers: algebra of complex numbers

CO 03: Construct inverse trigonometric ratios & differential calculus - i

CO 04: Construct the trigonometry

CO 05: Construct the differential calculus – II

Syllabus:

UNIT - I: ALGEBRA – DETERMINANTS, MATRICES AND BINOMIAL THEORY 12

DETERMINANTS: Definition and expansion of determinants of order 2 and 3. Properties of determinants (not for examination). Solution of simultaneous equations using Cramer's rule (in 2 and 3 unknowns) - Simple Problems.

MATRICES: Definition –Singular Matrix, Non-singular Matrix, Adjoin of a matrix and Inverse of a matrix up to 3 x 3 only. Simple Problems. Definition – Rank of a matrix. Finding rank of a matrix by determinant method (matrix of order 3 x 4) Simple Problems

BINOMIAL THEOREM: Definition of Factorial notation - Definition of Permutation and Combinations – values of *nPr* and *nCr* (results only) [not for examination]. Binomial theorem for positive integral index (statement only) - Expansion - Finding of general term, middle term, coefficient of *xn* and term independent of *x*. Simple Problems. Binomial Theorem for rational index up to - 3 (statement only), Expansions only for - 1, - 2 and - 3.

UNIT - II: COMPLEX NUMBERS: ALGEBRA OF COMPLEX NUMBERS 12

Definition – Real and Imaginary parts, Conjugates, Modulus and amplitude form, Polar form of a complex number, multiplication and division of complex numbers (geometrical proof not needed)– Simple Problems .Argand Diagram – Collinear points, four points forming, square, rectangle, rhombus and parallelogram only . Simple Problems.

DE MOIVER'S THEOREM: Demoivre's Theorem (statement only) – related simple problems.
ROOTS OF COMPLEX NUMBERS: Finding the n the roots of unity - solving equation of the form $x^n \pm 1 = 0$ where $n < 7$ Simple Problems.

UNIT - III: TRIGONOMETRY **12**

COMPOUND ANGLES- Expansion of sin($A^* B$) , cos($A^* B$) and tan ($A^* B$) [without proof]. Problems using above expansions.

MULTIPLE ANGLES: Trigonometrically ratios of multiple angles of 2A and 3A and sub multiple angles. Simple Problems.

SUM AND PRODUCT FORMULAE: Trigonometrically ratios of sum and product formulae. Simple Problems

UNIT - IV: INVERSE TRIGONOMETRIC RATIOS & DIFFERENTIAL CALCULUS - I **12**

INVERSE TRIGONOMETRIC FUNCTIONS : Definition of inverse trigonometric ratios – Relation between inverse trigonometric ratios. Simple Problems.

LIMITS: Definition of Limits. Problems using the following results:

Definition of Limits. Problems using the following results:

(i) $\lim_{x \to a} \frac{x^n - a^n}{x - a} = n a^{n-1}$ (ii) $\lim_{\theta \to 0} \frac{\sin \theta}{\theta} = 1$ and

(iii) $\lim_{\theta \to 0} \frac{\tan \theta}{\theta} = 1$ (θ - in radians) (results only) . Simple Problems.

DIFFERENTIATION:

Definition – Differentiation of x^n , $\sin x$, $\cos x$, $\tan x$, $\operatorname{cosec} x$, $\sec x$, $\cot x$, $\log x$, e^x , $u \pm v$, uv , uvw , $\frac{u}{v}$ $(v \neq 0)$ (results only).

Simple problems using the above results.

UNIT-V: DIFFERENTIAL CALCULUS – II **12**

DIFFERENTIATION METHODS- Differentiation of function functions (chain rule), Inverse Trigonometric functions and Implicit functions. Simple Problems.

SUCCESSIVE DIFFERENTIATION: Successive differentiation up to second order (parametric form not included). Definition of differential equation, order and degree, formation of differential equation. Simple Problems.

PARTIAL DIFFERENTIATION: Definition – Partial differentiation of two variables up to second order only. Simple Problems.

Total Hours: 60

TEXT BOOK:

1. Mathematics for Higher Secondary – I year and II year (Tamil Nadu Text Book Corporation)

REFERENCE BOOK:

1. Engineering Mathematics - Dr.M.K.Venkatraman, National Publishing Co, Chennai

2. Engineering Mathematics – Dr.P.Kandasamy & Others, S.Chand & Co Ltd, New Delhi.

Code	Subject	Lecture	Tutorial	Practical	Credits
21CDMR11	ENGINEERING PHYSICS –I	5	0	0	3

Course Objective:

- At the end of the study of I Semester the student will be able to
- Understand the importance of SI units and dimensional .formulae.
- Acquire broad ideas about resultant, moment of a..force and torque of a couple.
- Understand the elastic property and the types of Modulus of elasticity.
- Explain the surface tension of liquids and viscosity of fluids.
- Understand Newton's laws of motion and equations of different types of motion.

Course Outcome:

CO 01: Plan the Units and Measurements
CO 02: Compose the Proprieties of matter
CO 03: Construct the Dynamics - I
CO 04: Construct the Dynamics - II
CO 05: Construct the sound and magnetism.

Syllabus:

UNITS-I: UNITS AND MEASUREMENTS:- **12**

Unit-Definition-Fundamental Quantities-Definition-Seven fundamental Quantities: their SI units and symbol for the units-Supplementary quantities plane angle and solid angle; their SI units and symbol for the units Derived physical quantities. Dimensional formula for length, mass and time-derivation of dimensional formula for area, volume, density, velocity, momentum, acceleration, force, impulse, work or energy and power. Uses of Dimensional formula. Conventions followed in SI –Units Multiples & sub-multiples and prefixes of units.

STATICS:- Scalar and vector quantities–Definitions and examples–Concurrent forces and coplanar forces–Definition-Resolution of a vector into two perpendicular components-Resultant and equilibrant–Definitions-Parallelogram law of forces statement- Expressions for magnitude and direction of the resultant of two forces acting at a point with an acute angle between them-Lami's theorem-Statement and explanation-Experimental verification of parallelogram law of forces and Lami's theorem. Simple problems based on expressions for magnitude and direction of resultant. Moment of a force-Clockwise and anti-clockwise moments-Principle of moments-Couple–Torque acting due to a Couple–Experimental determination of mass of the given body using principle of moments.

UNIT- II: PROPERTIES OF MATTER: **12**

ELASTICITY:- Elastic and plastic bodies–Definition-stress, strain-Definitions–Hooke's law – statement-three types of strain–Elastic and plastic limit–Young's modulus, Bulk modulus, Rigidity modulus and Poisson's ratio–Definitions-Uniform and non-uniform bending of beams-Experimental determination of the Young's modulus of the material of a beam by uniform bending method. Simple problems based on stress, strain and Young's modulus.

VISCOSITY:- Viscosity–Definition-Coefficient of viscosity-Definition, SI unit and dimensional formula-Stream line flow, turbulent flow-Explanation-Critical velocity–Definition- Reynolds number-Experimental comparison of coefficient of viscosity of two low viscous liquids–Terminal velocity–Definition-Experimental determination of coefficient of viscosity of a highly viscous liquid by Stokes method–Practical applications of viscosity.

SURFACE TENSION:- Surface tension & angle of contact-Definitions-Expression for surface tension of a liquid by capillary rise method-Experimental determination of surface tension of water by capillary rise method–Practical applications of capillarity. Simple problems based on expression for surface tension.

UNIT - III: DYNAMICS–I: **12**

STRAIGHTLINE MOTION:- Introduction-Newton's Laws of motion-Fundamental Equations of motion for objects-horizontal motion-falling freely-thrown vertically upwards.

PROJECTILE MOTION:- Projectile motion, angle of projection, trajectory, maximum height, time of flight, and horizontal range–Definitions-Expressions for maximum height, time of flight and horizontal range–Condition for getting the maximum rang of the projectile- Derivation of the equation to show that the trajectory of the projectile is a parabola. Simple problems based on expressions for maximum height, time of flight and horizontal range.

CIRCULAR MOTION:- Circular motion, angular velocity, period and frequency of revolutions– Definitions–Relation between linear velocity and angular velocity–Relation between angular velocity, period and frequency–Normal acceleration, centripetal force and centrifugal force–Definitions–Expressions for normal acceleration and centripetal force. Banking of curved paths–Angle of banking– Definition–Expression for the angle of banking of a curved path.{ $\tan\theta = v2/(r\ g)$}Simple problems based on the expressions for centripetal force and angle of banking. Simple harmonic motion, amplitude, frequency and period-Definitions.

UNIT-IV: DYNAMICS–II: **12**

ROTATIONAL MOTION OF RIGID BODIES:- Rigid body–Definition-Moment of inertia of a particle about an axis, moment of inertia of a rigid body about an axis–expressions–Radius of gyration–Definition– Expression for the kinetic energy of a rotating rigid body about an axis–Angular momentum–Definition–Expression for the angular momentum of a rotating rigid body about an axis–Law of conservation of angular momentum–Examples.

GRAVITATION:- Newton's laws of gravitation–Acceleration due to gravity on the surface of earth–Expression for variation of acceleration due to gravity with altitude.

SATELLITES:- Satellites–Natural and artificial–Escape velocity and orbital velocity–Definitions– Expression for escape velocity–Expression for orbital velocity –Uses of artificial satellites. Simple problems based on the expressions for escape velocity and orbital velocity.

UNIT -V: SOUND AND MAGNETISM: **12**

SOUND:- Wave motion–Introduction and definition–Audible range-Infrasonic- Ultrasonic's- Progressive waves, longitudinal and transverse waves–Examples- Amplitude, wave length, period and frequency of a wave–definitions-Relation between wave length, frequency and velocity of a wave-Stationary or standing waves. Vibrations-Free & forced vibrations and resonance–definitions and examples– Laws of transverse vibrations of a stretched string–Sonometer–Experimental determination of frequency of a tuning fork. Acoustics of buildings–Echo-Reverberation, reverberation time, Sabine's formula for reverberation time (no derivation) –Coefficient of absorption of sound energy–Noise pollution. Simple problems based on expression for frequency of vibration.

MAGNETISM:- Pole strength –Definitions–Magnetic moment, intensity of magnetization, magnetizing field intensity, magnetic induction, permeability, hysteresis, saturation, retentively and coercively – Definitions - Method of drawing hysteresis loop of a specimen using a solenoid–Uses of Hysteresis loop simple problem based on intensity of magnetization.

Total Hours: 60

TEXT BOOK:
1. Published by DOTE-Govt of Tamil Nadu
2. Physics–Higher secondary–First year–Volume I & II TamilNadu Textbook Corp 2004.

REFERENCE BOOK :
1. Physics–Resnick and Haliday–Wisley Toppan publishers–England
2. Engineering Physics–B.L.Theraja–S. Chand Publishers.

Code	Subject	Lecture	Tutorial	Practical	Credits
21CDMR12	ENGINEERING CHEMISTRY –I	5	0	0	3

Course Objective:

The objective of this Course is to make the student:

1. Study about the importance of Engineering Chemistry in industry.
2. Know about atomic structure, molecular mass and acids and bases.
3. Learn about solutions, colloidal particles and nano-particles.
4. Know about hardness of water, catalysis and glass.

Course Outcome:

CO 01: Construct the Atomic Structure, Molecular Mass, Acids And Bases

CO 02: Construct the Solutions, Colloids, Nano-Particles

CO 03: Construct the Technology Of Water, Catalysis, Glass

CO 04: Construct the Electrochemistry, Electrochemical Cell,

CO 05: Construct the Energy Sources

Syllabus:

UNIT-I: ATOMIC STRUCTURE, MOLECULAR MASS, ACIDS AND BASES **12**

ATOMIC STRUCTURE: Atom – Definition – Fundamental particles of Atom – their Mass, Charge and Location – Atomic number and Mass number – Definition – Isotopes and Isobars – Definition with suitable examples – Formation of cation and anion by electronic concept of oxidation and reduction – Octet rule – Formation of electrovalent compound (NaCl) – Formation of covalent compound (NH_3).

MOLECULAR MASS: Molecule – Molecular Formula – Molecular Mass – Mole – Definition – Simple calculations – Avogadro's Hypothesis – Relationship between Molecular Mass and Vapour Density – Avogadro Number – Definition.

ACIDS AND BASES: Theories of Acids and Bases – Arrhenius Theory – Lowry – Bronsted Theory – Lewis Theory – Advantages of Lewis Theory – pH and pOH – Definition – Numerical problems – Indicator – Definition and Examples only – Buffer solution – Definition – Types of buffer solution with examples – Application of pH in Industries.

UNIT - II SOLUTIONS, COLLOIDS, NANO-PARTICLES **12**

SOLUTIONS: Definition – Methods of expressing concentration of a solution – Molarity, Molality, Normality, Mole fraction and Percentage Mass – Simple problems.

COLLOIDS: True solution and Colloidal solution – Definition – Differences – Types of colloids – Lyophilic and Lyophobic colloids – Differences – Properties – Tyndall effect, Brownian movement, Electrophoresis and Coagulation – Industrial applications of colloids – Smoke Precipitation by Cottrell's method, Purification of water, Cleansing action of soap, Tanning of leather and Sewage disposal.

NANO-PARTICLES: Definition – Importance of Nano-particles – Area of application – Medicine, Electronics and Biomaterials.

UNIT - III TECHNOLOGY OF WATER, CATALYSIS, GLASS **12**

TECHNOLOGY OF WATER: Sources of water – Reasons for depletion of underground water – Rain water harvesting (Basic ideas) – Advantages – Hard water and soft water – Hardness of water – Carbonate and Non-carbonate hardness – Methods of expressing hardness – mg/lit and ppm – Simple problems – Estimation of total

hardness of water by EDTA method – Problems involving Total, Carbonate and Non-carbonate hardness in ppm – Softening of hard water – Ion-Exchange method and Reverse Osmosis method – Municipal water supply – Purification (Sedimentation, Filtration and Sterilization) – Disadvantages of using hard water in boilers – Scale formation, Corrosion of boiler metal, Caustic Embrittlement and Priming and Foaming.

CATALYSIS: Catalyst – Positive catalyst – Negative catalyst – Definition – Types of catalysis – Homogeneous and Heterogeneous – Promoter – Catalyst poison – Definition – Characteristics of a catalyst – Industrial applications of catalysts.

GLASS: Definition – Manufacture of Glass – Varieties of Glass – Optical Glass, Windshield Glass and Photo chromatic Glass.

UNIT - IV ELECTROCHEMISTRY, ELECTROCHEMICAL CELL, ENERGY SOURCES 12

ELECTROCHEMISTRY: Electrolyte – Definition – Strong and Weak electrolytes – Examples – Electrolysis – Definition – Mechanism – Industrial application of Electrolysis – Electroplating – Preparation of surface – Process – Factors affecting the stability of the coating – Chrome plating – Electroless plating – Definition – Advantages of Electroless plating over electroplating – Applications of Electroless plating.

ELECTROCHEMICAL CELL: Electrochemical Cell – Definition – Representation of a Cell – Single Electrode Potential – Definition – Galvanic Cell – Formation of Daniel Cell – Electrochemical Series – Definition and Significance – Electrolytic Concentration Cell – Definition and Formation.

ENERGY SOURCES: Primary Battery – Definition and example – Construction, Working and Uses of Dry cell – Secondary Battery – Definition and example – Construction, Working and Uses of Lead-acid Storage Cell – Nonconventional Energy Sources – Solar Cell – Definition – Principle, Construction, Working and Uses.

UNIT-V CORROSION, METHODS OF PREVENTION CORROSION, ORGANIC COATINGS 12

CORROSION: Definition – Types of Corrosion – Theories of corrosion – Galvanic Cell Formation Theory – Differential Aeration theory – Factors influencing the rate of corrosion.

METHODS OF PREVENTION OF CORROSION: Control of Environment – Alloying – Surface coatings – Metal coatings – Electroplating, Galvanization and Tinning – Inorganic coating – Anodizing – Cathodic Protection – Sacrificial Anode Method and Impressed Voltage Method.

ORGANIC COATINGS: Paint – Definition – Components of Paints and their functions – Varnish – Definition – Preparation of Oil Varnish – Differences between Paint and Varnish – Special Paints – Luminescent Paints, Fire Retardant Paints, Aluminium Paints and Distemper

Total Hours: 60

TEXT BOOK:

1. Engineering Chemistry – Jain & Jain – Dhanpat Rai & Sons.
2. A Text Book of Engineering Chemistry – S.S. Dara – S. Chand Publication.

REFERENCE BOOK:

1. A Text Book of Environmental Chemistry and Pollution Control S.S. Dara – S. Chand Publication.
2. Engineering Chemistry – Uppal – Khanna Publishers.

Code	Subject	Lecture	Tutorial	Practical	Credits
21CDMR13	ENGINEERING GRAPHICS – I	5	0	0	5

Course Objective:

- Understand the importance of drawing.
- Identify and use the drawing instruments.
- Practice the rules and methods of dimensioning.
- Acquire knowledge about geometric construction.
- Construct conics curves.
- Draw the projection of points and straight lines.
- Draw orthographic views from isometric drawings.

Course Outcome:

CO 01: Construct the drawing office practices of Dimensioning

CO 02: Compose the Geometric Constructions of Conics

CO 03: Design the Projection of Points

CO 04: Construct the Projection of Lines

CO 05: Construct the orthographic Projection

Syllabus:

UNIT - I DRAWING OFFICE PRACTICE **12**

Importance of engineering drawing - drawing instruments: drawing board, mini drafter, compass, divider, protractor, drawing sheets, drawing pencils, set squares etc.,-title block – folding of drawing sheets. Lettering and numbering as per BIS 9609 - importance - single stroke letters – slanting letters - upper case and lower case letters - general procedures for lettering and numbering - height of letters – guide lines practices. Scales - full scale, reduced scale and enlarged scale.

DIMENSIONING: Dimensioning – terms and notations as per BIS -requirement of dimensioning - Dimension line, Extension lines and Leader lines – Dimensioning systems - Methods of dimensioning – Important dimensioning rules – Exercises (One view of the object).

UNIT -II:GEOMETRIC CONSTRUCTIONS **12**

Geometric constructions: Bisect a line – bisect an arc – bisect given angle – divide straight line into number of equal parts – divide the circle into number of equal divisions – draw an arc touching two lines at any angle – draw an arc touching two arcs.

CONSTRUCTIONS OF CONICS: CONICS: Cone – conic sections - Definition of locus, focus, directrix, axis, vertex and eccentricity. Definition: ellipse, parabola and hyperbola.

Ellipse: Construction of ellipse by concentric circle method, rectangular method and Eccentricity method when focus and directrix are given – Exercises.

Parabola: Construction of parabola by rectangular method, parallelogram method and eccentricity method when focus and directrix are given– exercises.

Hyperbola: Construction of hyperbola by rectangular method and eccentricity method when focus and directrix are given – exercises

UNIT - III PROJECTION OF POINTS **12**

Projection of points – points on the different quadrants and on the reference planes.

UNIT – IV PROJECTION OF STRAIGHT LINES **12**

Projection of straight lines – Line in the first quadrant and on the reference planes - perpendicular to one plane and parallel to other plane – inclined to one plane and parallel to the other plane – parallel to both the planes – inclined to both the planes – Exercise.

UNIT- V: ORTHOGRAPHIC PROJECTION **12**

Introduction – Orthographic projection - terms - First angle projection - Third angle projection – Draw symbols – Compare first and third angle projections. Draw the projection of the simple isometric objects using first angle projection only – Draw front view / top view / right / left side view.(Any two views only)

Total Hours: 60

Text Books

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010.
2. Gill P.S., “Engineering drawing”, S.K.Kataria & Sons.

Reference Books

1. Gopalakrishnan.K.R., "Engineering Drawing", (Vol.I & Vol.II), Dhanalakshmi publishers, Edition 2, 1970
2. Venugopal.K, Sreekanjana G, “Engineering Graphics” New Age International Publishers.
3. K V Nataraajan “A Text Book of Engineering Drawing”
4. Besant Agrawal, C M Agrawal “Engineering drawing”, Tata McGraw Hill Education Private Limited.
5. Barkinson & Sinha, "First Year Engineering Drawing", Pitman Publishers.

Code	Subject	Lecture	Tutorial	Practical	Credits
21PDMR11	ENGINEERING PHYSICS- I - PRACTICAL	0	0	3	2

Course Objective:

- All the Eight experiments given in the list of experiments should be completed and given for the end semester practical examination.
- In order to develop best skills in handling Instruments / Equipment and taking readings in the practical classes, every two students should be provided with a separate experimental setup for doing experiments in the laboratory.
- The external examiners are requested to ensure that a single experimental question should not be given to more than four students while admitting a batch of 30 students during Board Examinations.

Course Outcome:

CO 01: Invent the Thickness of the Glass Plate

CO 02: Invent the Diameter of the Solid Cylinder

CO 03: Invent the Parallelogram Law

CO 04: Invent the Coefficient of Viscosity of Two Liquids

CO 05: Invent the High Viscosity of liquid

CO 06: Construct the Capillary Rise method.

CO 07: Construct the frequency of Turning Fork.

EXPERIMENTS:

1. MICROMETER (SCREW GAUGE): To measure the thickness of the given irregular glass plate using micrometer. To determine the area of the glass plate using a graph sheet and to calculate the volume of the glass plate.

2. VERNIER CALIPERS.: To measure the length and diameter of the given solid cylinder using vernier calipers and to calculate the volume of the solid cylinder.

3. CONCURRENT FORCES: To verify the parallelogram law of forces and Lami's theorem.

4. COMPARISON OF VISCOSITIES: To compare the co-efficient of viscosities of two low viscous Liquids by capillary flow method.

5. STOKES' METHOD: To determine the coefficient of viscosity of a high viscous liquid.

6. SURFACE TENSION: To determine the surface tension of water by capillary rise method.

7. SONOMETER: To determine the frequency of the given tuning fork.

8. DEFLECTION MAGNETOMETER: To compare the magnetic moments of the two bar magnets using deflection Magnetometer in Tan A position, by equal distance method .

Total Hours: 30.

Code	Subject	Lecture	Tutorial	Practical	Credits
21PDMR12	ENGINEERING CHEMISTRY- I PRACTICAL	0	0	2	2

Course Objective:

- At the end of the program the student will have knowledge about volumetric analysis in acidimetric, alkali metric and permanganometric titration and their applications.
- To get knowledge of estimation of total hardness, temporary and permanent hardness in the hard water sample.
- To get knowledge about measurement of pH and to calculate Hydrogen ion concentration in a solution.

Course Outcome:

CO 01: Construct the Volumetric Titration

CO 02: Construct the Observe the chemical reaction

CO 03: Construct the weak and strong solution reaction

CO 04: Construct the Mohr's salt.

CO 05: Construct of pH using a pH meter and calculation of hydrogen ion Concentrations in the solutions

EXPERIMENTS

INTELLECTUAL SKILLS

1. Carrying out Volumetric titrations and calculation of masses
2. Knowing units for Concentrations of solutions

MOTOR SKILLS

1. Measure quantities accurately
2. Observe chemical reactions
3. Handle the apparatus carefully

ACIDIMETRIC AND ALKALIMETER

1. Estimation of weak base (sodium carbonate) using a standard solution of sodium hydroxide and sulphuric acid as link solution. [Test solution should be made up to 100 ml]
2. Estimation of strong base (sodium hydroxide) using a standard solution of sodium carbonate and sulphuric acid as link solution. [Test solution should be made up to 100 ml]
3. Comparison of strengths of two acid solutions using a standard solution of sodium hydroxide
4. Comparison of strengths of two alkaline solutions using a standard solution of oxalic acid

PERMANGANOMETRY

5. Estimation of Mohr's salt using a standard solution of ferrous sulphate and potassium permanganate as link solution. [Test solution should be made up to 100 ml]
6. Estimation of Iron in ferrous sulphate solution using a standard solution of ferrous ammonium sulphate and potassium permanganate as link solution. [Test solution should be made up to 100 ml]
7. Comparison of strengths of two potassium permanganate solutions using a standard solution of ferrous sulphate

WATER ANALYSIS

8. Estimation of total hardness of a water sample using EDTA.
9. Determination of pH using a pH meter and calculation of hydrogen ion Concentrations in the solutions (For five given samples). (This question may be given to any two students per batch)

Total Hours: 30

SEMESTER – II

Code	Subject	Lecture	Tutorial	Practical	Credits
21ADMR21	COMMUNICATION ENGLISH – II	5	0	0	3

Course Objective:

- Recognize & distinguish active/passive forms Use active & passive forms.
- Convert from direct to indirect, Indirect to direct.
- Build and expand vocabulary use, Comprehend, interpret, analyze texts.
- Identify, recognize, use word forms appropriately Convert words into other forms Add question tags
- Sort positive, comparative, superlative forms Recognize, distinguish & use degrees appropriately.

Course Outcome:

CO 01: Compose the Grammar Active and Passive Voices
CO 02: Construct the Vocabulary Exercise, understand the Grammar Word formation
CO 04: Compose the grammar word formation
CO 05: Construct the Writing - Process, tasks Job application ordering goods

Syllabus

UNIT - I : GRAMMAR ACTIVE / PASSIVE **12**

Through Activities Presentation, practice, use Presentation of rules Adequate contextual examples. Practice.

DIRECT TO INDIRECT - Task.

VOCABULARY LEXICAL SETS - Activity.

UNIT -I I : POLYMERS **12**

READING: Task based complex passages for academic purposes. Factual, Inferential Vocabulary & Experiential questions.

GRAMMAR WORD FORMS TAGS PREFIX/SUFFIX: Activities presentation, practice, use Presentation Adequate contextual examples Practice

SPEAKING : Activity - Pair work.

UNIT -III : DISASTERS **12**

GRAMMAR DEGREES OF COMPARISON

Activities Presentation, practice, uses Presentation of structure & rules Adequate contextual examples Practice.

VERBAL QUESTIONS WH QUESTIONS

Activities Presentation, Practice, uses Presentation of structure & rules Adequate contextual examples Practice.

READING :Task based Factual Inferential Vocabulary & Experiential Questions

SPEAKING: Opining Activities Gap: Pair/group work.

UNIT -IV : WRITING REPORTS HINTS EMAILS **12**

5-Step Writing - Process - Pre writing -(brainstorming) - Clustering/Grouping - Rough draft - Revision/Editing - Final draft.

UNIT -V : WRITING FORMAL LETTER RESUME VERBAL TO VISUAL **12**

Activities: tasks Job application ordering goods. Lodging complaints (sample, guided, controlled, free)

READING: Task based Factual Inferential Vocabulary & Experiential Questions

Total Hours: 60

Textbook:

1. English for Engineers and Technologists Vol. 1 and
2, Division of Humanities and Social Sciences, Anna University, Orient Longman Pvt. Ltd.,

Reference Book:

Effective Technical Communication, by Rizvi M. Ashraf, Tata McGraw-Hill publishing company ltd., New Delhi.

Code	Subject	Lecture	Tutorial	Practical	Credits
21ADMR22	ENGINEERING MATHEMATICS – II	5	0	0	5

Course Objective:

- The student will be able to acquire knowledge of algebra of vectors.
- And the application in finding work done, moment, volumes
- To Understand the knowledge of Integration principles
- To understand the different methods of Integration.

Course Outcome:

CO 01: Compose the Analytical Geometry

CO 02: Construct the Equation of Circle and Family of Circle and Conical Section

CO 03: Compose the Vector algebra and scale of Vector.

CO 04: Compose Two Vector Product and Three Vector Product.

CO 05: Construct the Vector Calculus.

Syllabus

UNIT - I : ANALYTICAL GEOMETRY **12**

EQUATION OF CIRCLE: Equation of circle – given centre and radius. General equation of circle – finding centre and radius. Equation of circle on the line joining the points (x_1,y_1) and (x_2,y_2) as diameter. Simple Problems.

FAMILY OF CIRCLES: Concentric circles, contact of two circles(Internal and External) -Simple problems. Orthogonal circles (results only). Problems verifying the condition.

INTRODUCTION TO CONIC SECTION:

Definition of a Conic, Focus, Directrix and Eccentricity. General equation of a conic $ax^2+2hxy+by^2+2gx+2fy+c=0$ (statement only). Condition for conic (i) for circle: $a=b$ and $h=0$ (ii) for pair of straight line: $\begin{vmatrix} a & h & g \\ h & b & f \\ g & f & c \end{vmatrix} = 0$ (iii) for parabola: $h^2-ab=0$ (iv) for ellipse: $h^2-ab<0$ and (v) for hyperbola: $h^2-ab>0$. Simple Problems.

UNIT -II: VECTOR ALGEBRA – I **12**

VECTOR - INTRODUCTION: Definition of vector - types, addition, and subtraction of Vectors, Properties of addition and subtraction. Position vector. Resolution of vector in two and three dimensions. Directions cosines, Direction ratios. Simple problems.

SCALAR PRODUCT OF VECTORS: Definition of Scalar product of two vectors – Properties – Angle between two vectors. Simple Problems.

APPLICATION OF SCALAR PRODUCT: Geometrical meaning of scalar product. Work done by Force. Simple Problems.

UNIT-III : VECTOR ALGEBRA - II : **12**

VECTOR PRODUCT OF TWO VECTORS: Definition of vector product of two vectors. Geometrical meaning. Properties – Angle between two vectors – unit vector perpendicular to two vectors. Simple Problems.

APPLICATION OF VECTOR PRODUCT OF TWO VECTORS & SCALAR TRIPLE PRODUCT: Definition of moment of a force. Definition of scalar product of three vectors – Geometrical meaning – Coplanar vectors. Simple Problems.

VECTOR TRIPLE PRODUCT & PRODUCT OF MORE VECTORS: Definition of Vector Triple product, Scalar and Vector product of four vectors Simple Problems.

UNIT-IV: INTEGRAL CALCULUS - I **12**

INTEGRATION – DECOMPOSITION METHOD

Introduction - Definition of integration – Integral values using reverse process of differentiation – Integration using decomposition method. Simple Problems.

INTEGRATION BY SUBSTITUTION:

Integrals of the form $\int [f(x)]^n f'(x)dx,\ n \neq -1$, $\int \frac{f'(x)}{f(x)}dx$ and $\int F[f(x)]f'(x)dx$. Simple Problems.

STANDARD INTEGRALS:

Integrals of the form $\int \frac{dx}{a^2 \pm x^2}$, $\int \frac{dx}{x^2 - a^2}$ and $\int \frac{dx}{\sqrt{a^2 - x^2}}$. Simple Problems

UNIT-V: INTEGRAL CALCULUS -II **12**

INTEGRATION BY PARTS

Integrals of the form $\int x \sin nx\,dx$, $\int x \cos nx\,dx$, $\int x e^{nx}\,dx$, $\int x^n \log x\,dx$ and $\int \log x\,dx$. Simple Problems

BERNOULLI'S FORMULA

Evaluation of the integrals $\int x^m \sin nx\,dx$, $\int x^m \cos nx\,dx$ and $\int x^m e^{nx}\,dx$ where $m \leq 2$ using Bernoulli's formula. Simple Problems.

DEFINITE INTEGRALS

Definition of definite Integral. Properties of definite Integrals - Simple Problems.

Total Hours: 60

TEXT BOOK:

1. Mathematics for Higher Secondary – I year and II year (Tamil Nadu Text Book Corporation)

REFERENCE BOOK:

1. Engineering Mathematics - Dr. M. K. Venkatraman, National Publishing Co, Chennai.
2. Engineering Mathematics – Dr.P.Kandasamy & Others, S.Chand & Co Ltd, New Delhi.

Code	Subject	Lecture	Tutorial	Practical	Credits
21CDMR21	ENGINEERING PHYSICS – II	5	0	0	3

Course Objective:

At the end of the study of II Semester the student will be able to

- Identify good conductors and insulators of heat.
- Analyze the relation between pressure, volume and temperature of gas and to interpret the results.
- Understand the process of Isothermal and Adiabatic changes of gas and basic laws of thermodynamics.
- Acquire knowledge about liquefaction process of gases.
- Realize the inevitable need for tapping Alternate energy to address the looming energy crisis.
- Identify the characteristics and properties of LASER, Optical fiber.

Course Outcome:

CO 01: Plan the Mode of heat Transfer
CO 02: Construct the kinetic theory of gas and Specific Heat Capacity
CO 03: Construct the thermodynamics, liquefaction of gas and Non conventional Energy.
CO 04: Compose about Light and remote Sensing
CO 05: Construct the Electricity , its circuit and Effect of current

Syllabus

UNIT - I : HEAT **12**

TRANSFER OF HEAT: Concept of Heat and Temperature - Centigrade, Fahrenheit and Kelvin scales of temperature measurement- Conduction, convection and radiation - Definitions and explanations-Coefficient of thermal conductivity-Definition and SI unit- good and poor conductors- Examples-Properties of thermal radiation.
KINETIC THEORY OF GASES: Postulates –Mean square velocity and Root Mean Square(RMS)velocity of molecules- Definitions and expressions –Expression for the pressure of a gas on the basis of postulates of kinetic theory of gases - Relation between pressure and kinetic energy, pressure and absolute temperature of the gas– Simple problems based on the expression for the pressure of a gas.
SPECIFIC HEAT CAPACITY: Specific heat capacity of a substance (solids and liquids) –Definition – Specific heat capacity of a gas at constant volume – Specific heat capacity of a gas at constant pressure– Ratio of specific heat capacities – Explanation for Cp is greater than Cv – Derivation of Mayer's relation – calculation of Universal gas constant R from the gas equation PV= RT. Simple problems based on Mayer's relation.

UNIT - II THERMODYNAMICS, LIQUEFACTION OF GASES - AND NON CONVENTIONAL ENERGY 12

THERMODYNAMICS: First law of thermodynamics – Statement-Isothermal and Adiabatic changes - Explanation – Equations for isothermal and adiabatic changes (No derivation)Simple problems..based on equations $P_1V_1 = P_2V_2$ and $P_1V_1 \quad \gamma = P_2V_2$ Second law of thermodynamics –Clausius statement and Kelvin's statement – Working of Carnot's reversible engine with indicator diagram and its efficiency.
LIQUEFACTION OF GASES: Critical temperature, critical pressure and critical volume – Definitions – Principle used in cascade process –Cascade process of liquefaction of oxygen –Disadvantages of cascade process - Joule Thomson effect – Temperature of inversion – Liquefaction of air by Linde's process.
NON – CONVENTIONAL ENERGY: Introduction – Non-renewable and Renewable (Alternate) energy sources – Examples – Solar energy, wind energy, – Advantages and disadvantages of Renewable energy.

UNIT - III LIGHT AND REMOTE SENSING **12**

OPTICS: Refraction – Laws of refraction – Refractive index of a medium – Definition – Spectrometer –Derivation of refractive index of glass prism using minimum deviation-Experimental determination of refractive index using spectrometer- Fiber optics – Introduction –Phenomenon of total internal reflection –problems using the refractive index.
LASER: LASER – Characteristics of LASER – principle of LASER –Spontaneous emission – Stimulated emission – population inversion – Ruby laser- Construction and working- Uses of LASER.
REMOTE SENSING: Remote sensing – Introduction – Active and passive remote sensing – Explanation and examples – Components of remote sensing – Data acquisition, data analysis and reference data –RADAR – principle and working with block diagram.

UNIT - IV ELECTRICITY **12**

ELECTRICAL CIRCUITS: Ohm's law – Laws of resistances – Resistivity, Conductivity, Super conductivity and Meissner effect-Definitions – Kirchhoff's current and voltage laws – Condition for balancing the Wheatstone's bridge .Simple problems based on expression for resistivity.
EFFECTS OF CURRENT: Joule's law of heating – Experimental determination of specific heat capacity of a liquid using Joule's calorimeter –Faraday's laws on electrolysis – Electro chemical equivalent(E.C.E) of an element – Definition – Experimental determination of E.C.E. of copper- Capacitance of a capacitor – Definition – ' FAAD '– Definition– expressions for effective capacitance when capacitors are connected in series and in parallel –Simple problems based on Expressions for E.C.E., effective capacitance for series and parallel connections of capacitors.

MEASURING INSTRUMENTS: Expression for the force acting on a current carrying straight conductor placed in a uniform magnetic field – Fleming's Left Hand rule – Expression for the torque experienced by a rectangular current carrying coil placed inside a uniform magnetic field – Working of a moving coil galvanometer and its merits – Conversion of galvanometer into an Ammeter and Voltmeter. Simple problems based on conversion of galvanometer into ammeter and voltmeter.

UNIT - V ELECTRONICS **12**

SEMI CONDUCTORS: : Semi conductors – Energy bands in solids – Energy band diagram of good conductors, insulators and semi conductors– Concept of Fermi level - Intrinsic semiconductors -Concept of holes - Doping – Extrinsic semiconductors – P type and N type semiconductors.
DIODES AND TRANSISTORS: P-N junction diode – Forward bias and reverse bias –Rectification action of diode – Working of full wave rectifier using P N junction diodes -PNP and NPN transistors – Three different configurations –Advantages of common emitter configuration – Working of NPN transistor as an amplifier in common emitter configuration.
DIGITAL ELECTRONICS:
Digital electronics–Introduction–Logic levels– Basic logic gates: OR, AND, NOT gates – Universal logic gates: NAND and NOR gates – Symbolic representation, Boolean expression and Truth table for all above logic gates – Integrated circuits– Levels of integration – SSI, MSI, LSI and VLSI-Advantages of ICs.
Total Hours 60

Text Book : 1. Engineering Physics ,DOTE, Tamil Nadu

Reference Book : 1. Fundamentals of physics – Brijlal and Subramaniam.
2. Fundamentals of Electricity – D.N. Vasudeva – S. Chand & co

Code	Subject	Lecture	Tutorial	Practical	Credits
21CDMR22	ENGINEERING CHEMISTRY – II	5	0	0	3

Course Objective:

The objective of this Course is to make the student:

1. To acquire knowledge about Environmental Chemistry.
2. To acquire knowledge about fuels, advantages and combustion of fuels and analysis and refractories.
3. To know about extraction of metals, powder metallurgy, alloys, and abrasives.
4. To acquire knowledge about cement, ceramics, lubricants and adhesives.
5. To know about polymer materials.

Course Outcome:

CO 01: Construct the Environmental Chemistry .
CO 02: Plan the concept of Air Pollution, Water Pollution and Solid Waste Management
CO 03: Compose the Green Chemistry
CO 04: Construct the Fuel combustion and Refractories
CO 05: Construct the Extraction of metals and Powder metallurgy

Syllabus

UNIT - I : ENVIRONMENTAL CHEMISTRY **12**

AIR POLLUTION: Pollution and Air pollution – Definition – Air pollutants (SO_2, H_2S, HF, CO and Dust) – Sources and Harmful effects – Formation of Acid Rain – Harmful effects – Green House Effect – Causes – Global warming – Harmful effects – Ozone Layer – Importance – Causes for Depletion of Ozone Layer (No equations) – Harmful effects of Ozone Layer Depletion – Control of Air Pollution.

WATER POLLUTION: Causes of Water Pollution – Sewage, Effluents, Algae and Microorganisms – Harmful effects –Sewerage – Definition – Sewage Disposal – Industrial Effluents – Harmful effects of Effluents – Harmful effects of Heavy Metal Ions – Lead, Cadmium, Zinc and Copper – Treatment of Effluents – Eutrophication – Definition and harmful effects.

SOLID WASTE MANAGEMENT: Solid Waste – Definition – Problems – Types of Solid Waste – Methods of disposal–Land fill and Incineration.

GREEN CHEMISTRY: Definition – Goals of Green Chemistry (Basic ideas) – Recycling –Definition – Examples – Advantages of Recycling (Basic ideas)

UNIT - II FUELS, COMBUSTION AND REFRACTORIES **12**

FUELS: Fuel and fossil fuel – Definition – Calorific value – Classification of fuels – Solid fuels – Wood – Coal – Varieties of Coal – Composition – Specific uses – Liquid fuels – Petroleum – Fractional distillation – Fractions and uses – Cracking (Concept only) – Liquid Hydrogen as fuel – Gaseous fuels – Preparation, composition and specific uses of Producer gas and Water gas – Composition and uses of CNG and LPG – Relative advantages of solid, liquid and gaseous fuels.

COMBUSTION: Definition – Combustion calculation by mass (for solid and liquid fuels) – Combustion calculation by volume (for gaseous fuels) – Stoichiometric calculations – Volume of air required – Excess air – Definition of Flue gas – Flue gas Analysis – Orsat Apparatus – Simple numerical problems.

REFRACTORIES: Definition – Requirements of a good Refractory – Classification – Acidic, Basic and Neutral Refractories – Examples and uses – Uses of Fireclay bricks, Alumina bricks and Silica bricks.

UNIT - III EXTRACTION OF METALS, POWDER METALLURGY, ALLOYS AND ABRASIVES **12**

EXTRACTION OF METALS:
Extraction of Tungsten and Titanium – Uses of Tungsten and Titanium.

POWDER METALLURGY: Definition – Preparation of Metal Powder – Atomization – Reduction of Metal Oxide – Applications of Powder Metallurgy.
ALLOYS: Definition – Purpose of alloying – Types – Ferrous Alloys – Composition and uses of Stainless Steel, Chromium Steel and Vanadium Steel – Nonferrous alloys – Composition and uses of Nichrome, Dutch metal, German silver, Gun metal and Duralumin.

ABRASIVES: Definition – Classification – Hardness in Mohr's scale – Natural abrasives – Diamond, Corundum, Emery and Garnet – Synthetic abrasives – Carborundum – Boron carbide – Manufacture – Properties and uses.

UNIT - IV CEMENT, CERAMICS, LUBRICANTS AND ADHESIVES **12**

CEMENT: Definition – Manufacture of Portland Cement – Wet Process – Setting of Cement (No equation).

CERAMICS:
White pottery – Definition – Manufacture of White pottery – Uses – Definition of glazing – Purpose – Method – Salt glazing.

LUBRICANTS
Definition – Characteristics of Lubricant – Types of Lubricants – Solid – Semi-solid –Liquid Lubricants .
ADHESIVES
Definition – Requirements of good adhesives – Natural adhesive – Uses of Shellac, Starch, Asphalt – Synthetic adhesive – Uses of Cellulose Nitrate, PVC, Phenol-formaldehyde and Urea-formaldehyde.

UNIT - V POLYMERS **12**

PLASTICS: Plastics – Definition - Polymerization – Definition – Types of polymerization – Addition polymerization – Formation of Polythene – Condensation polymerization – Formation of Bakelite – Types of plastics – Thermoplastics and Thermoset plastics – Differences – Mechanical properties of plastics – Advantages of plastics over traditional materials (Wood and Metal) –Reinforced or filled plastics – Definition – Advantages – Applications – Polymers in Surgery – Biomaterials – Definition – Biomedical uses of Polyurethane, PVC, Polypropylene and Polyethylene.

RUBBER: Definition – Preparation from Latex – Defects of natural rubber– Compounding of rubber – Ingredients and their functions – Vulcanization – Definition and Purpose – Reclaimed rubber – Definition – Process – Properties and uses.

COMPOSITE MATERIALS: Definition – Examples – Advantages over metals and polymers – General applications.

Total Hours 60

TEXT BOOK:

1. Engineering Chemistry – Jain & Jain – Dhanpat Rai & Sons.

REFERENCE BOOK:

1. Chemistry of Engineering Material-C.V. Agarwal, Andranaidu C. Parameswara Moorthy –B.S. Publications.

Code	Subject	Lecture	Tutorial	Practical	Credits
21CDMR23	ENGINEERING GRAPHICS – II	5	0	0	5

Course Objective:

- Understand the importance of drawing.
- Identify and uses of the drawing instruments, Acquire knowledge about construction of special curves.
- Draw the development of solids and objects.

Course Outcome:

CO 01: Design the Construction of Special Curves.
CO 02: Design the Principle of Development of surface
CO 03: Design the Projection of Solids
CO 04: Design the Section of Solids
CO 05: Design the Isometric projections

Syllabus:

UNIT - I CONSTRUCTIONS OF SPECIAL CURVES: 12

Geometric curves: Definition - construction of cycloid - epicycloids – hypocycloid – exercises. Involutes of a circle - Archimedean spiral – helix – exercises.

CONSTRUCTION OF POLYGON: Construct triangle, rectangle, pentagon and hexagon by side distance in various positions – construction by inscribe & circumscribe a circle and by angle.

UNIT - II DEVELOPMENT OF SURFACES 12

Methods of development - Need for development - Development of regular polygons: prism, cylinder, cone and pyramids. Exercises in rectangular, pentagon and hexagon prisms and pyramids. Exercises in regular cylinder and cone. Development of truncated prism and cylinder, frustum of pyramid and cone. Development of miscellaneous objects - T-pipe, elbow, ducts, tray, lamp shade and funnel.

UNIT - III PROJECTION OF SOLIDS 12

Introduction - important terms - classification of solids – polyhedron –solids of revolution – exercises in triangular and hexagonal prisms - triangular and hexagonal pyramids - cylinder and cone. Projections of solids in simple positions – Axis parallel to one plane and perpendicular to other plane - axis inclined to one plane and parallel to other plane - axis parallel to both planes - exercises.

SECTION OF SOLIDS

Introduction – terminology - true shape - sectional view - need for sectional view - cutting plane – section lines - triangular and hexagonal prisms and pyramids - cylinder and cone. Position of solids – Axis parallel to one plane and perpendicular to other plane - axis parallel to both planes - exercises. Position of cutting planes – cutting plane perpendicular to one plane and parallel to another plane - cutting plane perpendicular to one plane and inclined to another plane – exercises.

UNIT - IV ISOMETRIC PROJECTIONS 12

Introduction – isometric view - isometric projection – methods of drawing an isometric view - box method – isometric view of regular solids – isometric view of truncated solids - Isometric view of arcs and circles – four centre method for drawing an ellipse - arcs of circles in isometric view. Isometric view of the machine parts from the given simple orthographic view - exercises.

Total Hours 60

Text Books

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010.

Reference Books

1. Gopalakrishnan.K.R., "Engineering Drawing", (Vol.I and Vol.II), Dhanalakshmi publishers,
2. Venugopal.K, Sreekanjana G, “Engineering Graphics” New Age International Publishers.

Code	Subject	Lecture	Tutorial	Practical	Credits
21PDMR 21	ENGINEERING PHYSICS - II PRACTICAL	0	0	2	2

Course Objective:

All the Eight experiments given in the list of experiments should be completed and given for the end semester practical examination.

- In order to develop best skills in handling Instruments/Equipment and taking readings in the practical classes, every two students should be provided with a separate experimental setup for doing experiments in the laboratory.
- The external examiners are requested to ensure that a single experimental question should not be given to more than four students while admitting a batch of 30 students during Board Examinations.

Course Outcome:

CO 01: Construct the Principle of Refractive Index.

CO 02: Construct the Principle of Spectrometer

CO 03: Construct the Solar Cell.

CO 04: Construct the Principle of Law of Resistances

CO 05: Construct the Working Principle of Joules' Calorimeter

CO 06: Construct the Copper Voltammeter.

CO 07: Construct the Principle of P-N Junction Diode

CO 08: Construct the Principle of Logic Gates.

CO 09: Construct the Plastics, Rubber and composite materials

EXPERIMENTS

1. **REFRACTIVE INDEX :** To determine the refractive index of a transparent liquid (water) using travelling Microscope.

2.**SPECTROMETER:** To measure the angle of the prism and the angle of minimum deviation using Spectrometer and to calculate the refractive index of glass.

3. **SOLAR CELL:** To draw the V – I characteristics of the solar cell.

4. **LAWS OF RESISTANCES:** To verify the laws of resistances by connecting the two given standard resistances.
(i) in series and (ii) in parallel, using Ohm's law.

5.**JOULE'S CALORIMETER.:** To determine the specific heat capacity of water.

6. **COPPER VOLTAMETER:** To determine the electro chemical equivalent (e.c.e.) of copper.

7. **P-N JUNCTION DIODE:** To draw the voltage – current characteristics in forward bias and to find the 'dynamic Forward resistance' & 'knee voltage' from the graph.

8. **LOGIC GATES:** To find the output conditions for different combinations of the input for "NOT" gate and 2 inputs "AND", "OR", "NAND" & "NOR". logic gates, Using IC chips. (IC 7404 –NOT Gate, IC 7408 – AND Gate, IC 7432 – OR gate, IC 7400 – NAND Gate, IC 7402 – NOR Gate)

Total Hours 30

Code	Subject	Lecture	Tutorial	Practical	Credits
21PDMR22	ENGINEERING CHEMISTRY – II -PRACTICAL	0	0	2	2

Course Objective:

- At the end of the program the student will be able to identify the acid and basic radical present in the given Inorganic simple salt.
- To analyze the given effluent and to find out presence of heavy metal ion present it.
- To study about the harmful effects of the metallic pollutant.

Course Outcome:

CO 01: Compose the of In organics simple Salt in Qualitative Analysis.

CO 02: Compose the Effluent containing lead, cadmium, copper and zinc metal Ions.

CO 03: Compose the Basic Radical.

CO 04: Compose the Effluent Analysis

CO 05: Compose the Metallic Pollutant.

EXPERIMENTS

I. ANALYSIS OF INORGANIC SIMPLE SALT (QUALITATIVE ANALYSIS)

Analysis of eight inorganic simple salts containing any one acid radical and basic radical without omitting any of the above mentioned radicals.

II. ANALYSIS OF EFFLUENT CONTAINING LEAD, CADMIUM, COPPER AND ZINC METAL IONS (EFFLUENT ANALYSIS)

Analysis of four effluents, each containing the above mentioned metal ions.

Report on the metallic pollutant with procedure (Basic Radical Analysis Procedure) and their harmful effects.

Total Hours 30

Code	Subject	Lecture	Tutorial	Practical	Credits
21PDMR23	BASIC WORKSHOP - PRACTICAL	0	0	2	2

Course Objective:

- At the end of the course, the cadet should be able to Appropriate use of hand tools, machine tools and measuring instruments for fabrication and repair on board.

Course Outcome:

CO 01: Construct Safety measures to be taken to ensure a safe working environment and for using hand tools,

CO 02: Construct the Safety measure to be taken to ensure machine tools.

CO 03: Construct the Safety measure to be taken to ensure measuring instruments.

CO 04: Compose the Fitting Work

CO 05: Compose the Hand tool, machine tool, measuring instrument. and Packing.

Fitting

1. To make a hexagon block from a round bar by chipping and filing
2. To make a Male-Female V- fitting.
3. To make a T-Fitting.
4. To make a dovetail fitting
5. To make a Square fitting
6. To make a H fitting.
7. To make outside calipers of given dimensions.

Total Hours: 30

Text Book

1. In house Manual as per TAR Book.

Reference Book:

1. Engineering Practices Lab manual (3rd Edition) by T. Jeyapoovan, M. Saravanapandian and S. Pranitha

SEMESTER – III

Code	Subject	Lecture	Tutorial	Practical	Credits
21CDMR31	MARINE STRENGTH OF MATERIALS AND FLUID MECHANICS	5	0	0	5

Course Objective:

- Further, the student should understand the principle of centroid of sections.
- To understand the stresses developed in beams under various loads. The student should be
- able to comprehend the effect of shear force & bending moment on beams.
- The student should be able to understand the properties of fluid in motion and hydrostatic
- forces on surfaces, the fluid kinematics and fluid dynamics of motion. The applications of the
- conservation of laws to flow through pipes are studied.

Course Outcome:

CO 01: Compose the Mechanical Properties of Materials, Stress and Strains.

CO 02: Construct the Poisson's Ratio and Others Elastic Constants.

CO 03: Compose the Geometrical properties of Sections.

CO 04: Construct the Shear Force and Bending Moment Diagrams.

CO 05: Construct the Theory of Simple Bending.

CO 06: Compose the Properties of Fluids and Pressure Measurement

Syllabus:

UNIT -MECHANICAL PROPERTIES OF MATERIALS, STRESSES AND STRAINS: 12

Introduction—Definitions of mechanical properties of metals — tensile stress, compressive stress. Classification of force systems – tensile, compressive, shear, bending and torsional force systems – Behaviors of mild steel bar in axial tension up to rupture – stress strain diagram. Hook's Law, Young's Modulus, working stress, factor of safety.

POISSON'S RATIO AND OTHER ELASTIC CONSTANTS:
Lateral strain – Poisson's ratio – volumetric strain, bulk modulus, elastic constants and their relationship. Problems connecting linear, lateral and volumetric deformations. Problems on volumetric strain, Poisson's ratio and E,C,K relation.
GEOMETRICAL PROPERTIES OF SECTIONS: Introduction – centroid, center of gravity, position of centroids on plane geometrical areas such as square, rectangle, triangle. Determination of centriod of angles, channels, I and T sections. Moment of Inertia (definition only) - parallel axis theorem and perpendicular axis theorem.
UNIT - II SHEAR FORCE AND BENDING MOMENT DIAGRAMS: **12**

Classification of beams – shear force and bending moment – sign convention – types of loads – Shear force and bending moment diagram for simply supported beam and cantilever beam subjected to concentrated load and uniformly distributed load only – Problems.
THEORY OF SIMPLE BENDING:
Introduction – theory of simple bending – assumptions – neutral axis – bending stress distribution – moment of resistance – bending equation (study only). Section modulus – strength and stiffness of beam. Problems involving bending equation for cantilever and simply supported beam.

UNIT - III PROPERTIES OF FLUIDS AND PRESSURE MEASUREMENT **12**

Definition - Fluid Properties - Density - Specific weight - Specific volume – Relative density - Viscosity - Vapour pressure – compressibility - surface tension – capillarity - cohesion – adhesion – Pressure - Pascal's law - Pressure head - Atmospheric pressure - Absolute pressure – Gauge pressure and vacuum pressure. Pressure Measurement - Manometers - Piezometer - simple manometer - Differential manometer - Mechanical gauges - Bourdon tube pressure gauge - Problems on simple and differential manometers.

HYDROSTATIC FORCES ON SURFACES:

Total pressure - Centre of pressure - Total pressure and position of centre of pressure on horizontal immersed plane surface, vertical immersed plane surface and inclined immersed plane surface. Problems on hydro static forces on plane surfaces of square, rectangular and circular shapes only.

UNIT - IV FLUID KINEMATICS and FLUID DYNAMICS **12**

Types of flow - Laminar flow - Turbulent flow - Steady flow - Unsteady flow – Uniform flow - Non-uniform flow - flow pattern - path line - stream line - mean velocity of flow - Continuity equation (definition only) - Fluid dynamics – Different types of Heads and Energies of a liquid in motion – Bernoulli's
theorem (definition only) - Applications and limitations – Horizontal Venturimeters, Orifice meter and Pitot tubes. Problems on Horizontal Venturimeters and Orifice meter.

FLOW THROUGH PIPES:

Laws of fluid friction for laminar and turbulent flow - Froude's experiment – Wetted perimeter - Hydraulic radius - head lost due to friction - Darcy Weisbach equation and Chezy's formula (derivation not needed) – problems. Minor losses (description only).

UNIT - V RECIPROCATING PUMPS **12**

Reciprocating pumps - Classifications - single acting - Double acting reciprocation pumps - discharge of a reciprocating pump - theoretical power required - coefficient of discharge - slip - percentage slip - negative slip - acceleration head - air vessels. Problems on discharge, slip, percentage slip, power required to drive the pump.

CENTRIFUGAL PUMPS:

Constructional details – Principle of working – classifications – types of casing – volute – vortex – diffuser casings. Types of impellers – closed, open and semi open impellers – multi stage pumps reasons – working and advantages.

Total Hours 60

TEXT BOOKS:

1. Strength of Materials, R.S.Kurmi. S.Chand & Company Ltd ,2008

2. Hydraulics, Fluid Mechanics and Hydraulic machines, R.S.Kurmi, S.Chand & Company Ltd 2003.

REFERENCE BOOKS:

1. Strength of Materials, S. Ramamrutham, Dhanpat Rai Company-2009

2. Hydraulics, Fluid Mechanics and Fluid machines, S. Ramamrutham ,Dhanpat Rai Company-2009.

Code	Subject	Lecture	Tutorial	Practical	Credits
21ADMR31	MARINE WORKSHOP TECHNOLOGY – I	5	0	0	5

Course Objective:

- At the end of the study of III Semester the student will be able to
- Know the various types of moulds and preparation of casting.
- Have knowledge on Welding & heat treatments.
- Know various operations that can be performed in lathe and allied machines
- To equip with the practical knowledge required in the core industries.

Course Outcome:

CO 01: Construct the Foundry Function of Moulding, Casting.

CO 02: Construct the Welding Operation

CO 03: Construct the Heat Treatment Process

CO 04: Construct the Operation Of Centre Lathe

CO 05: Construct the Operation of Semi Automatic and Automatic Lathes.

UNIT - I FOUNDRY **12**

PATTERNS – definition – pattern materials – factors for selecting pattern materials – single piece solid, split patterns – pattern allowances – core prints.

MOULDING – definition – moulding boxes, moulding sand – ingredients – silica – clay – moisture and miscellaneous materials – properties of moulding sand – sand additives – moulding sand preparation –mixing – tempering and conditioning – types of moulding – green sand – dry sand - core – CO2 process core making – types of core – core boxes.

CASTING – definition – sand casting using green sand and dry sand – gravity die casting – pressure die-casting – hot and cold- chamber processes — cupola furnace – melting of non ferrous metals – crucible. furnace melting of steel and arc furnaces – cleaning of casting – tumbling, trimming, sand and shot blasting –defects in casting – causes and remedies – safety practices in foundry.

UNIT - II WELDING **12**

Welding – arc welding definition — carbon arc, metal arc, Metal Inert gas(MIG), Tungsten inert gas (TIG), Atomic hydrogen, Plasma arc, Spot welding, resistance welding, Submerged arc and Electro slag welding, Gas welding definition – oxy-acetylene welding – Three types of flame. Inspection and testing of welded joints – destructive and non destructive types of tests – magnetic particle test – radiographic and ultrasonic test - defects in welding – causes and remedies – safety practices in welding.

UNIT - III HEAT TREATMENTS **12**

Heat treatment processes – purpose – procedures – applications of various heat treatment processes – full annealing – process annealing stress relief annealing - spherodising annealing – isothermal annealing – normalizing – hardening –

tempering – quenching medium – different types and their relative merits – case hardening – pack carburizing – cyaniding – nitriding – induction hardening and flame hardening.

UNIT - IV CENTRE LATHE: 12

Theory of lathes – specifications – principal parts – head stock – back geared type – all geared type – tumbler gear mechanism – quick change gear box – apron mechanism – carriage cross slide – automatic, longitudinal and cross feed mechanism – tail stock and its functions – work holding device –face plate – three jaw chuck – four jaw chuck – catch plate and carrier – types of centers – machining operations done on lathe straight turning – step turning – taper turning – knurling – Thread cutting – Facing – Boring – chamfering – cutting speed – feed – depth of cut.

UNIT - V SEMI AUTOMATIC AND AUTOMATIC LATHES 12

SEMI AUTOMATIC LATHES:

Types of semi automatic lathes – capstan and turret lathes – difference between turret and capstan – tools and work holding devices – self opening die head – collapsible taps.

AUTOMATIC LATHES:

Automatic lathe – classification of single spindle automatic lathe – principle of automatic lathes – automatic screw cutting machines – multi spindle automatic lathes – use of cams in automats.

Total Hours 60

Text Book:

1) Elements of workshop Technology By S.K Hajra Choudhury , A.K Hajra Choudhury & Nirjhar Roy Volume I & II, Media promoters & Publishers (P) Ltd – 2004

2) A Text book of workshop Technology, R. S. Khurmi & J. K. Gupta, S.Chand & Co., Ram Nagar, New Delhi – 2006

3) A Text book of Foundry Technology, O.P.Khanna, Dhanpat Rai Publications (P) Ltd-2000

Reference Book :

1) Shop Theory, James Anderson, Earl E.Tatro Sixth Edition, Tata Macraw- Hill Publishing Co Ltd - 2001.

2) Technology of Machine Tools, Fourth Edition, Steeve F.KRAR, J. William Oswald, Tata Macraw- Hill Publishing Co Ltd-Singapore-1991.

Code	Subject	Lecture	Tutorial	Practical	Credits
21SDMR31	SHIP CONSTRUCTION TECHNOLOGY	5	0	0	3

Course Objective:

- Understand the ship terms, movement of ships and the various materials used in ship building.
- Acquire knowledge about different types of ships.
- Acquire broader ideas about shell & deck plating and stresses acting on the hull.
- Understand about hull dynamics and paintings. To study bulkheads, water tight doors, deep tanks and hatches.

Course Outcome:

CO 01 Construct the Ship Types and Its Terms in General Use.
CO 02: Construct the Stresses in Ship Structure.
CO 03: Construct the Bottom and Side Framing
CO 04: Construct the Shell and Decks.
CO 05: Construct the Fore Part.
CO 06: Construct the Ship Dynamics.

UNIT - I SHIP TYPES **12**

Passenger ships - cargo liners - cargo tramps - oil tankers - bulk carriers - container ships - roll-on/roll-off vessels - liquefied gas carrier - chemical carrier.

TERMS IN GENERAL USE: Forward – Aft - port side - starboard side – draught – freeboard – Length overall – length between perpendiculars – camber - tumble home – bilge radius – sheer – tonnage – displacement – light weight and dead weight.

STRESSES IN SHIP STRUCTURES: Longitudinal bending in still water and waves – Transverse bending - stresses when docking – panting and pounding..

UNIT - II BOTTOM AND SIDE FRAMING: **12**

Double bottom – internal structure – duct keel – double bottom in machinery space. Side framing – tank side brackets – beam knees – web frames.

SHELL AND DECKS: Shell plating – bulwarks – deck plating – beams – deck girders and pillars – discontinuities – Hatches – steel hatch covers – water tight hatches..

UNIT - III FORE PART **12**

Stem plating – arrangement to resist panting and pounding – bulbous bow – anchor and cable arrangement.

AFT PART: Cruiser stern – transom stern – stern frame and rudder – fabrication of stern frame – cast steel stern frame – unbalanced rudder – balanced rudder – open water stern – spade rudder – rudder and stern frame for twin screw ship – bossing – shaft tunnel – kort nozzle – fixed nozzle rudder – tail flaps and rotary cylinders.

UNIT - IV SHIP DYNAMICS: **12**

Propellers – wake distribution blade loading – controllable pitch propeller – contra rotating propellers – vertical axis propellers – bow thrusters – controllable pitch bow thrusters – hydraulic thrust units – rolling and stabilization – reduction of rolling – bilge keels – fin stabilizers – tank stabilizers – passive tanks – controlled passive tanks – active controlled tanks.

UNIT - V BULK HEADS AND DEEP TANKS: **12**

Water tight bulkheads – water tight doors – deep tanks for water ballast and oil – non water tight bulkheads – corrugated bulkheads.

SHIP MAINTENANCE: Insulation of ships – corrosion prevention – surface preparation – painting – cathodic protection – impressed current system – fouling .

Total Hours 60

TEXT BOOK : Reeds ship construction – E.A. Stroke

REFERENCE BOOK : Ship construction- Edrich Fernands Publishers:

Code	Subject	Lecture	Tutorial	Practical	Credits
21PDMR31	MARINE STRENGTH OF MATERIALS AND FLUID MECHANICS -PRACTICAL	0	0	3	2

Course Objective:

- In order to develop best skills in handling equipment and taking readings in the practical classes, every five students should be provided with a separate experimental setup for doing experiments in the laboratory.

Course Outcome:

CO 01: Plan the Test on Ductile Materials.

CO 02: Plan the Hardness Test.

CO 03: Plan the Torsion Test.

CO 04: Plan the Bending and Deflection Test.

CO 05: Plan the Impact Test

CO 06: Plan the Test on Helical Springs

CO 07: Plan the Shear Test.

CO 08: Plan the Bernoulli's Theorem.

CO 09: Plan the Coefficient of Discharge

CO 10: Plan the Friction factor in a Pipe

CO 11: Plan the Characteristic of Reciprocating Pumps.

CO 12: Plan the Characteristic of Centrifugal Pumps

EXPERIMENTS MARINE STRENGTH OF MATERIALS PRACTICAL

1. TEST ON DUCTILE MATERIALS: Finding Young's Modulus of Elasticity, yield points, percentage elongation and percentage reduction in area, stress strain diagram plotting, tests on mild steel. (Equipment : UTM)

2. HARDNESS TEST: Determination of Brinell hardness number for various materials like mild steel, brass, copper and aluminium. (Equipment : Brinell Hardness Testing Machine)

3. TORSION TEST: Torsion test on mild steel – relation between torque and angle of twist – determination of modulus of rigidity and Young's modulus. (Equipment : Torsion testing machine)

4. BENDING AND DEFLECTION TESTS: Determination of Young's Modulus for steel by deflection test.(Equipment : Deflection testing arrangement

5. IMPACT TEST: Finding the resistance of materials to impact loads by Izod test or Charpy test. (Equipment: Impact testing machine)

6. TESTS ON HELICAL SPRINGS: Determination of modulus of rigidity, strain energy, shear stress by load deflection method. (Equipment: Tension testing arrangements)

7. SHEAR TEST: Shear test on M.S. bar (Equipment: Shear testing machine)

EXPERIMENTS MARINE FLUID MECHANICS PRACTICAL:

1. VERIFYING THE BERNOULLI'S THEOREM (Equipment: The Bernoulli's Apparatus)

2. DETERMINATION OF COEFFICIENT OF DISCHARGE OF A VENTURIMETER / ORIFICE METER.
(Equipment: A Centrifugal pump having the discharge line with Venturimeter / Orifice meter arrangement)

3. DETERMINATION OF THE FRICTION FACTOR IN A PIPE
(Equipment: An arrangement to find friction factor)

4. PERFORMANCE TEST ON A RECIPROCATING PUMP AND DRAW THE CHARACTERISTIC CURVES.
(Equipment: A reciprocating pump with an arrangement for collecting data to find out the efficiency and plot the characteristic curves)

5. PERFORMANCE TEST ON A CENTRIFUGAL PUMP AND DRAW THE CHARACTERISTIC CURVES.
(Equipment: A centrifugal pump with an arrangement for collecting data to find out the efficiency and plot the characteristic curves)

6. PERFORMANCE TEST ON AN IMPULSE TURBINE
(Equipment: An impulse turbine with an arrangement for collecting data to find out the efficiency)

7. MAKING A SUITABLE PNEUMATIC (OR) HYDRAULIC CIRCUIT CONNECTION WITH DCVS, FLOW CONTROL VALVE AND CHECK VALVE TO SHOW THE RECIPROCATING MOTION OF A DOUBLE ACTING CYLINDER WITH METERING-IN CONTROL CIRCUIT.
(Equipment: Either Pneumatic trainer kit with air compressor (or) Hydraulic trainer kit with hydraulic power pack)

8. MAKING A SUITABLE PNEUMATIC (OR) HYDRAULIC CIRCUIT CONNECTION WITH DCVS, FLOW CONTROL VALVE AND CHECK VALVE TO SHOW THE RECIPROCATING MOTION OF A DOUBLE ACTING CYLINDER WITH METERING-OUT CONTROL CIRCUIT.

SAFETY PRECAUTIONS TO BE FOLLOWED

1. Always wear shoes. Always use good conditions tools during the work.
3. Appropriate safety device should be used.
4. Switch off the machines when not in use.

Total Hours 30

Code	Subject	Lecture	Tutorial	Practical	Credits
21PDMR32	MARINE WORKSHOP TECHNOLOGY-I PRACTICAL	0	0	3	2

Course Objective:

- Understand the various geographical regions
- Understand the role of different global market, Understand the different ship types

Course Outcome:

CO 01: Construct the Various Operation on lathe

CO 02: Construct the Properties of Sand in Foundry

CO 03: Construct the Types of pattern used in Foundry

CO 04: Construct the Welding Operation like a Arc Welding and Gas Welding

CO 05: Construct understand the types of Weld Joints.

EXPERIMENTS

I Lathe:

a) Plain turning
b) Step turning
c) Taper turning
d) Thread cutting
e) Drilling
f) Knurling

II Foundry: Preparation of sand mould:

1. Solid pattern: a. Stepped Pulley/ Bush bearing, b. Gear Wheel / T-pipe
2. Split pattern: a.Tumbles
3. Loose Piece Pattern: a.Dovetail
4. Cylindrical core making

III Welding

1. Arc welding
   a) Lap joint (Material: 25mm x 6mm Ms Flat)
   b) Butt joint (Material: 25mm x 6mm Ms Flat)
   c) T-joint (Material: 25mm x 6mm Ms Flat)
   d) Corner joint (Material: 25mm x 6mm Ms Flat)
2. Gas Welding
   a) Lap joint (Material: 25mm x 6mm Ms Flat) b) Butt Joint (Material: 25mm x 6mm Ms Flat)
3. Spot welding-Tray work.

SAFETY PRECAUTIONS TO BE FOLLOWED

1. Always wear apron, head screen and shoes, Always use good conditions tools during the work
2. Appropriate safety device should be used while welding.
3. Switch off the machines when not in use. Do not leave the chuck key on the chuck.

Total Hours 30

Code	Subject	Lecture	Tutorial	Practical	Credits
21PDMR33	SHIP CONSTRUCTION TECHNOLOGY -- PRACTICAL	0	0	3	2

Course Objective:

- Introduction about Ship construction
- To study Elements of ships
- Types of tools and equipments
- Preparation of different sections of ships.(Welding)

Course Outcome:

CO 01: Construct the Fabrication of keel part

CO 02: Construct the Fabrication of fore part.

CO 03: Construct the Fabrication of after part.

CO 04: Construct the Fabrication of bulkheads.

CO 05: Construct the Fabrication of transverse framing.

CO 06: Construct the Fabrication of hatches.

CO 07: Construct the Fabrication of mast.

CO 08: Construct the Fabrication of the hull.

CO 09: Construct the Fabrication of super structure.

CO 10: Construct the Fabrication of navigation bridge.

EXPERIMENTS

PART – A

1. Fabrication of keel part
2. Fabrication of fore part.
3. Fabrication of after part.
4. Fabrication of bulkheads.
5. Fabrication of transverse framing.
6. Fabrication of hatches.
7. Fabrication of mast.
8. Fabrication of the hull.
9. Fabrication of super structure.
10. Fabrication of navigation bridge.

PART – B

Ship visit at harbor to study the parts of ship and submit a report

Total Hours 30

Code	Subject	Lecture	Tutorial	Practical	Credits
21PDMR34	COMPUTER APPLICATIONS PRACTICAL	0	0	3	2

Course Objective:

On completion of the following exercises, the students will be able to

- Use the GUI operating systems
- Familiarize and customize the desktop
- Use the different facilities available in the word processor
- Prepare Power Point presentation with different formats
- Expose E-learning tools and chatting tools
- Analyze the datasheet
- Create and manipulate the database
- Create different types of charts
- PowerPoint presentation
- Understand Internet concepts and usage of e-mail

Course Outcome:

CO 01: Construct the Graphical Operating System

CO 02: Plan the Word Processing.

CO 03: Compose the Spread Sheet.

CO 04: Construct the function of Internet.

CO 05: Compose the Software and Hardware Requirement

Syllabus:

COMPUTER APPLICATIONS SECTION – A

GRAPHICAL OPEARTING SYSTEM

Introduction to GUI OS; Features and various versions of GUI OS & its use; Working with GUI OS; My Computer & Recycle bin ; Desktop, Icons and Explorer; Screen description & working styles of GUI OS; Dialog Boxes & Toolbars; Working with Files & Folders; simple operations like copy, delete, moving of files and folders from one drive to another, Shortcuts &Autostart; Accessories and Windows Settings using Control Panel- setting common devices using control panel, modem, printers, audio, network, fonts, creating users, internet settings, Start button & Program lists; Installing and Uninstalling new Hard ware & Software program on your computer - Copying in CD/DVD settings – Recording Audio files.

Exercises

1. a. Installing screen saver and change the monitor resolution by 1280X960
   b. Setting wall papers
   c. Creating, moving, deleting and renaming a folder
   d. Copy, paste and cut a folder/file

e. Displaying the properties for a file or folder

2. a. Restoring files and folders from Recycle bin
   b. Creating short cuts for folder/file
   c. Finding a file or folder by name
   d. Selecting and moving two or more files/folders using mouse
   e. Sorting folders/files.

WORD PROCESSING

Introduction to Word Processing – Examples- Creation of new documents, opening document, insert a document into another document. Page setup, margins, gutters, font properties, Alignment, page breaks, header footer deleting, moving, replace, editing text in document. Saving a document, spell checker. Printing a document. Creating a table, entering and editing, Text in tables. Changing format of table, height width of row or column. Editing, deleting Rows, columns in table. Borders, shading, Templates, wizards, drawing objects, mail merge.

Exercises

3. Create the following table and perform the operations given below

<table>
<tr><th>DAYS</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th></tr>
<tr><td>MON</td><td colspan="2">TEST</td><td colspan="2">A: JPP
B:RDBMS</td><td>CA</td><td>RDBMS</td><td>TUT</td></tr>
<tr><td>TUE</td><td>CA</td><td>OOP</td><td>CN</td><td>RDBMS</td><td colspan="3">A: RDBMS
B: JPP</td></tr>
<tr><td>WED</td><td>CN</td><td>RDBMS</td><td>OOP</td><td>RDBMS</td><td>COMMUNICATION</td><td>CN</td><td>CA</td></tr>
<tr><td>THU</td><td>OOP</td><td colspan="3">A: JPP
B: RDBMS</td><td>CA</td><td>RDBMS</td><td>CN</td><td>OOP</td></tr>
<tr><td>FRI</td><td colspan="2">COMMUNICATION</td><td colspan="2">A: RDBMS
B: JPP</td><td>OOP</td><td>CN</td><td>RDBMS</td><td>CA</td></tr>
<tr><td>SAT</td><td>OOPS</td><td>RDBMS</td><td>CN</td><td>CA</td><td colspan="4">--------</td></tr>
</table>

4. Create a standard covering letter and use mail merge to generate the customized letters for applying to a job in various organizations. Also, create a database and generate labels for the applying organizations.

5. Create a news letter of three pages with two columns text. The first page contains some formatting bullets and numbers. Set the document background color and add ‘confidential’ as the watermark. Give the document a title which should be displayed in the header. The header/ footer of the first page should be different from other two pages. Also, add author name and date/ time in the header. The footer should have the page number.

SPREAD SHEET

Introduction to Analysis Package – Examples - Concepts of Workbook & Worksheets; Using Wizards; Various Data Types; Using different features with Data, Cell and Texts; Inserting, Removing & Resizing of Columns & Rows; Working with Data & Ranges; Different Views of Worksheets; Column Freezing, Labels, Hiding, Splitting etc.; Using different features with Data and Text; Use of Formulas, Calculations & Functions; Cell Formatting including Borders & Shading; Working with Different Chart Types; Printing of Workbook & Worksheets with various options.

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Exercises

6. Create a result sheet containing Candidate's Register No., Name, Marks for six subjects. Calculate the total and result. The result must be calculated as below and failed candidates should be turned to red.

Result is Distinction if Total >= 70 %
First Class if Total > = 60 % and < 70 %
Second Class if Total >= 50 % and < 60 %
Pass if Total >= 35 % and < 50 %
Fail otherwise
Create a separate table based on class by using auto filter feature.

7. Create a table of records with columns as Name and Donation Amount. Donation amount should be formatted with two decimal places. There should be at least twenty records in the table. Create a conditional format to highlight the highest donation with blue color and lowest donation with red color. The table should have a heading.

8. Create line and bar chart to highlight the sales of the company for three different periods for the following data.

SALES BAR CHART

Period	Product1	Product2	Product3	Total
JAN	35	40	50	125
FEB	46	56	40	142
MAR	70	50	40	160

SECTION – B

DATABASE

Introduction – Menus – Tool bar – Create – Edit – Save – Data types – Insert – Delete – Update – View – Sorting and filtering – Queries – Report – Page setup – Print.

Exercises

9. Create Database to maintain at least 10 addresses of your class mates with the following constraints

- Roll no. should be the primary key.
- Name should be not null

10. create a student's table with the following fields: Sr. No, Reg. No, Name, Marks in 5 subjects. Calculate total and percentage of 10 students. Perform the following queries.

- To find the details of distinction student
- To find the details of first class students
- To find the details of second class students

11. Design a report for the above exercise to print the consolidated result sheet and mark card for the student.

PRESENTATION

Introduction - Opening new presentation, Parts of PowerPoint window – Opening -Saving and closing presentations - Features of PowerPoint, Background design, Word art, Clip art, Drawings,3D settings - Animations, Sound, Views, types

of views - Inserting and deleting slides, arranging slides, slides show, rehearsal, setup show, custom show - Creating custom presentations, action setting, auto content wizard, working with auto content wizard

Exercises

12. Make a marketing presentation of any consumer product with at least 10 slides. Use different customized animation effects on pictures and clip art on any four of the ten slides.

13. Create a Presentation about our institution or any subject with different slide transition with sound effect.

INTERNET

Introduction – Getting acquainted with Internet Connection - Browsers – Website URL - Open a website – Net Browsing - Email: Creating E-mail id – Sending , receiving and deleting E-mail - Email with Attachments – CC and BCC - Chatting – Creating Group mail - Google docs – Search Engines – Searching topics.

Most Popular Social Networking Sites : History – Features – Services – Usage of Face book , Twitter and LinkedIn. Transferring data through wifi / Bluetooth among different devices.

Introduction to cybercrime – Software Piracy – Viruses – Antivirus Software

Exercises

14. Create an e-mail id and perform the following

- Write an e-mail inviting your friends to your Birthday Party.
- Make your own signature and add it to the e-mail message.
- Add a word attachment of the venue route
- Send the e-mail to at least 5 of your friends.

15. Create a presentation on Google docs. Ask your friend to review it and comment unit. Use “Discussion” option for your discussions on the presentation.

Hardware and Software Requirements

Hardware Requirements:

- Computers – 36Nos
- Intel Core i3 Processor
- 500 GB Hard Disk, 2 MB RAM
- 14” Monitor
- Projector – 1 Nos
- Laser Printer – 1 No
- Internet Connection – Minimum of 512 KB

Software Requirement

- Any GUI Operating System
- Open Source Software / MS- Office

Total Hours 60

SEMESTER – IV

Code	Subject	Lecture	Tutorial	Practical	Credits
21ADMR41	MARINE WORKSHOP TECHNOLOGY – II	5	0	0	5

Course Objective:

- To understand the concept and working of standard machine tools such as shaping, planner
- and allied machines, milling, drilling and allied machines.
- To understand the basic concepts of (CNC) Computer Numerical Control of Machine tools Acquire broader ideas about shell & deck plating and stresses acting on the hull.
- Understand about hull dynamics and paintings. To study bulkheads, water tight doors, deep tanks and hatches.

Course Outcome:

CO 01: Construct the Principle of Reciprocating Machine.

CO 02: Plan the Working Principle of Planer, Shaper and Slotter.

CO 03: Plan the Working Principle of Drilling Machines.

CO 04: Plan the Working Principle of Milling Machines.

CO 05: Plan the Abrasive Process.

CO 06: Plan the Computer Numerical Control machines.

Syllabus:

UNIT - I RECIPROCATING MACHINE **12**

PLANER : Types of planers –description of double housing planer specifications- principles of operation- drives- quick return mechanism-feed mechanism- work holding devices

SHAPER : Types of shapers- specifications- standard-plain- universal - principles of operation –drives- quick return mechanism-crank and slotted link-feed mechanism- work holding devices.

SLOTTER :Types of slotter - specifications-method of operations- Whitworth quick return mechanism- feed mechanism – work holding devices.

UNIT - II DRILLING MACHINES **12**

Drills- twist drills – nomenclature – types of drilling machines – bench type – floor type – radial type – gang drill – multi spindle type – principle of operation in drilling — speeds and feeds of various materials – drilling holes – method of holding drill bit – drill chucks – socket and sleeve – drilling
operation – reaming – counter boring – counter sinking – spot facing – tapping – deep hole drilling.

UNIT - III MILLING MACHINES **12**

Types- column and knee type – plain milling machine – universal milling machine – vertical milling machine – specifications of milling machines principles of operation-work and tool holding devices – arbour – stubarbour – spring collect – adapter – milling cutters – cylindrical milling cutter – slitting cutter-side milling cutter – angle milling cutter –

T-slot milling cutter – woodruff milling cutter – fly cutter – nomenclature of cylindrical milling cutter – milling process – conventional milling – climb milling – milling operations – straddle milling – gang milling.

UNIT - IV ABRASIVE PROCESS **12**

Types and classification – specifications – rough grinding – pedestal grinders- portable grinders – belt grinders – precision grinding-cylindrical grinder- center less grinders – surface grinder – tool and cutter grinder – planetary grinders-principles of operations – grinding wheels – abrasives natural and artificial diamond wheels – types of bonds – grit, grade and structure of wheels – wheel shapes and sizes – standard marking systems of grinding wheels – selection of grinding wheel – mounting of grinding wheels – Dressing and Truing of wheels – Balancing of grinding wheels.

UNIT - V COMPUTER NUMERCIAL CONTROL (CNC) MACHIES **12**

Numerical control – definition – components of NC systems – development of NC – DNC – CNC and adaptive control systems – working principle of a CNC system – distinguishing features of CNC machines - advantage of CNC machines – difference between NC and CNC – types of turning centre:
horizontal, vertical – types of machining centers: horizontal spindle, vertical spindle, universal machines – machine axis conventions – design considerations of NC machine tools. CNC EDM machine – Coordinate measuring machines: construction, working principles and specifications – maintenance of CNC machines.

Total Hours 60

TEXT BOOKS:

1) Elements of workshop Technology By S.K Hajra Choudhury , A.K Hajra Choudhury & Nirjhar Roy Volume I & II, Media promoters & Publishers (P) Ltd-2004

2) A Text book of workshop Technology, R. S. Khurmi & J. K. Gupta, S.Chand & Co., Ram Nagar, New Delhi – 2006

3) A Text book of Foundry Technology, O.P.Khanna, Dhanpat Rai Publications(P) Ltd-2000

4) A Text book of Production Technology, O.P.Khanna, M.Lal, Dhanpat Rai Publications(P) Ltd-2002

REFERENCE BOOKS

1) Shop Theory ,James Anderson, Earl E.Tatro Sixth Edition , Tata Macraw- Hill Publishing Co Ltd- 2001.

2) Technology of Machine Tools, Fourth Edition, Steeve F.KRAR, J. William Oswald, Tata Macraw- Hill Publishing Co Ltd-Singapore-1991.

3) Automation production systems and computer –Integrated manufacturing, Mikell.P.Groover, Prentice- Hall of india private Ltd, 2003.

Code	Subject	Lecture	Tutorial	Practical	Credits
21ADMR42	PERSONAL SAFETY AND SOCIAL RESPONSIBILITIES	5	0	0	3

Course Objective:

At the end of the study of VI Semester the student will be able to

- Understand the important of emergency drill
- Acquire broad ideas about personal safety equipments.
- Understand the enclosed space entry & work..
- Acquire knowledge about maintenance of safety devices.

Course Outcome:

CO 01: Compose the Types of emergencies, Drills, Personal Safety Equipments.
CO 02: Construct the Closed Space Entry.
CO 03: Compose the Maintenance of Safety Devices, Precaution of Fire, Explosions and Work Permit.
CO 04: Compose the MARPOL 73-78
CO 05: Construct the International Safety managements Port State.

Syllabus:

UNIT - I TYPES OF EMERGENCIES, DRILLS, PERSONAL SAFETY EQUIPMENTS 12

Emergency – types of emergency - main engine, steering gear failure, collision, flooding, man overboard. Action to be taken in the event of emergency, emergency signals, action to be taken hearing emergency signal, muster list, muster station – fire station, boat station - drills – value of training and drills important of training and drills , fire drill, Survival craft drills Protective Clothing and Equipment – General – Head protection – Safety helmets –nets and safety caps – Hearing protection – Face and eye protection - Respiratory protective equipment – Respirators –Breathing apparatus – Resuscitators – Hand and foot protection – gloves –Footwear –Protection from falls – Body protection.

UNIT - II ENCLOSED SPACE ENTRY 12

Procedure & precautions, precautions on entry dangerous space, duties and responsibilities of officer, Entering Enclosed or Confined Spaces – General – Precautions on Entering Dangerous Spaces – Duties and Responsibilities of a competent Person and of Responsible Officer – Identifying potential Hazards oxygen Deficiency –Flammability – Other Hazards – Preparing and Securing the Space for Entry –Toxicity of oil Cargoes – Toxicity of Other Substances – Testing the Atmosphere of the Space – Testing for oxygen Deficiency – Testing for Flammable Gases or Vapours – Testing for Toxic Gases – Procedures and Arrangements Before.

UNIT - III MAINTENANCE OF SAFETY DEVICES, PRECAUTION OF FIRE EXPLOSIONS AND WORK PERMIT 12

Testing and maintaining of - life boat engine, fixed CO2 flooding rooms-bulk CO2 rooms – portable extinguisher, – Maintenance of Equipment – Training, Instruction and Information – Statutory Regulations for breathing apparatus –

accident causes and prevention – engine room –scavenging fire metal fire in boiler – battery room, main switch board - use of permit to work system - procedure and arrangement before entry, during entry, hot work permit check lists.

UNIT - IV MARPOL 73-78 **12**

Annex-I-Use of oil record book 1 - Entry of oil record book - oil record book

part 2 – Ship board oil pollution prevention emergency plan (SOPPEP) –

SOPPEP locker - Bunkering procedure.

Annex-II-Definition – categories - disposal of noxious substances.

Annex-III- Definition - IMDG Code – packing – marking – labelling – documentation – stowage - transportation

Annex-IV- Definition - disposal of sewage

Annex-V- Definition - disposal of garbage

Annex-VI- Control of emission – CFC, Nitrous oxide, sulphur oxide,

incinerator smoke - international air pollution certificate.

UNIT - V INTERNATIONAL SAFETY MANAGEMENT (ISM), PORT STATE

CONTROL INSPECTIONS

ISM-objectives – safety and environmental protection policy- company responsibilities and authority – Designated person – master responsibility and authority – resource person - development of plan for ship board operation- emergency preparedness- report and analysis of non conformities –maintenance of the ship and equipment- documentation – company verification and review and evaluation –certificate verification and control - master co operation of inspection –document verification of port state control officer - inspection – clear ground – more detailed inspection – suspensions of inspection.

Total Hours 60

Text Books:

Ship board operation H.I.LAVERY, Last Edition 1990 , Publisher British library cataloguing in publication data: SOLAS IMO publications Last Edition 2001,MARPOLE 73 / 78 IMO, Last Edition 1997.

Reference Book:

Ship safety and environmental protection, Vikram Gokhale, N. Nanda Edition 2003 N.G. Engineering publications

Code	Subject	Lecture	Tutorial	Practical	Credits
21CDMR41	MARINE ENGINEERING DRAWING	5	0	0	5

Course Objective:

- Appreciate the need for sectional view and types of sections.
- Draw sectional views using different types of sections.
- Explain the use of threaded fasteners and the types of threads.
- Compare whole basis system with shaft basis system.

Course Outcome:

CO 01: Design the Section Views.

CO 02: Design the Limits, Fit and Tolerances.

CO 03: Design the Surface Texture.

CO 04: Design the Keys, Screw threads and Threaded Fasteners.

CO 05: Design the detailed Assembly Drawing.

Syllabus:

UNIT - I SECTION VIEWS **12**

Review of sectioning – Conventions showing the section – symbolic representation of cutting plane- types of section – full section, half section, offset section, revolved section, broken section, removed section – section lining.

UNIT - II LIMIT, FIT AND TOLERANCES **12**

Tolerances – Allowances – Unilateral and Bilateral tolerances. Limits – Methods of tolerances – Indication of tolerances on linear dimension of drawings – Geometrical tolerances – application – Fits – Classifications of fits – Selection of fits – examples.

UNIT - III SURFACE TEXTURE **12**

Surface texture – importance – controlled and uncontrolled surfaces – Roughness – Waviness – lay – Machining symbols.

UNIT - IV KEYS, SCREW THREADS AND THREADED FASTENERS **12**

Types of fasteners – temporary fasteners – keys – classification of keys – Heavy duty keys – light duty keys. Screw thread – Nomenclature – different types of thread profiles – threads in sections – threaded fasteners – bolts – nuts – through bolt – tap bolt, stud bolt – set screw – cap screws – machine screws – foundation bolts

UNIT - V DETAILED ASSEMBLY DRAWING **12**

1. Spigot & cotter joint, 2. Protected type flanged coupling, 3. Universal coupling, 4. Screw jack

MARINE COMPONENT DRAWINGS

1. Bilge suction strainer, 2. Feed check valve, 3. Rams bottom safety valve, 4. Stop valve, 5. Marine engine connecting rod, 6. Blow off cock

Total Hours 60

REFERENCE BOOKS:

1. Machine Drawing by P.S. Gill, Katsan Publishing House, Ludiana
2. A Text book Engineering Drawing by R.B. Gupta, Satya Prakasan – Technical India Publications, Delhi
3. Mechanical Draughtsman ship by G.L. Tamta, Dhanpat Rai & Sons, Delhi.

Code	Subject	Lecture	Tutorial	Practical	Credits
21CDMR42	ELECTRICAL DRIVES AND CONTROL	5	0	0	3

Course Objective:

- Explore fundamental electric circuit laws.
- Explain the working principle of DC and AC Electrical machines.
- Identify the effective uses of drives of Electrical machines.
- Analyze the various power supply circuits.
- Select the field controlled elements.
- Explain the construction and working of Transformer.
- Compare the different types of Logic gates.
- Appreciate the safety practices followed in Electrical system.
- Compare the use of servo motors and stepper motors in electrical driving system
- Identify PLC Input outputs.
- Identify the use of Control elements.

Course Outcome:

CO 01: Compose the DC Circuits and DC machines.

CO 02: Compose the AC Circuits and AC Machines.

CO 03: Compose the Stepper and Servo Motors and Drives.

CO 04: Compose the Power Supplies and Logic Gates.

CO 05: Compose the Control Elements and PLC.

Syllabus

UNIT - I DC CIRCUITS AND DC MACHINES **12**

Definition- Electric current, voltage and resistance -Ohm's law and Kirchhoff's law. Resistance in series and parallel and series, parallel – simple problems electromagnetism(definitions only) – magnetic flux, flux density magnetic field intensity, MMF, permeability, reluctance, Faraday's law of electromagnetic induction, electrical and mechanical Units DC generators – construction, principle of operation, types and application.

DC motors: - construction, principle of operation, types and application. Necessity of starters: Three point, four point starters.

UNIT - II AC CIRCUITS AND AC MACHINES **12**

Fundamentals of AC voltage, and current – peak, average, RMS value of sine wave, frequency, time period, amplitude, power and power factor (definition only)- star and delta connection relationship between phase, line voltage and current in star and delta connections. Transformer: Principle of operation and construction – EMF equation(no definition)- losses in Transformer – efficiency – application. Alternator construction – principle of operation – types and applications.

AC machine: AC motors- Principle of operation of single phase capacitor start and universal motor induction motor-applications- Three phase induction motors – Squirrel cage and slip ring Induction motors (construction and working principle only) - application – speed control of 3Φ Induction motor -Necessity of starters – DOL and star/delta starter.

UNIT - III STEPPER AND SERVO MOTORS & DRIVES **12**

PMDC, Stepper motor- construction and working principle and applications - Servo motor – types: brushless servo motor, permanent magnet servo motor construction and applications. Industrial drives- types, group drive, individual drive, multi motor drive, block diagram of Variable frequency drive , stepper motor drive: single stepping and half stepping. Servo drives.

Electrical safety: - importance of earthling - electric shock: first aid, precautions - causes of accident and their preventive measures. Energy conservation.

UNIT - IV POWER SUPPLIES AND LOGIC GATES **12**

Diode – terminals: anode and cathode, forward biasing and reverse biasing – use of diode in rectifiers – half wave and full wave – necessity of filters- Regulated power supplies: IC voltage regulators – SMPS, UPS and Inverters – General description and their applications. Display devices – LED, 7 segment LED, LCD Logic gates: Positive and negative logic, definition, symbol truth table, Boolean expression for OR, AND, NOT, NOR, NAND, EXOR AND EXNOR gates – Universal logic Gates: NAND, and NOR.

UNIT - V CONTROL ELEMENTS AND PLC **12**

Fuses – selection of fuse – necessity of fuse- fuse switch units. Sensors: Photo electric sensor, Inductive proximity sensors, Temperature sensors. Switches: Push button switch, selector switch, limit switch, pressure switch, temperature switch, float switch and reed switch. Relays – NO, NC – usage- bimetallic thermal overload relays. Contactors- usage – necessity of contactor- Solenoid type contactor Circuit breakers – Miniature case Circuit breaker (MCCB) and Miniature Circuit breaker (MCB), Oil Circuit breakers (OCB), Earth leakage circuit breaker (ELCB) Features of PLC-PLC Block diagram- PLC scan - Fixed and modular PLC Ladder logic-NO, NC contacts-Coils-AND, OR.

Total Hours 60

TEXT BOOKS:

1) A course in electrical engineering - B.L.Theraja - Multi Colour Edition, S Chand & Co, Reprint 2006

2) Control of Machines - S.K Bhattacharya, Brijinder Singh – New Age Publishers, Second Edition- Reprint 2010

3) Electronic Circuits & System- Analog and Digital – Y.N.Bapat - Tata Mc Graw Hill.

REFERENCE BOOKS:

1) Electrical Technology – Hughes - 8th Edition, Pearson Education.

2) Electronic Device and Circuits- An introduction – Allen Mottershed - Prentice Hall of India.

Code	Subject	Lecture	Tutorial	Practical	Credits
21ADMR43	MARINE WORKSHOP TECHNOLOGY – II - PRACTICAL	0	0	3	2

Course Objective:

- Identify the parts of a drilling machine, milling machine & grinding machine and their functions.
- Use tools and instruments for drilling, milling and grinding
- Identify the work holding devices
- Hold the work in proper work holding devices.
- Set the tools for various operations.
- Operate the drilling machine, milling machine and grinding.
- Machine a component using drilling machine, milling machine and grinding machine..
- Follow safety practices while machining.

Course Outcome:

CO 01: Design the Drilling Operation.

CO 02: Design the Milling Operation.

CO 03: Design the Grinding Operation.

CO 04: Construct the Machine Component

CO 05: Assess the Safety Precaution

EXPERIMENTS

1. DRILLING:

a) Through hole drilling b) Through hole drilling with counter sunk c) Part drilling d) Through hole drilling (on pitch circle)

2. MILLING:

a) Milling a cube b) Milling a slot c) Milling a gear

3. GRINDING:

Surface grinding

SAFETY PRECAUTIONS TO BE FOLLOWED:

1. Always worn apron, shoe and safety glasses.
2. Always check speed, feed and stroke length before running the machine.
3. Do not clean and clamp when machine running.
4. Do not hold the job in hand in drilling operation.
5. Switch off the machines when not in use.

Total Hours 30

Code	Subject	Lecture	Tutorial	Practical	Credits
21SDMR41	COMPUTER AIDED MARINE ENGINEERING DRAWING PRACTICAL	0	0	3	2

Course Objective:

- Appreciate the need of sectional view and types of sections.
- Draw sectional views using different types of sections.
- Explain the use of threaded fasteners and the types of threads.
- Compare hole basis system with shaft basis system.
- Select different types of fits and tolerance for various types of mating parts.
- Practice on CAD commands in making 2D Drawings.
- Draw assembled drawings of different types of joints and couplings using CAD.
- Draw assembled drawings of various types of machine elements using CAD.

Course Outcome:

CO 01: Design the CAD Software.

CO 02: Design the Drawing Aid and Editing Commands.

CO 03: Design the Basic Dimensioning, Hatching, Blocks and Views.

CO 04: Design the Isometric Drawing, printing and plotting.

CO 05: Design the CAD Drawing.

Syllabus

UNIT - I INTRODUCTION TO CAD SOFTWARE

Introduction – History of CAD – Applications – Advantages over manual drafting– Hardware requirements – Software requirements – Windows desktop – CAD screen interface – menus – Tool bars – How to start CAD – How to execute command – types of co-ordinate systems – Absolute – Relative – Polar.

UNIT - II DRAWING AID AND EDITING COMMANDS

Creating objects (2D) – Using draw commands – Line, Arc, Circle, Ellipse, Donut, Polygon, Point, Pline, Sketch, Trace – Creating 2D Solid. Creating text – Dtext, Mtext, Text styles – Mline, spline – Drawing with precision – Osnap options – drafting settings –limits – Units – drawing aids – Fill, Snap, Grid, Ortho lines – Function keys - Editing and modify commands – Object selection methods – Erasing object – Oops - Cancelling and undoing a command – Copy – Move – Array – Offset – Scale – Rotate – Mirror – Break – Trim – Extend – Explode. Divide – Measure – stretch – Lengthen – Changing Properties – Color – line types –LT scale – Matching properties – Editing with grips – Pedit – Ddedit –Mledit.

UNIT - III BASIC DIMENSIONING, HATCHING, BLOCKS AND VIEWS

Basic dimensioning – Editing dimensions – Dimension styles – Dimension system variables. Machine drawing with CAD. Creation of blocks – V block – inserting a block – Block attributes – Hatching –Pattern types – Boundary hatch –

working with layers - Controlling the drawing display – Blip mode – View group commands – Zoom, redraw, regen, regenerator, pan, viewers – Real time zoom. Inquiry groups – calculating area – Distance – Time – Status of drawing – Using.

UNIT - IV ISOMETRIC DRAWING, PRINTING AND PLOTTING

Isometric drawing – Isometric projection – drawing isocircles – Dimensioning isometric objects. File commands – File Import and export – plotting drawing – external references – 3D fundamentals – 2D to 3D Conversion, 3D Drawing: 3D Primitives-Extrude – Revolve-Slice-Section, Surface 3D Mesh- 3D - Surface-3D Operation-Solid Editing.

UNIT - V CAD DRAWING PRACTICE

Detailed drawings of following machine parts are given to students to assemble and draw the sectional or plain elevations / plans / and side views with dimensioning and bill of materials using CAD Software

1. Sleeve & cotter joint
2. Spigot & cotter joint
3. Knuckle joint
4. Protected type flanged coupling
5. Universal coupling
6. Connecting rod
7. Feed check valve
8. Bilge suction strainer

3D Drawing

1. Geneva wheel
2. Machined block
3. Square head bolt and nut
4. Piston and piston rings
5. Screw jack

Note: Take the orthographic view and sectional view from the above assembled 3D drawing

Total Hours 30

REFERENCE BOOKS:

1) Inside AutoCAD - D. Raker and H. Rice - BPB Publications, NewDelhi

2) Engineering Drawing and Graphics + AutoCAD – K.Venugopal, - New Age International Publications

3) CAD/CAM/CIM - P. Radhakrishnan, S. Subramaniyan and V.Raju - New Age International Publications.

4) AutoCAD 2002 with Applications - Sham Tickoo - Tata Mcgraw Hill.

5) Computer Graphics, Prentice – Donald Hearn, M. Pauline Baker - Hall of India Pvt. Limited, NewDelhi.

Code	Subject	Lecture	Tutorial	Practical	Credits
21SDMR42	ELECTRICAL DRIVES AND CONTROL - PRACTICAL	0	0	3	2

Course Objective:

- Identify starters for different motors.
- Study and prepare earthling
- Test the characteristics of DC and AC machines.
- Identify and select controlling elements.
- Explore the performance of ELCB, MCB.
- Design regulated power supplies.
- Identify display devices - LED, 7 segment LED, LCD.
- Identify the drive circuit for special motors.

Course Outcome:

CO 01: Compose the Ohm's Law.
CO 02: Compose the DC starters.
CO 03: Compose the DC shunt motor.
CO 04: Compose the AC starters.
CO 05: Compose the Load test on single phase induction motor.
CO 06: Compose the Load test on three phase squirrel cage motor.
CO 07: Compose the Testing of relays, contactors, push buttons and limit switch.
CO 08: Compose the Half wave and Full Wave Rectifier Fabrication of the hull.
CO 09: Compose the Universal Gate.

EXPERIMENTS: **Part A:**

1. Verification of Ohm's Law
2. Testing of DC starters – 3 point and 4 point starter
3. Load test on DC shunt motor
4. Testing of AC starters - DOL , star - Delta starter
5. Load test on single phase induction motor
6. Load test on three phase squirrel cage motor
7. Testing of relays, contactors, push buttons and limit switch
8. Connection and Testing of MCB, ELCB

Part B

9. Construction and testing of Half wave and Full wave rectifier.
10. Construction and testing of IC voltage regulator using IC 7805.
11. Verification of truth tables for logic gates.
12. Verification of universal gates.
13. Identification and testing of display devices- LED, 7 segment LED, Laser diode.
14. Testing of Stepper motor drive.
15. Testing of Servo motor drive

Total Hours 30

SEMESTER –V

Code	Subject	Lecture	Tutorial	Practical	Credits
21CDMR51	MARINE THERMODYNAMICS	5	0	0	5

Course Objective:

At the end of the study of V Semester the student will be able to

- Understand about the engine cycles and working of various engines.
- Study of steam and its properties, Know about the working of boiler, mountings and accessories.
- Study about turbine, condenser, cooling towers and basic principles of refrigeration and air conditioning

Course Outcome:

CO 01: Assess the Basic theory.

CO 02: Assess the Characteristic of Steam.

CO 03: Assess the Characteristic of Boilers, the Characteristic of Turbine, characteristic of Condenser.

CO 04: Assess the Principle of Refrigeration, the Principle of Air Conditioning.

CO 05: Assess the Principle of Air Conditioning

Syllabus

UNIT – I BASIC THEORY **12**

Laws of thermodynamics – Zeroth law – First law - Theoretical cycles - Carnot cycle – Otto cycle – diesel cycle-comparison of cycles – compression ratio – cut off ratio – Brake horse power – measurement of BHP in Prony, Rope brake – engine testing – flash point – fire point – pour point – cloud point – specific gravity – viscosity.

UNIT - II STEAM **12**

Introduction – formation of steam – wet steam – dry steam – super heated steam – advantage of super heated steam –dryness fraction –wetness fraction enthalpy of wet, dry, superheated steam – specific volume of water – specific volume of steam – density of steam – external work of evaporation - internal energy of steam – latent heat – entropy of wet, dry, superheated steam – steam tables – T- S and H – S charts.

UNIT - III BOILERS **12**

Boilers-Introduction-classification Boilers-High pressure Boiler-La mont and BHEL Boilers-Boiler Mountings-Safety valve-water level indicator-fusible plug-pressure gauge-steam stop valve – Blow off cock – man holes-Boiler Accessories-Air pre-heater – Super heater – Feed pump-Steam trap-steam separator(dryer)-Feed water treatment for Boiler and types-Starting of boiler in cold condition-safety precautions-Provisions in Indian boiler act regarding safety.

UNIT - IV TURBINE AND CONDENSER **12**

Introduction - steam power cycles – Rankine's cycle – impulse turbine – reaction turbine – comparison of impulse and reaction turbine - pressure compounding – velocity compounding – pressure velocity compounding – Condenser – introduction – elements of condensing plant – classification of condenser – surface condenser (down flow, central flow, evaporative condenser) – merits and demerits of surface condenser – condenser vacuum – condenser efficiency – Dalton's Law.

UNIT - V REFRIGERATION AND AIR CONDITIONING **12**

Refrigerator - Introduction –- classification – performance of refrigerator – common refrigerant – ammonia sulphur dioxide – carbon dioxide – refrigerants of Freon -Air conditioning **–** introduction – psychometric properties – dry air – moist air – dry bulb temperature – wet bulb temperature – dew point temperature - dew point depression – humidity – relative humidity – psychometric chart – sensible heating process – sensible cooling process – comfort air conditioning – industrial air conditioning – window air conditioning – central air conditioning system – loads encountered in air conditioning system

Total Hours 60

TEXT BOOK : Thermal Engineering, P.L.Ballaney ; Thermal Engineering, R.S. Khurumi

REFERENCE BOOK : Thermal Engg, Raj Putt

Code	Subject	Lecture	Tutorial	Practical	Credits
21CDMR52	MARINE DIESEL ENGINE & POWER PLANT	5	0	0	3

Course Objective:

- Understand the parts and working of I.C. engines.
- Study about Cooling system, safety provision and Automation in marine diesel engines.
- Acquire broader ideas about reciprocating steam engine and steam turbines.
- Understand about power generation using conventional and non-conventional resources.

Course Outcome:

CO 01: Construct the Parts of Marine Diesel Engine and Starting, Running of Diesel Engine.
CO 02: Construct the Working Principle of Marine Diesel Engine.
CO 03: Construct the Cooling system and Safety Provision in Diesel Engine.
CO 04: Construct the Automation in Diesel Engine.
CO 04: Construct the Reciprocating Steam Engine.
CO 05: Construct the Steam Turbines.

Syllabus

UNIT - I MARINE DIESEL ENGINE – PARTS AND WORKING **12**

Engine components - cylinder- cylinder liner - Cylinder head-piston- piston rod – connecting rod – crank shaft – cross head – piston rings – rocker arm arrangement – cam shaft – fly wheel – bed plates – Working Principles – 2 Stroke & 4 Stroke engines – working and comparison – spark ignition and compression ignition – working and comparison – types of scavenging systems – loop flow, cross flow and uniflow – turbo chargers and super charger – need of turbo charger for marine diesel engines.

UNIT - II MARINE DIESEL ENGINE (MDE) STARTING AND RUNNING **12**

Working of 4 cylinder and 6 cylinder in-line marine diesel engine – warm up procedure for main engine – air Starting system for main engine – reversing systems of main engine – Factors affecting performance of marine engine – Jerk and common rail systems – importance of atomization – need for injector – design aspects of combustion chamber – compression pressure ratio – peak pressures – properties of fuel used in marine diesel engines.

UNIT - III COOLING SYSTEM, SAFETY PROVISION AND AUTOMATION IN MDE **12**

Need for cooling – cylinder head and Jacket water cooling – lubrication oil cooling – piston cooling - need for safety provision – basic governor function .

UNIT - IV RECIPROCATING STEAM ENGINE AND STEAM TURBINES **12**

Marine Reciprocating Steam Engine classification, parts and working – steam turbines classification, parts and working - Warming up procedure for main propulsion turbine - methods of improving turbine efficiency - Comparison of reciprocating engine and turbine - Types of blades and methods of fixing - general layout and description of modern geared steam turbine - materials used for various components in turbine – double reduction gearing for marine use – self closing emergency stop valve.

UNIT - V POWER PLANT: GAS TURBINE AND OTHER POWER PLANTS **12**

Gas turbine working - Auxiliary Gas Turbine Engine -Combined gas turbine and steam turbine - Principles of operation of Atomic Reactors – construction and working of Atomic power Installations – Concept of Atomic Power installations on Sea going Vessels – construction and working of thermal power plant, solar power plant, wind power plant, Hydraulic power plant and tidal power plant.

Total Hours 60

TEXT BOOK: Marine Diesel engine - D.K. Sanyal, Power Plant Engineering – Vijaya ragavan

REFERENCE BOOK : Marine Diesel engine - Mc George Mc

Code	Subject	Lecture	Tutorial	Practical	Credits
21ADMR51	**NAVAL ARCHITECTURE**	**5**	**0**	**0**	**5**

Course Objective:

- Understand how the ship floats in water. Know about the basic principles of naval architecture.
- Study about position of centre of gravity of the ship.
- Acquire broader ideas about area, volume and moment.
- Understand about stability of ships, Study about propellers and rudder..

Course Outcome:

CO 01: Plan the Basic Geometric Concept, Area and Volume.
CO 02: Plan the Hydrostatic.
CO 03: Plan the Centre of Gravity.
CO 04: Plan the Transverse Stability.
CO 05: Plan the Longitudinal Stability and the Propeller and Rudder.

Syllabus:

UNIT - I BASIC GEOMETRIC CONCEPTS, AREA AND VOLUME **12**

Middle line plane, transverse plane, water plane, water plane area - waterline, amidships, midship section - midship section area, beam, moulded depth. Calculation of Area under a curve - Simpson's first rule - Application of Simpson's rule to calculation of Volume - Use of intermediate ordinates - Simpson's second rule - Trapezoidal rule - Tchebycheff's rule.

UNIT - II HYDROSTATICS AND CENTRE OF GRAVITY **12**

Density - Relative density - Archimedes' principle – Buoyancy - Floating bodies - Displacement – Volume of Displacement– TPC – Effect of density on draught of a ship – Fresh water allowance - Coefficient of forms - Wetted surface area. Centre of gravity - Shift in centre of gravity due to addition of mass - Shift in centre of gravity due to movement of mass - Effect of suspended mass.

UNIT - III TRANSVERSE STABILITY **12**

Stability of ships - Statical stability at small angles of heel - Stable, Unstable and Neutral equilibrium - Transverse metacentre - Calculation of KM for rectangular and triangular cross section - Metacentric diagram - Inclining experiment - Free surface effect - Effect of tank divisions on free surface - Stability at large angles of heel – Curve of statically stability - Dynamical stability - Stability of wall sided ship.

UNIT - IV LONGITUDINAL STABILITY **12**

Trim - Centre of flotation - Mean draught – longitudinal metacentre – longitudinal metacentric height – Effect of adding small masses - moment to change trim by one centimetre - Change in draught due to
addition of masses - Change in mean draught due to change in density – Bilging - Reserve buoyancy - Permeability.

UNIT - V PROPELLER AND RUDDER **12**

Propellers – Diameter – Pitch - Pitch ratio - Theoretical speed - Apparent slip - Real slip – Wake - Projected area - Developed area - Blade area ratio - Disc area ratio – Thrust - Measurement of pitch –
Cavitations - Built and Solid propellers. Rudders - Force on rudder - Torque on stock - Angle of heel due to force on rudder - Angle of heel when turning.

Total Hours 60

TEXT BOOK:
1. Naval Architecture for Marine Engineers By E.A.Stokoe
2. Naval Architecture and ship construction By Vikram Gokhle and N.Nanda

REFERENCE BOOKS:
1. Basic Ship Theory, Vol - I and Vol – II By Rawson and Tupper.

Code	Subject	Lecture	Tutorial	Practical	Credits
21DDMR51	NAVIGATION AND OCEANOGRAPHY	5	0	0	3

Course Objective:

- Understand about the courses and distance. Know about the latitudes and longitudes.
- Study about different types of sailing. Acquire broader idea about navigational flags.
- Understand about various types of navigational equipments.
- Study about oceanography and metrological equipments.

Course Outcome:

CO 01: Compose the Courses and Distance.
CO 02: Compose the Sailing and Flags.
CO 03: Compose the Navigational Equipments and Charts.
CO 04: Compose the Basic Oceanography and the Currents
CO 05: Compose the Meteorological instruments..

Syllabus

UNIT - I COURSES AND DISTANCE **12**

Courses – Direction, Degree of points, True north, Magnetic North, The Variation, Deviation, Error, Leeway, poles, Meridian, Longitude, Parallels, Latitudes, D'lat, Great circle, Small circle. Distance – Departure, Rhumb line, Vertex of Great circle, Position lines, Angular distance between two places, Linear measurement of longitude, Linear measurement of latitude.

UNIT - II SAILING AND FLAGS **12**

Sailing – Parallel Sailing, Plane sailing, Middle latitude sailing, Mercator sailing, Rotation of the Earth, Convergence. Flags – Types of flags, When and where hoisted, Flags hoisted when entering or leaving a port, When shifting a ship, When berthed, Saluting another ship, Mourning, Meaning of some important international code flags.

UNIT - III NAVIGATIONAL EQUIPMENTS AND CHARTS **12**

Navigational Equipments – Navigational Lights, Navigational Flags, Sextant, Magnetic Compass, Gyro Compass, Echo-sounder, Barometer, Walkie- Talkie, Radar, Nav-tex, Global positioning system, Line throwing apparatus. Charts – Kinds of Charts, Mercator chart, Meridnal parts, Gnomonic Charts, Plan, Natural scale,

UNIT - IV BASIC OCEANOGRAPHY **12**

Basic Oceanography – Temperature zones of the world, clouds, Classification of clouds, Formation of clouds, Isobars, Pressure gradient, Wind, Katabatic and Anabatic wind. Prediction of wind direction, Coriolis force, Prediction of wind speed, Basic Isobaric Patterns, Cyclone, Anticyclone, Thunder storms. Disaster Management. Salinity, Ice at sea, Sea ice, Ice-bergs, glacier, ice shelf, International ice patrol, area of coverage, Contributors.

UNIT - V CURRENTS AND METEOROLOGICAL INSTRUMENTS **12**

Currents – Tides, Sea surface currents, Monsoons, North East monsoon and South West monsoon. Ocean Currents, Drift, Upwelling and gradient currents. Warm and cold currents, Effects of ocean currents on climate. Meteorological Instruments – Rain gauge, Anemometer, Barometer, Wet bulb and dry bulb thermometer, Hygrometer, Hydrometer.

Total Hours 60

TEXT BOOK :

1. Munro's Navigation By Capt G.E. Earl and Capt F.L. Main.
2. Marine Meteorology By Capt. H. Subramanian

Code	Subject	Lecture	Tutorial	Practical	Credits
21SDMR51	SEAMANSHIP & COMMERCIAL GEOGRAPHY	5	0	0	3

Course Objective:

- Understand about the courses and distance. Know about the latitudes and longitudes.
- Study about different types of sailing. Acquire broader idea about navigational flags.
- Understand about various types of navigational equipments.
- Study about oceanography and metrological equipments.

Course Outcome:

CO 01: Design the Seamen and Duties

CO 02: Design the Rope, knots and mooring

CO 03: Design the Anchors

CO 04: Design the World Transports.

CO 05: Assess the Navigation Equipments

COURSE PLAN

UNIT I **12**

Seamen & their duties: Ship's department, general ship knowledge and nautical terms like poop-deck, forecastle, bridge etc. navigational lights and signals: Port & starboard, forward and aft mast lights, colors and location.

UNIT II **12**

Rope Knots and Mooring: Types of knots. Practice of knot formation.

UNIT III **12**

Anchors: Their use, dropping and weighing anchor, cable stopper. Navigation: General knowledge of principles of navigation compasses, echo sounder.

UNIT IV **12**

World Transport – Ports – Types, Characteristics and establishment issues – Major ports of the world – Government Policy.

UNIT V **12**

Economics of Sea Transport – Major Shipping Routes – Weather Routing – Fishing Zones – Off shore Oil and Power Installations.

TOTAL: 36 hours.

Text Book: Seamanship by Capt. V.K. Bhandarkar, Bhandarkar Publications

Reference Books: Seamanship Techniques by D.J. House.

Code	Subject	Lecture	Tutorial	Practical	Credits
21PDMR51	MARINE DIESEL ENGINE AND POWER PLANT- PRACTICAL	0	0	3	2

Course Objective:

- To perform various types test like tension, compression impact tests in Laboratory.
- To perform experiments on various types of pumps and turbines to understand their characteristics.
- To understand the various mechanical properties by conducting tensile test.
- To understand the hardness value of different materials.
- To understand the concepts flow through different cross sections.
- To understand and draw characteristics of various pumps and turbines.

Course Outcome:

CO 01: Assess the Flash Point and Fire Point in Open Cup Apparatus.

CO 02: Assess the Flash Point and Fire Point in Closed Cup Apparatus.

CO 03: Assess the Viscosity of Lubrication Oils by Redwood Viscometer Apparatus.

CO 04: Assess the Viscosity of Lubrication Oils by Saybolt Viscometer Apparatus

CO 05: Assess the Valve Timing Diagram in Four Stroke Engine.

CO 06: Assess the Port Timing Diagram Two Stroke Engine.

EXPERIMENTS

Part A

1. Flash Point and fire point – Open cup apparatus
2. Flash point and fire point – closed cup apparatus
3. Viscosity of Lubrication oils – Redwood Viscometer apparatus
4. Viscosity of Lubrication oils – Saybolt Viscometer apparatus
5. Valve timing diagram of diesel engine – four stroke engine
6. Port timing diagram of diesel engine – two stroke engine

Part B

7. Performance test on Multi cylinder Diesel Engine
8. Test on air compressor - Volumetric efficiency
9. Diesel Engine Injection Time Setting
10. Dismantling and assembling of fuel injection pump (Study experiment)
11. Servicing and Testing of Diesel injector (Study experiment)
12. Dismantling and assembling of fuel feed pump (Study experiment)

Part C

13. Visit to Power plant and submit a report

SAFETY PRECAUTIONS TO BE FOLLOWED

1. Always wear shoes.
2. Always use good conditions tools during the work
3. Appropriate safety device should be used
4. Switch off the machines when not in use.

Total Hours :30

Code	Subject	Lecture	Tutorial	Practical	Credits
21PDMR52	NAVIGATION AND METEOROLOGY PRACTICAL	0	0	3	2

Course Objective:

- All the experiments given in the list of experiments should be completed and given for the end semester practical examination.
- In order to develop best skills in handling Instruments/Equipment in the practical classes, every two students should be provided with a separate experimental setup for doing experiments in the laboratory.
- The external examiners are requested to ensure that a single experimental question should not be given to more than four students while admitting a batch of 30 students during Board Examinations.

Course Outcome:

CO 01: Assess the construction and working of Navigational Lights
CO 02: Assess the demonstration of Different types of Navigational Flags.
CO 03: Assess the construction and Working of sextant
CO 04: Assess the Construction and working of magnetic compass.
CO 05: Assess the Construction and working of gyro compass.
CO 06: Assess the Construction and working of echo sounder.
CO 07: Assess the Construction and working of walkie-talkie.
CO 08: Assess the Construction and working or radar.
CO 09: Assess the Construction and Working of Nav-tex.
CO 10: Assess the Construction and Working of global positioning system.

EXPERIMENTS

1. Study about the construction and working of navigational lights.
2. Study and demonstration of different types of navigational flags.
3. Study about the construction and working of sextant.
4. Study about the construction and working of magnetic compass.
5. Study about the construction and working of gyro compass.
6. Study about the construction and working of echo-sounder.
7. Study about the construction and working of walkie- talkie.
8. Study about the construction and working of radar.
9. Study about the construction and working of nav-tex.
10. Study about the construction and working of global positioning system.
11. Study about the construction and working of line throwing apparatus.

METEOROLOGICAL EQUIPMENTS:

12. Study about the construction and working of rain gauge.
13. Study about the construction and working of anemometer.
14. Study about the construction and working of thermometer (wet bulb and dry bulb)
15. Study about the construction and working of barometer.
16. Study about the construction and working of hygrometer.
17. Study about the construction and working of hydrometer.

SAFETY PRECAUTIONS TO BE FOLLOWED BY STUDENTS

- Do not touch, connect or disconnect any plug or cable without teacher's permission
- Don't attempt to touch any live wires
- Equipments should be switched off properly after completion of work.

Total Hours 30

Code	Subject	Lecturer	Tutorial	Practical	Credits
21PDMR53	LIFE AND EMPLOYABILITY SKILL -PRACTICAL	0	0	3	2

Course Objective:

1. Emphasize and Enhance Speaking Skills.
2. Increase Ability to Express Views & Opinions.
3. Develop and Enhance Employability Skills.
4. Induce Entrepreneurship and Plan for the Future.
5. Expose & Induce Life Skills for Effective Managerial Ability.

Course Outcome:

CO 01: Assess the communication, listening, training, facing interview, behavioral Skills.

CO 02: Assess the Drawing Entrepreneurship, Project Prepation, Marketing Analysis, Support and Procurement.

CO 03: Assess the Productivity.

CO 04: Assess the Safety, First Aid, Labour Welfare legislation and Welfare Acts.

CO 05: Assess the Environment, Global Warming, Pollution.

Syllabus

UNIT - I

COMMUNICATION, LISTENING, TRAINING, FACING INTERVIEWS, BEHAVIOURAL SKILLS **12**

-- instant sentence making – say expressions/phrases-- self- introduction/another higher official in company – describe/explain product – frame questions based on patterns – make sentences based on patterns.

UNIT - II ENTREPRENEURSHIP, PROJECT PREPARATION, MARKETING ANALYSIS, SUPPORT & PROCUREMENT **12**

-- prepare an outline of a project to obtain loan from bank in becoming an entrepreneur – prepare a resume.

UNIT - III PRODUCTIVITY – COMPARISON WITH DEVELOPED COUNTRIES, QUALITY TOOLS, CIRCLES, CONSCIOUSNESS MANAGEMENT, HOUSE KEEPING **12**

-- search in the website -- prepare a presentation – discuss & interact.

UNIT - IV SAFETY, FIRST-AID ,LABOUR WELFARE LEGISLATION, WELFARE ACTS **12**

-- search in the website -- prepare a presentation – discuss & interact.

UNIT - V ENVIRONMENT, GLOBAL WARMING, POLLUTION **12**

-- taking down notes / hints – answering questions -- fill in blanks the exact words heard.

Total Hours 60

SEMESTER –VI

Code	Subject	Lecture	Tutorial	Practical	Credits
21CDMR61	MARINE AUXILIARY MACHINERY	5	0	0	5

Course Objective:

- Understand about the fresh water system, oil water separator deck machinery.
- Know about the working of steering machineries.
- Study about incinerator, sewage plant, pumps and purifiers.
- Acquire broader ideas about refrigeration and air conditioning plants in ships.

Course Outcome:

CO 01: Construct Fresh water system, oily bilge separators, Deck machinery.

CO 02: Construct the Blowers and compressors, steering system and valves

CO 03: Plan the ship board equipments, pumps and purifiers.

CO 04: Construct the marine refrigeration, ventilation, heat exchangers..

CO 05: Construct the Piping system and vibration.

Syllabus

UNIT - I FRESH WATER SYSTEM, OILY BILGE SEPARATORS, DECK MACHINERY 12

Evaporators: Construction and operation of boiling type and flash type evaporators - fresh water generator and Domestic water treatment plant. Pollution prevention oily bilge separators their construction and operation – oil content monitoring system-Bilge level maintenance-bilge pump (gear with reciprocating) - type of deck machinery used in ships - winch – windlass - derricks - cranes, their requirements operation and maintenance.

UNIT - II BLOWERS AND COMPRESSORS, STEERING SYSTEM AND VALVES 12

Construction and operation of Blowers and compressors used on board ships - uses of compressed air - steering gears - Construction and operation of 2-RAM steering system ,4-RAM steering system , rotary vane steering system - Emergency steering arrangement - under water fittings - propellers, rudder, bow thrusters - maintenance of hull. Valves – screw valve – gate valve – globe valve – quick closing valve

UNIT - III SHIP BOARD EQUIPMENTS, PUMPS AND PURIFIERS 12

Auxiliary engines (power generators) – Incinerators- chemical sewage treatment plant – biological sewage treatment plant - Engine room crane- Different types of ship stabilizer - Different types of bearings used for marine machineries. Pumps used in ships-centrifugal pump –reciprocating
pump - gear pumps – screw pump- axial flow pump - purifiers.

UNIT - IV MARINE REFRIGERATION, VENTILATION, HEAT EXCHANGERS 12

Vapour compression system - vapour absorption system- Refrigerants used in marine practice and their justification- properties of refrigerant- Control of temperature in various rooms in Cargo or domestic plants, Ventilation necessity – International requirements for ventilation- control in Humidity in Air Conditioning plants, operation and maintenance of Air Conditioning plants - control and safety equipment – heat exchangers (shell & tube and plate type)

UNIT - V PIPING SYSTEM AND VIBRATION 12

Piping Systems – fire main systems – fixed Carbon dioxide system - fresh water systems – sea water systems - fuel oil systems - lubricating oil systems – main steam systems – Bilge systems – overflow arrangement and vents. Vibration - source of vibration - various modes of vibration - forced, damped, transverse, longitudinal and torsional vibration. Noise – noise suppression techniques – noise level measurement.

Total Hours 60

Text Book : Marine Auxiliary Machinery by Mc. George.

Reference Book : Marine Auxiliary Machinery by Smith.

Code	Subject	Lecture	Tutorial	Practical	Credits
21DDMR62	PERSONAL SURVIVAL TECHNIQUES	5	0	0	3

Course Objective:

At the end of the study of V Semester the student will be able to

- Understand about the stowage of life saving appliances.
- Know about the need for organization and training.
- Study about the survival techniques.
- Acquire broader ideas about survival instructions.
- Understand about search and rescue problems.

Course Outcome:

CO 01: Examine Safety, Survival and emergency situations.
CO 02: Examine the evacuation.
CO 03: Examine the survival crafts, rescue boats and life saving appliances.
CO 04: Examine the Helicopter Assistance and Emergency Radio Equipment.
CO 05: Examine the Communication on Board.

Syllabus

UNIT - I SAFETY, SURVIVAL AND EMERGENCY SITUATIONS 12

Safety guide lines – principles of survival at sea – types of emergencies – precautions – fire provisions – foundering – crew expertise – muster list and emergency signals – crew and emergency instructions – extra equipment for survival – abandoning ship – complications.

UNIT - II EVACUATION 12

Abandoning ship as a last resort – Emergency signal – Abandon ship signal – personal preparation for abandoning ship – need to prevent panic – crew duties to passengers – crew duties launching survival craft – master's orders to abandon ship – means of survival – Survival at sea – Search and Rescue – Landing boat in a surf.

UNIT - III SURVIVAL CRAFTS, RESCUE BOATS AND LIFE SAVING APPLIANCES 12

Lifeboats – types of lifeboats – life rafts – types of life rafts - rescue boats – marine evacuation system – line throwing appliances –general alarm and public address system – lifebuoys – lifejackets – immersion suits – thermal protective aid – anti explosive suits – dangers to survivors – best use of
survival craft facilities.

UNIT - IV HELICOPTER ASSISTANCE AND EMERGENCY RADIO EQUIPMENT 12

Communication with helicopter – evacuation from ship and survival craft – helicopter pickup – rescue net – litter – general precautions for personnel during winching operations – emergency position indicating radio beacons (EPIRB) – types of EPIRB – search and rescue radar transponder (SART) –
walkie-talkie

UNIT - V COMMUNICATION ONBOARD 12

Fundamentals of communication – types of communication – communication onboard ships – written communication – advantages of written method – disadvantages of written method – use of verbal communication – hand signals – effective transmission and listening skills – methods to improve communications – basic principles for giving instructions.

Total Hours 60

TEXT BOOK:

1. Survival at sea. The life boat and life raft, C.H. Wright, Edition 1993, Brownson & Furguson Ltd.,
2. Ship board operation H.I. Lavery 1993 British library cataloguing in publications

REFERENCE BOOKS :

1. Seamanship Primer By Capt J. Dinger

Code	Subject	Lecture	Tutorial	Practical	Credits
21DDMR63	RULE OF THE ROAD	5	0	0	3

Course Objective:

- Understand about the risk of collision and action to avoid collision
- Know about the maneuvering of ships and study about different types of signals.
- Acquire broader ideas about the guidelines of IMO and other authorities.
- Understand about lighthouse authorities and marks.

Course Outcome:

CO 01: Assess Actions and responsibilities at different situations.
CO 02: Assess traffic regulations and maneuvering.
CO 03: Assess the signals and bells
CO 04: Assess the IMO guidelines
CO 05: Assess the light house authorities and marks.

Syllabus

UNIT - I ACTIONS AND RESPONSIBILITIES AT DIFFERENT SITUATIONS 12

Application – Responsibility – General Definitions – Look-out – Safe speed – Risk of collision – Action to avoid collision – Narrow channels – Traffic separation schemes – sailing vessels – Overtaking – Head-On Situation – Crossing Situation – Action by give-way vessel – Action by stand-on vessel – responsibilities between vessels – conduct of vessels in restricted visibility – Light and shapes – Definitions – Visibility of Lights – Power-driven vessels underway – Towing and Pushing – Sailing vessels underway and vessels under oars – Fishing vessels.

UNIT - II TRAFFIC REGULATIONS AND MANEUVERING 12

Vessels not under command or restricted in their ability to man-oeuvre Vessels constrained by their draught – pilot vessels Anchored vessels and vessels aground – Seaplanes – Sound and light signals – Definitions – Equipment for sound signals – Manoeuvring and warning signals - sound signals in restricted visibility – Signals to attract attention – Distress signals – Exemptions – Positioning and Technical details of lights and shapes – Definition – Vertical Positioning and spacing of lights – Horizontal positioning and spacing of Lights – Details of location of direction indicating lights for vessels, Dredgers and vessels Engaged in underwater operations – Screens for sidelights – shapes Colour specification of lights – intensity of Lights – Horizontal sectors – Vertical sectors – Intensity of Non-electric Lights – Maneuvering light – High-speed craft – Approval.

UNIT - III SIGNALS AND BELLS 12

Additional signals for fishing vessels – fishing in close proximity – signals for trawlers – Signals for purse seiners – Technical details of sound signal alliances – whistles – Frequencies and range of audibility – Limits of fundamental frequencies – Sound signal intensity and range of audibility – Positioning of whistles – Fitting of more than one whistle – combined whistle systems – Bell or gong – intensity of signal – Construction – Approval – Distress signals.

UNIT - IV IMO GUIDELINES 12

I.M.O.'s Guidance for the uniform application of certain rules of the 1972 collision regulations – clarification of the definition "vessel constrained by her draught", - Clarification of the application of the word "underway", - Clarification of the implication of the words "not to impede" as appearing – Clarification of the relation between – Clarification of the transference within a lane – Clarification on the use of inshore traffic zones by small vessels – clarification of the relation between – Basic Principles to be observed in keeping a navigational watch – Fitness for duty - Navigation – Look-out – Navigation with pilot embarked – Protection of the marine environment.

UNIT - V LIGHT HOUSE AUTHORITIES AND MARKS 12

International Association of lighthouse authorities maritime buoyage system – General principles of the system – Lateral Marks – Cardinal Marks – isolated danger mark – safe water marks – Special Marks – New dangers – Maritime buoyge system rules – Scope – Type of marks – Method of characterizing marks – Definition of "Conventional direction of buoyage - Buoyage Regions - Description of lateral marks used in region.

Total Hours 60

Text Book : Seamanship Primer by Capt J. Dinger.

Reference Books : 1. Survival in Life boat and life raft By Capt. S.K. Puri
2. Survival at sea The life boat and life raft C.H. Wright Edition 1993.Brownson & Furguson Ltd.,

Code	Subject	Lecture	Tutorial	Practical	Credits
21DDMR64	MARINE WELDING TECHNOLOGY	5	0	0	5

Course Objective:

- Understand about different types of welding processes and equipments.
- Know about the special welding process.
- Study about metallurgy of welding.
- Acquire broader ideas about weldability of ferrous and non ferrous metals.
- Understand about welding economy and applications.

Course Outcome:

CO 01: Design Welding process and equipment.
CO 02: Assess Special Welding Processes.
CO 03: Assess Metallurgy of welding..
CO 04: Assess the Weld ability of ferrous and Non ferrous metals.
CO 05: Assess Welding Economy and Applications.

Syllabus

UNIT - I WELDING PROCESS AND EQUIPMENT: **12**

Arc and resistance welding –Types of electrodes - Selection of electrodes - Arc welding power sources – DC Power Sources – DC generators – rectifiers – AC power sources – Generators and transformers – Phenomenon of arching arc voltage – characteristics – arc temperature and heat distribution–Gas welding –oxy-acetylene welding – gas welding techniques – gas welding equipment –gas cutting –Brazing –Soldering - Welding safety – safety recommendations for installation and operation of arc welding and cutting equipment – gas welding and cutting equipment.

UNIT - II SPECIAL WELDING PROCESSES **12**

Submerged arc welding –TIG welding –MIG welding – resistance welding – spot welding – CO_2 welding – Electro slag welding –plasma arc welding – Under water welding – Principle of operation –equipment – merits and demerits – applications – Ultrasonic welding – explosive welding – atomic hydrogen welding – electron beam welding - laser beam welding – definition, concept principle of operation and applications.

UNIT - III METALLURGY OF WELDING **12**

Welding arc – Heat flow and temperature distribution in and around weld metal – temperatures zones – temperatures gradient cooling rates – metallurgical effects of welding–weld metal solidification – absorption of gases by welds and their effects- gas metal reactions – porosity in welds – Isothermal contours for localized heating – thermal effects of welding on parent metal – structure of fusion weld deposits in mild steel – heat affected zones – grain size control – corrosion of welds, weld decay, dilution – metallurgy of soldering and brazing.

UNIT - IV WELDABILITY OF FERROUS AND NON – FERROUS METALS **12**

Concept of weld ability – Welding Processes used for welding wrought iron – welding of grey cast iron , malleable cast iron, nodular cast and alloy cast iron – Welding of low carbon steels, high carbon steels – welding of steel castings – welding of alloy steels, stainless steels - Welding of aluminum and its alloys, copper and its alloys, magnesium and its alloys – welding of inconel , cadmium – welding of dissimilar metals – welding of plastics.

UNIT - V WELDING ECONOMY AND APPLICATIONS **12**

Principles of sound welding design of ship construction ‘V’ and ‘U’ preparation - advantages of ‘U’ preparation when compared to ‘V’ preparation economics of welding design – cost of welding design – Welding Economy – Cost of welding by different processes and selection of welding processes – Principles governing design of good welding jigs and fixtures –design of pressure vessels for welding – design of static loaded structures, plate girders, beam brackets for welding. Defects in welds –causes and remedies – welding distortion – control of welding distortion.

Total Hours 60

TEXT BOOK : Workshop technology I and II by Hajra Choudary

Code	Subject	Lecture	Tutorial	Practical	Credits
21SDMR61	MARINE AUXILIARY MACHINERY -PRACTICAL	0	0	3	2

Course Objective:

- All the Ten experiments given in the list of experiments should be completed and given for the end semester practical examination.
- In order to develop best skills in handling Equipments and taking readings in the practical classes, every five students should be provided with a separate experimental setup for doing experiments in the laboratory.

Course Outcome:

CO 01: Assess Dismantling and assembling of winch.

CO 02: Assess Dismantling and assembling of oil water separator.

CO 03: Assess Dismantling and assembling of centrifugal pump.

CO 04: Assess Dismantling and assembling of reciprocating pump.

CO 05: Assess the Dismantling and assembling of gear with reciprocating pump.

CO 06: Assess the Dismantling and assembling of purifier.

CO 07: Assess the corrosion. Practice of chipping and painting of corroded parts.

CO 08: Assess the Dismantling and assembling of compressor.

EXPERIMENTS

1. Dismantling and assembling of winch.
2. Dismantling and assembling of oil-water separator.
3. Dismantling and assembling of centrifugal pump.
4. Dismantling and assembling of reciprocating pump.
5. Dismantling and assembling of gear with reciprocating pump.
6. Dismantling and assembling of purifier.
7. Study about corrosion. Practice of chipping and painting of corroded parts.
8. Dismantling and assembling of compressor.

Total Hours 30

SAFETY PRECAUTIONS TO BE FOLLOWED

1 Always wear shoes.

2 Always use good conditions tools during the work

3 Appropriate safety device should be used

4 Switch off the machines when not in use.

Code	Subject	Lecture	Tutorial	Practical	Credits
21SDMR62	MARINE WELDING TECHNOLOGY -PRACTICAL	0	0	3	2

Course Objective:

- All the experiments given in the list of experiments should be completed and given for the end semester practical examination.
- In order to develop best skills in handling Instruments/Equipment in the practical classes, every two students should be provided with a separate experimental setup for doing experiments in the laboratory.
- The external examiners are requested to ensure that a single experimental question should not be given to more than four students while admitting a batch of 30 students during Board Examinations.

Course Outcome:

CO 01: Assess Shielded Metal Arc Welding.

CO 02: Assess Gas Metal Arc Welding.

CO 03: Assess Flux cored arc Welding.

CO 04: Assess Gas Tungsten Arc Welding.

CO 05: Assess Gas Welding.

CO 06: Assess Gas Cutting.

CO 07: Assess Spot Welding.

EXPERIMENTS

PART – A

1. Shielded metal arc welding
2. Gas metal arc welding
3. Flux cored arc welding
4. Gas tungsten arc welding
5. Gas welding

The following joints should be practiced for all the above welding methods:

1. T – joint
2. Butt joint
3. Lap joint
4. Corner joint
5. Open corner joint
6. Pipe joint

PART – B

1. Gas cutting
2. Spot welding

Total Hours 60

SAFETY PRECAUTIONS TO BE FOLLOWED

1. Always wear apron, head screen and shoes.
2. Always use good conditions tools during the work
3. Appropriate safety device should be used while welding.
4. Switch off the machines when not in use.

Code	Subject	Lecture	Tutorial	Practical	Credits
21RDMR61	PROJECT WORK	0	0	3	5

Course Objective:

All the experiments given in the list of experiments should be completed and given for the end semester practical examination.

- In order to develop best skills in handling Instruments/Equipment in the practical classes, every two students should be provided with a separate experimental setup for doing experiments in the laboratory.
- The external examiners are requested to ensure that a single experimental question should not be given to more than four students while admitting a batch of 30 students during Board Examinations.

Course Outcome:

CO 01: Construct Environmental Management.

CO 02: Construct Disaster Management.
CO 03: Assess the Pollution
CO 04: Rate of Hazard Zones
CO 05: Assess Crisis due to fires, accidents

Syllabus

ENVIRONMENTAL & DISASTER MANAGEMENT

1. ENVIRONMENTAL MANAGEMENT

Introduction – Environmental Ethics – Assessment of Socio Economic Impact – Environmental Audit – Mitigation of adverse impact on Environment – Importance of Pollution Control – Types of Industries and Industrial Pollution. Solid waste management – Characteristics of Industrial wastes – Methods of Collection, transfer and disposal of solid wastes – Converting waste to energy – Hazardous waste management Treatment technologies. Waste water management – Characteristics of Industrial effluents – Treatment and disposal methods – Pollution of water sources and effects on human health. Air pollution management – Sources and effects – Dispersion of air pollutants – Air pollution control methods – Air quality management. Noise pollution management – Effects of noise on people – Noise control methods.

2. DISASTER MANAGEMENT

Introduction – Disasters due to natural calamities such as Earthquake, Rain, Flood, Hurricane, Cyclones etc – Manmade Disasters – Crisis due to fires, accidents, strikes etc – Loss of property and life.. Disaster Mitigation measures – Causes for major disasters – Risk Identification – Hazard Zones – Selection of sites for Industries and residential buildings – Minimum distances from Sea – Orientation of Buildings – Stability of Structures – Fire escapes in buildings - Cyclone shelters – Warning systems. Disaster Management – Preparedness, Response, Recovery – Arrangements to be made in the industries / factories and buildings – Mobilization of Emergency Services - Search and Rescue operations – First Aids – Transportation of affected people – Hospital facilities – Fire fighting arrangements – Communication systems – Restoration of Power supply – Getting assistance of neighbors / Other organizations in Recovery and Rebuilding works – Financial commitments – Compensations to be paid – Insurances – Rehabilitation.

Total Hours: 60