PROGRAMME STRUCTURE

FOR

DIPLOMA PROGRAMME IN

SHIPBUILDING ENGINEEERING

UNDER RATIONALISED SEMESTER SYSTEM

(IMPLEMENTED FROM ACADEMIC YEAR 2020-2021)

BOARD OF TECHNICAL EDUCATION, GOA STATE

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DIPLOMA IN SHIPBUILDING ENGINEERING

(GC101) Communication Skills

1. COURSE OBJECTIVE :

The course aims to develop Communication skills in English by improving students' ability to write ,speak, listen and read effectively. Emphasis is also laid on students' personality development, helping them to build their confidence in interpersonal / group communication.

2. TEACHING AND EXAMINATION SCHEME

Semester	I								
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme			
						Theory Marks		Practical Marks		Total Marks
		L	T	P	H	TH	TM	TW	PR/OR	
(GC101) Communication Skills		-	-	02	32	-	-	25	25	50

3 . COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

GC101.CO1 Understand the essentials of effective Communication.

GC101CO2 Develop reading. writing, speaking , listening and effective presentation skills.

GC101.CO3 Select the appropriate mode of Communication .

GC101.CO4 Demonstrate reading. writing, speaking , listening and effective presentation skills.

4.Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	0	0	0	0	3	3	3
CO2	1	0	1	0	3	3	3
CO3	1	0	1	0	3	3	3
CO4	1	0	0	0	3	3	3

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Phr = Practical hours	CO = Course Outcomes	

Unit	M	Phr	CO
1 UNIT NAME: FUNDAMENTALS OF COMMUNICATION SKILLS	-		CO1 CO2

1.1 **Communication Skills fundamentals** Definition, communication process, importance of Communication Skills, essentials of effective communication		01	**CO3** **CO4**
1.2 **Types of communication**: verbal Communication and Nonverbal communication (Body language, facial expressions, gestures, eye contact, posture, dress and grooming/personal appearance, deportment, personal hygiene) Paralinguistic (Volume, pace, pitch, pauses)		02	
1.3 **Barriers to communication:** physical barriers, psychological barriers and cultural barriers		01	
2. Unit: PRESENTATION SKILLS			
2.1 Presentations: Methods and style of presentation, Importance, planning a presentation, venue selection, audience awareness (age, gender, profession background, educational and social background) time and duration, audio visual aids (OHP, LCD projector, flip charts, white/black/green board, computer, microphone)		**02**	**CO2** **CO3** **CO4**
2.2 Public speaking: preparatory steps, tips for good beginning and end, delivery style, techniques for a good speech (repetition, signs, pictures, humor), body language		**02**	
3 UNIT: TECHNICAL Writing			
3.1 Report **writing** Functions and parts of a report, Qualities of a good report, and types: Report on any institute function, Accident report, Industrial visit Report		04	
3.**2 Business letters** Principles of effective letter writing, parts of a business letter, formats (Full block style, Semi block style, modified block style) Routine/ Generic letters (letter to the heads of the institute, letter to the heads of various departments/sections of the institute) Types of letters: Enquiry Letter, Quotation, Purchase Order, Letter of Complaint		06	**CO1** **CO2** **CO4**
3.3 **Job application** Tips for a good C.V and a Resume		02	
4 UNIT GRAMMAR	-		**CO1**

4.1 Fundamentals of English writing Subject verb agreement, homonyms, homophones, homographs, articles, Punctuation, synonyms, fundamentals of sentence construction		**02**	**CO2** **CO4**
4.2 Paragraph Writing: Developing Topics (the main idea), body (supporting sentences), conclusion, proof reading		**02**	
UNIT V: LANGUAGE WORKSHOP **5.1 Reading Skills** strategies to use for building vocabulary and reading fluencies (read extensively, identify new words, use of dictionary, online dictionary apps), reading comprehension, pronunciation, debate, role play,	-	08	**CO1** **CO2** **CO4**
5.2 Listening Skills How to listen effectively, listening comprehension			
5.3 Speaking skills speech, group discussion			
5.4 Writing skills précis writing, comprehension			
Total		**32**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, videos, exercises

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	**Unit**	**NO of lectures**	**Marks**
1	Fundamental of Communications skills	04	-
2	Presentation Skills	04	-
3	Technical Writing	12	-
4	Grammar	04	-
5	Language workshop	08	-
	Total	32	25

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	**Practical**
1.	**Practical Title: Fundamental of Communications skills**
i.	Comprehension
ii.	Précis writing
iii.	Self-Introduction
2	**Practical Title: Presentation Skills**
iv.	Extempore speech
v.	Presentation on any given Topic
3	**Practical Title: Technical Writing**
vi.	Accident Report
vii.	Report on Institute function
viii.	Industrial visit report

ix.	Generic letters to the heads of various department/ Sections of the institute
x.	Inquiry letter
xi.	Quotation
xii.	Purchase or supply order
xiii.	Complaint letter
xiv.	Job application
4	**Grammar**
xv.	Exercises in subject – verb agreement
xvi.	Exercises in use of preposition
xvii.	Exercises in use of Homophones, homonyms, homographs
xviii.	Exercises in use of punctuation
xix.	Exercises relating to correcting the sentences
xx.	Paragraph writing
5	**Language workshop**
xxi.	Exercises to improve Reading skills
xxii.	Exercises to improve Writing skills
xxiii.	Group discussion
xxiv.	Listening comprehension

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	R. C. Sharma & Krishna Mohan	Business Correspondence and Technical Writing	Tata McGraw Hill
2	P. Prasad, Sharma, K. Rajendra	The Functional aspects of communication skills	S.k. Kataria& sons
3	SanjayKumar,Pushpa Lata	Communication Skills	Oxford University Press
4	A.K.Jain,A.M.Shaikh&Pravin S R Bhatia	Professional communication Skills	S.Chand
5	Wren & Martin	High School English Grammar & Composition	S. Chand, N. Delhi

10.Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Raul R. Timm	How to make winning presentations	Sneha Printers
2	Dale Carnegie, Training CPI	Stand and Deliver, How to become a masterful communicator and public speaker	Cox & Wyman, UK
3	John Seely	The Oxford Guide to Effective Writing and speaking	Oxford University Press

Autobiographies, self-help books, Audio speeches given by famous personalities

Internet and Web Resources

https://www.grammarly.com/

https://www.bbc.co.uk/programmes/articles/5QFnVy3xzT5htTh13cmP2P8/teacher-resources

https://Ted.com

Videos and Multimedia Tutorials

https://you.tu.be/AykYRO5d_II

(GC102) Engineering Mathematics I

1. COURSE OBJECTIVE:

1. The course is aimed at providing mathematical knowledge, developing computational skills and reasoning. It also helps students to think logically and in systematic manner so as to grasp mathematical concepts easily. It helps to build analytical thinking which play an important role in solving real world problems in all scientific discipline.

2.TEACHING AND EXAMINATION SCHEME

Semester	**I**							
Course code & course title		**Periods/Week (in hours)**			**Total hours**	**Examination Scheme**		
						Theory Marks	**Term Work**	**Total Marks**
(GC102) Engg.Maths I		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**
		4	**2**	**-**	**96**	**75**	**25**	**25**	**125**

3.COURSE OUTCOMES:

GC102.CO1. Understand the basic mathematical concepts for Engineering applications.

GC102.CO2. Identify and use appropriate formulae for solving practical engineering problems

GC102.CO3. Apply formulae of algebra, geometry, trigonometry and calculus for solving problems.

GC102.CO4 . Co-relate mathematical formulae to practical problems.

4.Mapping Course Outcomes with Program Outcomes:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**
CO1	**3**	**2**	**1**	**0**	**0**	**0**	**2**
CO2	**3**	**3**	**1**	**0**	**1**	**0**	**1**
CO3	**2**	**2**	**3**	**3**	**2**	**0**	**1**
CO4	**2**	**3**	**3**	**2**	**1**	**1**	**1**

Relationship :Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**	

Unit	**Marks**	**Thr**	**CO**
1 MATHEMATICS FUNDAMENTAL	**8**	**6**	**CO1**
1.1 **Polynomials: Types** of polynomials, addition subtraction, (no question to be asked), Multiplication and division of polynomials	3	2	
1.2 **: Algebraic equations:**Different types of equations and their geometric meaning(line,circle parabola only) ,equations with one, two and three variables and solving equations with two and three variables Quadratic equations and nature of their solutions	3	2	
1.3: Logarithm: Definition of log, log with base 'e' and base'10' Properties of log, log and antilog , problems using definition and properties of log.	2	2	
2.STRAIGHT LINES AND CIRCLES	15	14	**CO1, CO4**
2.1: Straight line: Intercept, slope, intersection of lines Equations of line: 1. Slope intercept form, slope point form, two points form, parallel and perpendicular lines, angle between lines Perpendicular distance of a point from line	8	7	
2.2: Circle: circle as a locus, Centre, diameter, chord of a circle Equations of circle: Centre radius form, diameter form, general form and sums	7	7	
3. TRIGONOMETRY			**CO1, CO3**
3.1: Angle and measurement, degree and radians and conversion and related sums, arc length and area of sector and sums **3.2:** Trigonometric ratios and identities 3.3: Trigonometric ratios of compound and allied angles 3.4: Product formulae sinA±sinB, cosA±cosB **3.5:** Sum and difference formulae **3.6:** Multiple angle 2A, and their trigonometric ratios, **3.7**: Sine rule, Cosine rule in triangle, solution of triangle	12	15	
4 : MENSURATION	10	6	**CO1,**

4.1: Areas of 2D figures like quadrilaterals, circle triangle etc (no questions to be asked) **4.2:** Surface area and volumes of cube, sphere, cylinder, cone, (no question to be asked) Surface areas and volumes of prism, pyramid, **4.3**: Frustum of cone, pyramid and their surface areas and volumes. **4.4:** Simpson's 1/3 rd rule for area and volume			**CO4**
5 :CALCULUS	30	23	**CO1, CO2, CO3, CO4**
5.1:Limits 5.1.1 : Pre requisite : Sets , intervals, relation and function (no questions to be asked) 5.1.2 : Limit of a function , algebraic properties of limits 5.1.3: Limits of algebraic, trigonometric, exponential, logarithmic functions	7	6	
5.2 : Derivatives 5.2 .1: Derivative definition by first principle (no question to be asked) 5.2.2: Standard formulae, Algebraic properties of derivative ($u \pm v$) etc. 5.2.3: Derivatives of algebraic, trigonometric, exponential, logarithmic functions 5.2.4: Derivative of product of functions (uv rule). 5.2.6: Derivative of quotient of functions (u/v rule) 5.2.7: Derivative of composite functions 5.2.8: Derivative of parametric functions 5.2.9: Derivative of implicit functions 5.2.10 : Logarithmic differentiations 5.2.11: Second order derivatives (no question to be asked)	15	12	
5.3 : Applications of derivatives 5.3.1: Application to the geometry: i) derivative as a slope of a tangent ii) to find equations of tangent and normal at given point on the curve 5.3.2: Application to the Linear motion:i) displacement, velocity,acceleration 5.3.3: Application to the rate measure i) to find rate change in area and volume etc 5.3.4 : Maxima and minima	8	5	
Total	**75**	**64**	

6. COURSE DELIVERY:
The Course will be delivered through lectures, class room interactions, exercises

7. SPECIFICATION TABLE FOR THEORY

Unit No	Unit	Number of lectures	Marks
1	**Mathematics Fundamental**	06	8
2	**Straight line and circle**	14	15
3	**Trigonometry**	15	12
4	**Mensuration**	06	10
5	**Calculus**	23	30
	Total	**64**	**75**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

- Tutorial books should be maintained by students (5 marks)
- Two home assignments per semester (5 marks)

  The Two assignments each comprises of thirty questions which includes 15 short questions and fifteen long questions. First assignment will cover fifty percent of syllabus

  and second assignment will cover remaining portion of syllabus
- Topic-wise class assignment (15 marks)

  Class assignment comprises of ten short and ten long questions.

9. LEARNING RESOURCES

Text Books

S. No.	Title of Books	Author	Publishers
1	Mathematics for Polytechnic Students(Basic Mathematics)	S.P. Deshpande	Pune VidyarthiGrihaPrakashan 1786, Sadashiv Peth, Pune
2	Mathematics for Polytechnic Students(Engineering Mathematics)	S.P. Deshpande	Pune VidyarthiGrihaPrakashan 1786, Sadashiv Peth, Pune
3	S.B. Gore, M.B.Patil, S.P. Pawar	Applied Mathematics	Vrinda Publications

Reference Books for further study

S. No.	Title of Books	Author	Publishers
1	Applied Mathematics I	Dr. U.B.Jangam, K.P. Patil, Nalini Kumthekar	Nandu Printers& Publishers pvt. Ltd. Mumbai
2	Applied Mathematics for Polytechnics	H.K. Dass	CBS Publishers and distributers Pvt.Ltd. ,Pune
3	Set Theory and related topics	Seymour Lipschutz	McGraw-Hill

(GC103) APPLIED PHYSICS-I

1.COURSE OBJECTIVE :

On successful completion of the course, Students completing the Applied Physics I course will be able to demonstrate competency and understanding of the basic concepts found in, Units and Dimensions, Kinematics of motion in one dimension Force Work Power and Energy, Circular Motion and Gravitation, Properties of Matter and Heat and will be able to utilize the knowledge to demonstrate competency with experimental methods that are used to discover and verify the concepts related to content knowledge

2.TEACHING AND EXAMINATION SCHEME

Semester	**I**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(GC103) Applied Physics I		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		03	**0**	**02**	**80**	**75**	**25**	**25**	**-**	**125**

3.COURSE OUTCOMES:

GC103.CO1: Understand the Fundamental concepts of physical quantities, Force, Power, Energy, Motion, Matter and heat transfer used in Engineering applications.

GC103.CO2: Explain the concepts of Dimensions, Work, Power , Energy ,Motion, properties of matter and heat transfer

GC103.CO3: Apply the Knowledge of Physical quantities, Types of motions, Force, work ,Power, properties of matter and heat transfer in Engineering applications

GC103. CO4: Analyze different types of Physical quantities, motions, properties of matter, and modes of heat transfer

4. Mapping Course Outcomes with Program Outcomes

Relationship: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	**Problem Analysis**	**Design and Devlopment of Solutions**	**Engg. Tools, Experimentatn& Testing**	**Engg. Practices for Society,Sustainability& Environment**	**Project Management**	**Life -long Learning**
CO 1	3	1	1	3	2	0	3
CO 2	3	1	2	3	0	0	3
CO 3	3	1	2	2	0	1	1
CO 4	1	1	2	2	0	1	1

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Outcomes**			
Unit	**Thr**	**M**	**CO**
1 UNIT NAME: UNITS AND DIMENSIONS	**08**	**12**	**CO1, CO2, CO3, CO4**
1.1 Fundamental and Derived units ,			
1.2 Different system of units, SI unit conversion from one system to other,			
1.3 Principle of Homogeneity,			
1.4 Dimensions, dimensional formula,			
1.5 dimensonal correctness of given equation using dimensions			
1.6 least count of vernier calliper and screw gauge			
1.7 zero errors-- in case of vernier calliper and screw gauge			
1.8 Types of error.			
2. UNIT NAME: MOTION IN ONE DIMENSION, FORCE, WORK,POWER AND ENERGY	**10**	**16**	**CO1, CO2, CO3, CO4**
2.1 Distance and displacement,			
2.2 Scalar and Vectors			
2.3**,** Speed and Velocity, Uniform Velocity, ,			
2.4 Uniform acceleration,acceleration due to gravity			
2.5 Equation of motion ($v=u+at$, $v^2=u^2+2as$, $s=ut+1/2at^2$)(no derivation)			
2.6 Motion under gravity. Force and its unit.			
2.7 Work and its unit. Energy, law of conservation of energy,			
2.8. Kinetic and Potential energy equation and examples.			
3. UNIT NAME: Uniform Circular Motion and Gravitation	**10**	**16**	**CO1, CO2, CO3, CO4**
3.1 Unifrom circular motion,			
3.2 Definition angular displacement,angular velocity, ,			
3.3 Conversion from rpm to rad/sec,$v=r\omega$, tangential velocity, radial acceleration			
3.4 Centripetal force and centrifugal force, examples,			
3.5 Banking of roads,superelevation, expression for angle of banking			
3.6 Newtons law of gravitation, acceleration due to gravity ,			
3.7 Expression for acceleration due to gravity. Escape velocity, Critical velocity, and periodic time definition and expression (no derivation)			
3.8. Sattellite, types(Geosationary,communication remote sensing)			
4. UNIT NAME: PROPERTIES OF MATTER	**10**	**16**	**CO1, CO2, CO3, CO4**
4.1 Elasticity ,			
4.2 Stress, Strain,Hooke's law,			
4.3 Youngs Modulus,			
4.4 Bulk Modulus, Rigidity Modulus,			
4.5 Stress v/s Strain graph			
4.6 Yield point, breaking stress,factor of safety, ,			
4.7 Surface tension definition and example			
4.8. Adhesive and cohesive force, application,			
4.9 liquid miniscus and angle of contact, capillarity,			
4.10 Expression for surface tension (no derivation), applications. viscocity,			
4.11 Definition velocity gradient, newtons law of viscocity, terminal			

velocity,stokes law,			
4.12 Streamline flow and turbulent flow,critical velocity, application of viscocity.			
5. UNIT NAME: HEAT	**10**	**15**	**CO1, CO2, CO3, CO4**
5.1 Statements of boyles law,charles law,gay lussacs law			
5.2 General gas equation,specific heat definition and unit, Latent heat definition and unit			
5.3 Modes of transfer of heat, conduction, convection and radiation,			
5.4 Conduction of heat through a metall rod,			
5.5 Variable and Steady state			
5.6 law of thermal conductivity (With Derivation)			
5.7 Applications of thermal conductivity, ,			
5.8. Thermal expansion of solids			
5.9 linear expansion,superficial expansion,			
5.10 Cubical Expansion			
5.11 Realtion betwenn α,β,γ (no derivation)			
5.12 Engineering applications of expansion of solids.			

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	UNITS AND DIMENSIONS	8	12
2	MOTION IN ONE DIMENSION, FORCE, WORK AND ENERGY	10	16
3	UNIFORM CIRCULAR MOTION AND GRAVITATION	10	16
4	PROPERTIES OF MATTER	10	16
5	HEAT	10	15
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS

No	Practicals	Marks
1.	Basic Conversion Techniques from one system of units to the other	25
2.	Use of Vernier callipers to find the Volume of Hollow cylinder, Block	25
3.	Use of Screw gauge to find the cross-sectional area of a wire and thickness of a clip	25
4.	To find the Coefficient of Viscosity of a given liquid by stokes method	25
5.	To Find the coefficient of Thermal Conductivity by Searle's Method	25
6	To Find the Surface Tension of a given liquid by capillary rise method	25
7	To Find Young's Modulus by Searles Method	25
8	To Find acceleration due to gravity by simple pendulum method.	25
	Total (Average)	25

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	B G Dhande	Applied Physics of Polytechnics	Pune Vidyarthi Griha Prakashan
2	Bhandarkar	Applied Physics of Polytechnics	Vrinda publication
3	R K Gaur and S L Gupta	Engineering Physics	Dhanpat Rai & Sons Delhi
4	Dr. Vasudev R Bhagwat	A Text Book of Applied Physics for Polytechnics	Broadway Publishing House
5	B L Thereja	Engineering Technology	S. Chand

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Halliday D and Resnick	Physics Part I-II	Wiley Eastern Ltd.
2	Satish k. Gupta	ABC of Physics I&II	Modern Publisher
3	Saxena HC and Singh Prabhakar	Applied Physics Vol I & II	S. Chand Publisher

(GC104) Applied Chemistry

1. COURSE OBJECTIVE:

Chemistry is the branch of Science which deals with the study of composition, properties and changes in matter. An understanding of the basic concepts of Applied Chemistry, chemical principles and chemical properties of materials is essential to all the engineers. The emphasis is on applying the knowledge of principles of chemistry in all the fields of engineering wherein students appreciate the significance of chemistry in day to day life. The subject develops in students the habit of scientific enquiry, the ability to investigate cause and effect relationship & the ability to interpret & analyze the results.

2. TEACHING AND EXAMINATION SCHEME

Semester	**I**								
Course code & course title		**Periods/Week (in hours)**			**Total Credits (Hours)**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(GN104) Applied Chemistry		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**-**	**2**	**80**	**75**	**25**	**25**	**-**	**125**

3. COURSE OUTCOMES:

GC 104.CO1: Understand the fundamental concepts of Atomic Structure, electrochemistry, water quality, corrosion and polymers.

GC 104.CO2: Explain the process of Chemical bonding, water softening, electroplating, corrosion control and polymerization

GC 104.CO3: Relate the principles of Chemical Bonding, Electrolysis, water hardness for domestic and Industrial applications and properties of polymers.

GC 104.CO4: Distinguish between types of Chemical bonding, Water softening methods, corrosion control methods, different processes of metal coating and different polymers.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentin g& Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	3	2	1	1	2	1	1
CO2	2	3	2	1	3	1	2
CO3	3	2	2	2	3	1	2
CO4	3	2	2	2	2	1	1

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**Mks**	**Thr**	**CO**
UNIT 1.0 : ATOMIC STRUCTURE AND CHEMICAL BONDING	**15**	**10**	CO1 CO2 CO3 CO4
1.1 Atomic Structure 1.1.1 Fundamental particles and their characteristics. 1.1.2 Energy levels - Definition & designation 1.1.3 Sub Energy levels- Definition & designation 1.1.4 Orbital – Concept & shape (s and p only) **1.2** Quantum numbers 1.2.1 Designation, definition, values.			
1.3 Electronic distribution (Elements from atomic Number 1-20) 1.3.1 Bohr – Bury's laws for distribution of electrons in shells (1st three laws only) 1.3.2 Aufbau Principle. for distribution of electrons in sub-shells 1.3.3 Pauli's Exclusion Principle. 1.3.4 Hund's Rule of maximum multiplicity 1.3.5 Orbital Electronic Configuration of elements (from atomic numbers 1 to 20 only).			
1.4 Chemical Bonding 1.4.1 Lewis and Longmuir concept of stable configuration. 1.4.2 Electrovalent - Bond - Concept Formation of Electrovalent Compound (NaCL & MgO) 1.4.3 Covalent Bond – Concept Formation of Colvalent Compounds (Cl_2, O_2, N_2) 1.4.4 Co-ordinate Bond - Concept Formation of Co-ordinate Compounds (O_3) 1.4.5 Properties of Electrovalent, Colvalent & Co-Ordinate compounds.			
UNIT 2.0 : WATER	**15**	**10**	CO1 CO2 CO3 CO4
2.1 Hardness of Water 2.1.1 Soft and Hard Water - Concept Soap Test (Chemical Equation not expected) 2.1.2 Causes of Hardness 2.1.3 Types of Hardness 2.1.4 Degree of Hardness & Units of Hardness (mg/L & ppm)			
2.2 Disadvantages of Hard Water 2.2.1 Domestic Purpose Drinking, cooking, Washing & Bathing. 2.2.2 Industrial Purpose			

(Paper Industry, Textile & Dyeing Industry, Sugar Industry, Bakery & Concrete Making) 2.2.3 Boilers- Steam Generation Purpose. Sludge formation – causes & Disadvantages (No chemical equation expected)			
2.3 Water Softening 2.3.1 Zeolite and Ion Exchange process of water softening			
2.4 Desalination of water 2.4.1 Electrodialysis & Reverse Osmosis process. 2.4.2 pH- Concept, pH scale & Importance of pH			
UNIT 3.0 : <u>ELECTROCHEMISTRY</u>	**12**	**08**	CO1 CO2 CO3 CO4
3.1 Electrolytic dissociation 3.1.1 Arrhenius theory of Electrolytic dissociation 3.1.2 Factors affecting degree of Ionization- nature of solute, nature of solvent, concentration of solution and temperature.			
3.2 Electrolysis 3.2.1 Mechanism of Electrolysis. Ionization Reactions Reactions at cathode, Activity series of Cations. Reactions at Anode, Activity series of Anions. 3.2.2 Electrolysis of Molten NaCl using Carbon Electrodes. Aqueous NaCl using Platinum Electrodes. Aqueous $CuSO_4$ using Platinum Electrodes. Aqueous CuSO4 using copper Electrodes.			
3.3 Electrochemical series – Definition and Significance			
UNIT 4.0 : CORROSION AND ITS CONTROL	**25**	**14**	CO1 CO2 CO3 CO4
4.1 Dry /Direct Chemical corrosion 4.1.1 Definition 4.1.2 Oxidation corrosion 4.1.3 Corrosion due to other gases.			
4.3 Types of Electrochemical corrosion. 4.3.1 Galvanic Cell corrosion 4.3.2 Concentration cell corrosion(Metal ion concentration & differential Aeration)			
4.4 Corrosion Control Protection of metals by:			

4.4.1. Using Pure Metals & Metal alloys 4.4.2 Proper designing 4.4.3 Modifying the environment (De- aeration, Deactivation, Dehumidification, Alkaline neutralization) 4.4.4 Cathodic protection (Sacrificial anode and Impressed current cathodic protection) 4.4.5 Metal Coating (Galvanizing, Tinning, Metal-Spraying, Electroplating & powder coating)			
UNIT 5: POLYMERS	**08**	**06**	CO1 CO2 CO3 CO4
5.1 Concept of Monomers & Polymers **5.2**Polymerization- Definition. 5. 2.1 Addition polymerization-Definition. 5.2.2 General equation of polymerization of :- Ethylene to Polyethylene. Vinyl chloride to Polyvinylchloride Tetra fluoro ethylene to Poly tetra fluoroethylene(PTFE) 5.2.3 Condensation Polymerization-Definition 5.2.4 General Equation for formation of Phenol formaldehyde Resin. **5.3** Plastics. 5.3.1 Types of plastic (Thermosetting and Thermo softening), Examples 5.3.2 Properties and applications of Poly-ethylene, PVC, polystyrene, Nylons, Bakelite & silicones.			
5.4 Rubber 5.4.1 Natural Rubber 5.4.2 Drawbacks of Crude rubber. 5.4.3 Vulcanization of Rubber (General Equation) 5.4.4 Rubber examples. 5.4.5 Properties of Synthetic Rubber & related applications.			

8. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

9. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**ATOMIC STRUCTURE AND CHEMICAL BONDING**	10	15
2	**WATER**	10	15
3	**ELECTROCHEMISTRY**	08	12
4	**CORROSION & IT'S CONTROL**	14	25
5	**POLYMERS**	06	08
	Total	**48**	**75**

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
	Practical Title
1.	Double Acid-Base Titration using Phenolphthalein.
2.	Acid- Base titration using Methyl orange.
3.	Redox Titration of $KMnO_4$ soln., $FeSO_4$ soln. and Oxalic acid
4.	Determination of degree of Hardness by E.D.T.A method.
5.	Determination of Total Alkalinity of water sample.
6.	Determination of Chloride content of water sample by Mohr's method.
7.	pH- Metric titration.
8.	Conduct metric Titration.
9.	Determination of Conductivity of water samples from different water body sources.
10.	Corrosion Susceptibility of Aluminum to Acid or Base.
11.	Determination of pH of different food items.
	Total Marks: 25
	No Class room Assignments

*** Any TEN of the above.**

****Term Work Assessment Scheme**: 1. Performance:15 marks (Carrying out experiment, Readings, Calculations and Results)
2.Knowledge :05 Marks(Theory of the experiment)
3. Journal : 05 Marks

11. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	M.M. Uppal	Text book of Engg. Chemistry	Khanna Publisher
2	V.P.Mehta	Text book of Engg. Chemistry	Jain Bros. Delhi
3	S.N Narkhede	Textbook of Engg. Chemistry	Niraj Prakashan
5	S S Dara	A Textbook of Engg. Chemistry	S Chand & Co
4	P.C. Jain and M.Jain	Engg. Chemistry.	Dhanpat Rai Publishing Co.

(GC105) Basic Engineering Practice (Electronics& Comp.)

1. COURSE OBJECTIVE:

The students will be able to acquire knowledge about safety aspects, firefighting, first-aid and carpentry, fitting, plumbing skills. The students will learn proper ways of using various hand tools, measuring devices in acquiring these skills and will also interpret simple electrical drawings/circuit diagrams.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Hours	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
(GC 106)	L	T	P	H	TH	TM	PR/OR	TW	
Basic Engineering Practice	0	0	5	80	-	-	50	100	150

3. COURSE OUTCOMES:

PART A

On successful completion of the course, the student will be able to:
GC106.CO1. Understand safety procedures to be followed in carpentry, fitting, and plumbing.
GC106.CO2. Identify various tools used for carpentry, fitting, and plumbing.
GC106.CO3: Demonstrate basic working skills in carpentry, fitting and plumbing.

GC106.CO4: Plan & execute a job/activity using job drawing.

PART B

On successful completion of the course, the student will be able to:
GC106.CO1. List the safety measures.to be observed in electrical workshop.
GC106.CO2. Identify various electrical tools, fittings used for electrical measurements & troubleshooting.
GC106.CO3: Distinguish between single phase and three phase supply.

GC106.CO4: Plan & execute a job/activity from electrical circuit drawing.

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

PART A

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	2	1	1	3	2	2	3
CO2	2	1	2	3	2	2	2
CO3	2	1	1	3	2	2	2
CO4	2	1	3	3	2	3	2

Relationship: Low-1 Medium-2 High-3

PART B

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	2	1	1	3	2	2	3
CO2	2	1	2	3	2	2	2
CO3	3	1	1	2	2	1	2
CO4	2	1	3	3	2	3	2

Relationship: Low-1 Medium-2 High-

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Hr = Practical Hours**	**CO = Course Outcomes**			
Unit			**M**	**Hr**	**CO**
1 General Safety, Housekeeping, Fire Fighting & First Aid			10	06	
1.1Introduction to General Safety aspects of engineering workshop 1.2 Meaning and importance of housekeeping. 1.3 Fire hazards, fire triangle, types of fire extinguishers – selection and use. 1.4Basic knowledge of first aid with specific inputs on cuts, burns, electric shocks, artificial respiration, handling emergencies.					CO1
2 Fitting Workshop Practice			30	18	
2.1 Introduction to the trade. 2.2 Introduction to various hand Tools, Measuring and Marking					CO1 CO2

Tools, cutting tools, Holding tools, Striking tools 2.3 Types of files and filing methods. 2.4 Drill bits and drilling Processes, using portable and pillar drilling machine. 2.5 Operations performed in fitting shop such as measuring, marking, chipping, filing, grinding, sawing, drilling 2.6 Threading using taps and dies.			CO3
3 Carpentry Workshop Practice	20	18	
3.1 Introduction to carpentry 3.2 Types of wood and its characteristics, forms of wood, defects in timber and its identification, wood working hand tools 3.3 Wood working processes. 3.4 Different types of joints and their usage. 3.5 Introduction to wood working machines: 3.6 Lathe 3.7 Circular saw 3.8 Band saw 3.9 Wood planner 3.10 Universal wood working machine			CO1 CO2 CO3
4 Electrical Workshop Practice	30	32	
4.1 Brief introduction to power distribution and Electrical Safety. 4.2 Use of different hand tools used in electrical trade 4.3 Collection of details of motors and transformers. 4.4Introduction to Control Panel and its various sections/components. 4.5 Making of wire joints. 4.6Measurement of current, voltage, frequency and Power Consumption. 4.7 Connecting and starting of Induction Motor & Measurement of its speed. Changing of Direction of rotation of induction motor. 4.8 Introduction to commonly used electrical Fittings (Domestic & Industrial). 4.9Wiring of Simple Electric Circuit (Bulb & plug point and switches) on wooden board 4.10 Study, connection & use of Energy Meter 4.11Testing of components using Series test lamp & Multimeter 4.12Study of Fuses & practice replacement of Fuse 4.13 Study & Troubleshooting of Tube Light			CO1 CO2 CO3 CO4
5 Plumbing	10	06	
5.1Plumbing tools, pipe fittings and method of joining pvc pipes. 5.2 Use of spirit level and plumb bob. 5.3 Minor repairs and replacement of fittings. 5.4 Reading of plumbing drawings. *[Note: Plumbing restricted to domestic plumbing and pvc piping.]*			CO1 CO2 CO3
Total	**100**	**80**	

6. COURSE DELIVERY:

The Course will be delivered through workshop practical sessions in mechanical and electrical workshops.

7. SPECIFICATION TABLE FOR PRACTICALS/ MACRO-LESSON PLAN

Unit No	Unit	Number of hrs.	Marks
1	General Safety, Housekeeping, Fire Fighting & First Aid	06	10
2	Fitting Workshop Practice	18	30
3	Carpentry Workshop Practice	18	20
4	Electrical Workshop Practice	32	30
5	Plumbing	06	10
	Total	80	100

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Hrs.
1	**General Safety, Housekeeping, Fire Fighting & First Aid**	**06**
a	Demonstration on use of Safety Measures while working in Workshop and use of safety signs.	03
b	Demonstration on use of First Aid and Artificial Respiration procedure ,Training on fire and emergency services (using video presentation /fire and safety expert talk)	03
2	**Fitting Workshop Practice**	**18**
a	Identification of various hand Tools, Measuring and Marking Tools, cutting tools, Holding tools, Striking tools	03
b	Identification of various types of files and demonstration on filing methods.	03
c	Identification of various types of Drill bits, taps, dies and Drilling machines such as portable and Pillar Drilling machine.	03
d	Job involving filing, marking, cutting operation on MS Flat.	06
e	Job involving Drilling and Tapping operation on MS flat.	03
3	**Carpentry Workshop Practice**	**18**
a	Identification of various types of woods and wood working hand tools	03
b	Identification of various types of Carpentry joints and their usage.	03
c	Introduction to wood working machines such as wood working Lathe, Circular saw ,Band saw, Wood planner, Universal wood working machine	03
d	Job involving marking, measuring, planning, sawing, chiseling, joint preparation and assembly of wooden blocks.	06
e	Preparation of job on wood working lathe.	03
4	**Electrical Workshop Practice**	**32**
a	Measurement of Single Phase and Three Phase supply Voltage using multimeter.	02
b	Identification of various hand tools used in electrical trade.	02
c	Measurement of electric circuit parameters using Ammeter, Voltmeter, Frequency meter, Wattmeter.	04

d	Making of Straight and T wire joints.	02
e	Testing of electrical components such as Choke, starter, Fuse, Switch using Series Test lamp and Multimeter	02
f	Starting of induction motor using DOL Starter	02
g	Reversal of direction of rotation of Three phase induction motor	02
h	Identification of commonly used electrical fittings.	02
i	Wiring of simple electrical circuit using bulb and socket.	04
j	Measurement of Energy using Energy Meter.	02
k	Identification of Different types of Fuses and their replacement in circuit.	02
l	Testing of various components and connection of Tube light circuit.	02
m	Collecting Name plate Details of Motors and Transformers and operating and controlling speed of motor from Control panel.	04
5	**Plumbing**	**06**
a	Identification of Plumbing tools and pipe fittings , Reading of plumbing drawings, methods of joining PVC pipes, use of spirit level and plumb bob in piping.	03
b	To carry out minor repairs and replacement of fittings.	03

9. LEARNING RESOURCES

TEXT BOOKS

S. No.	Author	Title of Books	Publishers
1	N. Sesha Prakash	Manual of Fire Safety	CBS Publishers and Distributers
2	S.K. Hajara-Chaudhary	Workshop Technology	Media Promoters
3	B.S. Raghuwanshi	Workshop Technology-	Dhanpat Rai and sons, New Delhi
4	R K Jain-	Production Technology	Khanna Publishers, New Delhi
5	H. S .Bawa	Workshop Technology	Tata McGraw Hill Publishers, New Delhi
6	Kent	Mechanical Engineering Hand book	John Wiley and Sons, New York
7	B.L. Theraja	Fundamentals of Electrical Engineering and Electronics	S. Chand – New Delhi

REFERENCE BOOKS FOR FURTHER STUDY

S. No.	Author	Title of Books	Publishers
1	CIMI- Central Instructional Media Institute Madras	Turner – Trade Theory – Ist and IInd Year	Wiley Eastern Ltd. New Delhi

(GC106) Basic Engineering Practice (Mech & Elect.)

2. COURSE OBJECTIVE:

The students will be able to acquire knowledge about safety aspects, firefighting, first-aid and carpentry, fitting, plumbing skills. The students will learn proper ways of using various hand tools, measuring devices in acquiring these skills and will also interpret simple electrical drawings/circuit diagrams.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Hours	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
(GC 106)	L	T	P	H	TH	TM	PR/OR	TW	
Basic Engineering Practice	0	0	5	80	-	-	50	75	125

3. COURSE OUTCOMES:

PART A

On successful completion of the course, the student will be able to:
GC106.CO1. Understand safety procedures to be followed in carpentry, fitting, and plumbing.
GC106.CO2. Identify various tools used for carpentry, fitting, and plumbing.
GC106.CO3: Demonstrate basic working skills in carpentry, fitting and plumbing.

GC106.CO4: Plan & execute a job/activity using job drawing.

PART B

On successful completion of the course, the student will be able to:
GC106.CO1. List the safety measures.to be observed in electrical workshop.
GC106.CO2. Identify various electrical tools, fittings used for electrical measurements & troubleshooting.
GC106.CO3: Distinguish between single phase and three phase supply.

GC106.CO4: Plan & execute a job/activity from electrical circuit drawing.

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

PART A

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	2	1	1	3	2	2	3
CO2	2	1	2	3	2	2	2
CO3	2	1	1	3	2	2	2
CO4	2	1	3	3	2	3	2

Relationship: Low-1 Medium-2 High-3

PART B

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	2	1	1	3	2	2	3
CO2	2	1	2	3	2	2	2
CO3	3	1	1	2	2	1	2
CO4	2	1	3	3	2	3	2

Relationship: Low-1 Medium-2 High-

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Hr = Practical Hours** | **CO = Course Outcomes**			
Unit	**M**	**Hr**	**CO**
1 General Safety, Housekeeping, Fire Fighting & First Aid		06	
1.1Introduction to General Safety aspects of engineering workshop 1.2 Meaning and importance of housekeeping. 1.3 Fire hazards, fire triangle, types of fire extinguishers – selection and use. 1.4Basic knowledge of first aid with specific inputs on cuts, burns, electric shocks, artificial respiration, handling emergencies.			CO1
2 Fitting Workshop Practice		18	
2.7 Introduction to the trade. 2.8 Introduction to various hand Tools, Measuring and Marking Tools, cutting tools, Holding tools, Striking tools 2.9 Types of files and filing methods. 2.10 Drill bits and drilling Processes, using portable and pillar drilling machine. 2.11 Operations performed in fitting shop such as measuring, marking, chipping, filing, grinding, sawing, drilling 2.12 Threading using taps and dies.			CO1 CO2 CO3
3 Carpentry Workshop Practice	20	18	
3.10 Introduction to carpentry 3.11Types of wood and its characteristics, forms of wood, defects in timber and its identification, wood working hand tools 3.12 Wood working processes. 3.13 Different types of joints and their usage. 3.14 Introduction to wood working machines: a. Lathe b. Circular saw c. Band saw d. Wood planner e. Universal wood working machine			CO1 CO2 CO3
4 Electrical Workshop Practice	30	32	
4.1 Brief introduction to power distribution and Electrical Safety. 4.2 Use of different hand tools used in electrical trade 4.3 Collection of details of motors and transformers. 4.4 Introduction to Control Panel and its various sections/components. 4.5 Making of wire joints. 4.6Measurement of current, voltage, frequency and Power Consumption. 4.7 Connecting and starting of Induction Motor & Measurement of its speed. Changing of Direction of rotation of induction motor. 4.8 Introduction to commonly used electrical Fittings (Domestic & Industrial). 4.9Wiring of Simple Electric Circuit (Bulb & plug point and			CO1 CO2 CO3 CO4

switches) on wooden board 4.10 Study, connection & use of Energy Meter 4.11Testing of components using Series test lamp & Multimeter 4.12Study of Fuses & practice replacement of Fuse 4.13 Study & Troubleshooting of Tube Light			
5 Plumbing		06	
5.1 Plumbing tools, pipe fittings and method of joining pvc pipes. 5.2 Use of spirit level and plumb bob. 5.3 Minor repairs and replacement of fittings. 5.4 Reading of plumbing drawings. *[Note: Plumbing restricted to domestic plumbing and pvc piping.]*			CO1 CO2 CO3
Total		**80**	

6. COURSE DELIVERY:

The Course will be delivered through workshop practical sessions in mechanical and electrical workshops.

7. SPECIFICATION TABLE FOR PRACTICALS/ MACRO-LESSON PLAN

Unit No	**Unit**	**Number of hrs.**	**Marks**
1	General Safety, Housekeeping, Fire Fighting & First Aid		10
2	Fitting Workshop Practice		30
3	Carpentry Workshop Practice		20
4	Electrical Workshop Practice		30
5	Plumbing		10
	Total		100

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	**Practical**	**Hrs.**
1	**General Safety, Housekeeping, Fire Fighting & First Aid**	**06**
a	Demonstration on use of Safety Measures while working in Workshop and use of safety signs.	03
b	Demonstration on use of First Aid and Artificial Respiration procedure ,Training on fire and emergency services (using video presentation /fire and safety expert talk)	03
2	**Fitting Workshop Practice**	**18**
a	Identification of various hand Tools, Measuring and Marking Tools, cutting tools, Holding tools, Striking tools	03
b	Identification of various types of files and demonstration on filing methods.	03
c	Identification of various types of Drill bits, taps, dies and Drilling machines such as portable and Pillar Drilling machine.	03
d	Job involving filing, marking, cutting operation on MS Flat.	06
e	Job involving Drilling and Tapping operation on MS flat.	03
3	**Carpentry Workshop Practice**	**18**

a	Identification of various types of woods and wood working hand tools	03
b	Identification of various types of Carpentry joints and their usage.	03
c	Introduction to wood working machines such as wood working Lathe, Circular saw ,Band saw, Wood planner, Universal wood working machine	03
d	Job involving marking, measuring, planning, sawing, chiseling, joint preparation and assembly of wooden blocks.	06
e	Preparation of job on wood working lathe.	03
4	**Electrical Workshop Practice**	**32**
a	Measurement of Single Phase and Three Phase supply Voltage using multimeter.	02
b	Identification of various hand tools used in electrical trade.	02
c	Measurement of electric circuit parameters using Ammeter, Voltmeter, Frequency meter, Wattmeter.	04
d	Making of Straight and T wire joints.	02
e	Testing of electrical components such as Choke, starter, Fuse, Switch using Series Test lamp and Multimeter	02
f	Starting of induction motor using DOL Starter	02
g	Reversal of direction of rotation of Three phase induction motor	02
h	Identification of commonly used electrical fittings.	02
i	Wiring of simple electrical circuit using bulb and socket.	04
j	Measurement of Energy using Energy Meter.	02
k	Identification of Different types of Fuses and their replacement in circuit.	02
l	Testing of various components and connection of Tube light circuit.	02
m	Collecting Name plate Details of Motors and Transformers and operating and controlling speed of motor from Control panel.	04
5	**Plumbing**	**06**
a	Identification of Plumbing tools and pipe fittings , Reading of plumbing drawings, methods of joining PVC pipes, use of spirit level and plumb bob in piping.	03
b	To carry out minor repairs and replacement of fittings.	03

9. LEARNING RESOURCES

TEXT BOOKS

S. No.	Author	Title of Books	Publishers
1	N. Sesha Prakash	Manual of Fire Safety	CBS Publishers and Distributers
2	S.K. Hajara-Chaudhary	Workshop Technology	Media Promoters
3	B.S. Raghuwanshi	Workshop Technology-	Dhanpat Rai and sons, New Delhi
4	R K Jain-	Production Technology	Khanna Publishers, New Delhi
5	H. S .Bawa	Workshop Technology	Tata McGraw Hill Publishers, New Delhi
6	Kent	Mechanical Engineering Hand book	John Wiley and Sons, New York
7	B.L. Theraja	Fundamentals of Electrical Engineering and Electronics	S. Chand – New Delhi

REFERENCE BOOKS FOR FURTHER STUDY

S. No.	Author	Title of Books	Publishers
1	CIMI- Central Instructional Media Institute Madras	Turner – Trade Theory – Ist and IInd Year	Wiley Eastern Ltd. New Delhi

(GC201) ENGINEERING MATHEMATICS II

1. COURSE OBJECTIVE:

2. The course is aimed at providing mathematical knowledge, developing computational skills and reasoning. It also helps students to think logically and in systematic manner so as to grasp mathematical concepts easily. It helps to build analytical thinking which play an important role in solving real world problems in all scientific discipline.

2. TEACHING AND EXAMINATION SCHEME

Semester	**II**								
Course code & course title		**Periods/Week (in hours)**			**Total hours**	**Examination Scheme**			
						Theory Marks		**TERM WORK**	**Total Marks**
(GC201) Engineering Mathematics II		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**
		4	**2**	**-**	**96**	**75**	**25**	**25**	**-**

3.COURSE OUTCOMES:

GC201.CO1: Understand the basic principles of Matrices ,Integration, Determinants and Vectors in engineering problems.
GC201.CO2: Interpret the formulae to solve problems of Matrices ,Integration, Determinants and Vectors.
GC201.CO3: Apply appropriate mathematical methods for solving engineering problems.
GC201.CO4: Analyse the knowledge of Matrices ,Integration, Determinants and Vectors for various Engineering applications.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	3	1	1	2	0	2	2
CO2	3	1	1	2	0	2	2
CO3	2	2	2	3	1	2	2
CO4	1	3	2	3	1	2	2

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**			
Unit			**Marks**	**Thr**	**CO**
1 .DETERMINANTS AND MATRICES			**15**	**12**	**CO1, CO2, CO4**
1.1 **Determinants**: Definition & order of determinant, value of determinant, properties of determinants(no question), Cramer's rule for solving equations with two & three variables			7	4	
1.2 **Matrices**: - Definition & order of matrix, types of matrices, Equality of matrices, addition & subtraction, multiplication of matrices, adjoint & inverse of a matrix , solution of linear equations with two & three variables using matrices			8	8	
2 .INTEGRATION			20	22	**CO1, CO2, CO4**
Definition, Standard Formulae, properties of Integration for sum, difference and scalar multiplication, integration of algebraic, trigonometric, inverse trigonometric, exponential, logarithmic, composite function, Integration by substitution, integration by partial fraction, integration by parts					
3 .DEFINITE INTEGRALS			10	08	**CO3**
Definition of definite integral and Properties of definite integral ,integration by parts Applications:Area under the curves & lines and area between the curves and Volumes (simple problems)					
4 .VECTORS			15	12	**CO1, CO2, CO4**
Definition of scalars & vectors, equality of vectors, Addition & subtraction of vectors, triangle, parallelogram laws for addition, position vector, dot product & cross product and their properties and applications, relation between dot and cross product and scalar triple product and applications					
5 .STATISTICS / COMPLEX NUMBERS			15	10	**CO3**
Statistics : **(ME and Allied courses only)** 5.1:Measures of central Tendency -mean, median, mode for ungrouped & grouped data 5.2:Measures of dispersion –Range, mean deviation, standard deviation, variance, coefficient of variation 5.3: Corrected mean and relation between standard deviation and					

mean.			**CO3**
5.Complex Numbers (electronics and Allied courses only) 5.1:Definition of complex number and Argand diagram, equality of complex numbers, 5.2:powers of 'i' ,complex conjugates, 5.3:Addition& subtraction of complex nos. Multiplication& division of complex nos. 5.4: Modulus and argument of a complex number 5.5:Polar form & exponential form of complex no. 5.6: De Moivre's theorem., nth root of complex nos. 5.7:Hyperbolic, exponential, circular functions			
Total	**75**	**64**	

6. COURSE DELIVERY:
The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY (GC201)

Unit No	**Unit**	**Number of lectures**	**Marks**
1	**Determinants & Matrices**	12	15
2	**Integration**	22	20
3	**Definite Integrals**	08	10
4	**Vectors**	12	15
5	**Statistics /Complex Number**	10	15
	Total	**64**	**75**

- Tutorial books should be maintained by students (5 marks)
- Two home assignments per semester (5 marks)

  The Two assignments each comprises of thirty questions which includes 15 short questions and fifteen long questions. First assignment will cover fifty percent of syllabus

  and second assignment will cover remaining portion of syllabus
- Topic-wise class assignment (15 marks)

  Class assignment comprises of ten short and ten long questions.

9. LEARNING RESOURCES

Text Books /reference books

S. No.	Title of Books	Author	Publishers
1	Mathematics for Polytechnic Students(Basic Mathematics)	S.P. Deshpande	Pune VidyarthiGrihaPrakashan 1786, Sadashiv Peth, Pune
2	Mathematics for Polytechnic Students(Engineering Mathematics)	S.P. Deshpande	Pune VidyarthiGrihaPrakashan 1786, Sadashiv Peth, Pune
3	Applied Mathematics	S.B. Gore, M.B.Patil, S.P. Pawar	Vrinda Publications

Reference Books for further study

S. No.	Title of Books	Author	Publishers
1	Applied Mathematics I	Dr. U.B.Jangam, K.P. Patil, Nalini Kumthekar	Nandu Printers& Publishers Pvt. Ltd. Mumbai
2	Applied Mathematics for Polytechnics	H.K. Dass	CBS Publishers & Distributers Pvt. Ltd. Pune
3	Advanced Engineering mathematics	H.K. Dass	S. Chand

(GC 202) APPLIED PHYSICS- II

1. COURSE OBJECTIVE:

On successful completion of the course, Students completing the Applied Physics II course will be able to demonstrate competency and understanding of the basic concepts found in, Electrostatics, Current Electricity, Electromagnetism and Electromagnetic Induction, Light and Optics and Sound, and will be able to utilize the knowledge to demonstrate competency with experimental methods that are used to discover and verify the concepts related to content knowledge.

2.TEACHING AND EXAMINATION SCHEME

Semester	**II**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(GC202) Applied Physics- II		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		03	**0**	**02**	**80**	**75**	**25**	**25**	**-**	**125**

3. COURSE OUTCOMES:

GC202.CO1: Understand the Fundamental Concepts of Electrostatics, Current Electricity, Electromagnetism and Electromagnetic Induction, Light, Optics and Sound.
GC202.CO2: Explain the basic principles of Electrostatics, Current Electricity, Electromagnetism and Electro Magnetic Induction, Light , Optics and sound.
GC202.CO3: Apply the knowledge of Electrostatics, Current Electricity, Electromagnetism and Electromagnetic Induction, Light, Optics and Sound to specific applications.
GC202.CO4: Compute various parameters in the field of Electrostatics, Current Electricity, Electromagnetism and Electromagnetic Induction, Light, Optics and Sound.

4. Mapping Course Outcomes with Program Outcomes

Relationship : 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	**Problem Analysis**	**Design and Devlopment of Solutions**	**Engg. Tools, Experimentatn & Testing**	**Engg. Practices for Society,Sustain ability& Environment**	**Project Management**	**Life -long Learning**
CO 1	3	3	1	1	2	0	3
CO 2	3	3	1	1	2	0	2
CO 3	3	2	3	3	3	1	1
CO 4	2	2	2	3	1	1	1

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**M**	**Thr**	**CO**
1 UNIT NAME: ELECTROSTATICS	**12**	**8**	**CO1, CO2, CO3, CO4**
1.1 Coulomb's law, Electric field,			
1.2 Electric field Intensity, Electric lines of force and properties			
1.3 Electric potential, Definition of Absolute potential			
1.4, Potential difference, Potential of sphere,			
1.5 Potential of earth.			
1.6 Capacitance,			
1.7 Capacitors in Parallel Derivation of Expression			
1.8. Capacitor in series Derivation Of Expression			
2. UNIT NAME: CURRENT ELECTRICITY	**20**	**12**	**CO1, CO2, CO3, CO4**
2.1 Definition of Electric Current and its Unit, Ohm's Law, Resistance,			
2.2 Factors on which resistance depends, Specific resistance. Effect of temperature on resistance Temperature coefficient of resistance,			
2.3 Resistances in Series and parallel			
2.4 EMF and Internal resistance of cell			
2.5 General Equation of ohm's law.			
2.6. Wheatstone's Network and Principle of Meter Bridge			
2.7 Principle of Potentiometer (Vα L) and Applications to compare EMF of given cells by single cell method and sum difference method			
2.8 Determination of Internal resistance of a cell using potentiometer.			
2.9 Electric Power and Electric Energy, KWh			
2.10 Calculation of Energy bills			
2.11 Heating Effect of Electric current. Joule's law.			
2.12 Applications in house hold appliances			
3. **UNIT NAME: ELECTROMAGNETISM AND EM INDUCTION**	**16**	**10**	**CO1, CO2, CO3, CO4**
3.1 Magnet, Magnetic field, Magnetic flux, and magnetic flux density and its unit			
3.2 Magnetic effect of Current, Oersted's Experiment, Right hand Thumb Rule, Biot Savart law			
3.3 Magnetic field at the center of the coil (no derivation), Magnetic field due to coil (Qualitative discussion only			
3.4 Electromagnet. Force acting on a current carrying conductor placed in magnetic field and expression (no derivation)			
3.5 Fleming's left-hand rule. Electromagnetic Induction. Faraday's Experiment			
3.6. Faraday's laws Lenz's law. Self-Induction and Mutual Induction.			
3.7 Transformer Principle.			
3.8 Step up and Step-down transformer.			
3.9 Induction Heating			
3.10 Induction heater and uses			

4. **UNIT NAME: LIGHT AND OPTICS**	**16**	**10**	**CO1, CO2, CO3, CO4**
4.1 Frequency Range of Infrared, ultraviolet and visible light and their uses			
4.2 Reflection, Refraction, Snell's law, refractive index.			
4.3 Refraction through glass slab and prism.			
4.4 Total Internal reflection applications in optical fibers.			
4.5 Advantages of optical fibers. LASER, sources and applications.			
4.6. Luminous Intensity, Intensity of Illumination			
4.7 Inverse square law of Illumination (No derivation)			
4.8 Principle of Photometry, X rays,			
4.9 Production of X Rays by Coolidge tube			
4.10 Properties and applications			
5. **UNIT NAME: SOUND**	**11**	**08**	**CO1, CO2, CO3, CO4**
5.1 Sound as longitudinal wave,wavelength,frequency,time period, amplitude,			
5.2 Free vibration force vibration,resonance, examples,			
5.3 Echo reverberation ,pitch loudeness,intensity of sound,			
5.4 Ultrasonic waves, Piezo electric effect, Principle of Production of ultra-sonics waves			
5.5 Application of Ultra sonics in finding depth of sea,			
5.6. Detection of flaws in metal, soldering, Drilling,			
5.7 Ultrasonic Cleaning			
5.8Ultrasound for medical purposes.(Just Uses)			

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	ELECTROSTATICS	8	12
2	CURRENT ELECTRICITY	12	20
3	ELECTROMAGNETISM AND EM INDUCTION	10	16
4	LIGHT AND OPTICS	10	16
5	SOUND	8	11
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS

No	Practicals	Marks
1.	Specific Resistance by Ammeter Voltmeter Method	25
2	Specific Resistance by Meter Bridge Method	25
3	To Verify the Series Law of Resistance by Meter Bridge Method	25
4	To Verify the Parallel Law of Resistance by Meter Bridge Method	25
5	To Compare the emf of two cells by single cell method	25
6	To find the internal resistance of a cell by Potentiometer Method	25
7	To find the velocity of sound by Resonance Tube method	25
8	To find the Refractive index	25
	Total (Average)	25

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	B G Dhande	Applied Physics of Polytechnics	Pune Vidyarthi Griha Prakashan
2	Bhandarkar	Applied Physics of Polytechnics	Vrinda publication
3	R K Gaur and S L Gupta	Engineering Physics	Dhanpat Rai & Sons Delhi
4	Dr. Vasudev R Bhagwat	A Text Book of Applied Physics for Polytechnics	Broadway Publishing House
5	B L Thereja	Engineering Technology	S. Chand

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Halliday D and Resnick	Physics Part I-II	Wiley Eastern Ltd.
2	Satish k. Gupta	ABC of Physics I&II	Modern Publisher
3	Saxena HC and Singh Prabhakar	Applied Physics Vol I & II	S. Chand Publisher

(GC203) ENVIRONMENTAL STUDIES

1. COURSE OBJECTIVE:

Environment is the nurturing force upon which we depend. It decides our well being, our health & quality of our life. The environment is deteriorating at an alarming rate due to increasing human activity and can be saved only by timely human action. The aim of Environmental studies is to sensitize the students towards the need to conserve & protect natural resources & biological support systems. With the aim to develop an attitude of concern for the environment the students will learn to choose environmentally friendly options for sustainable development and live in harmony with nature.

2. TEACHING AND EXAMINATION SCHEME :

Semester	**I**								
Course code & course title		**Periods/Week (in hours)**			**Total Credits**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(GC203) Environmental Studies		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		04	**-**	**-**	**64**	**75**	**25**	**-**	**-**	**100**

3. COURSE OUTCOMES:

GC203.CO1: Understand the role and importance of various elements of Environment.

GC203.CO2: Identify the concerns related to the natural resources, ecosystems, biodiversity, pollution and social issues of environment.

GC203.CO3: Develop sensitivity towards Environmental issues.

GC203.CO4: Co-relate causes affecting the environment & biodiversity.

4. Mapping Course Outcomes with Program Outcomes :

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimental &	Engg. Practices for Society,Sustainability	Project Management	Life -long Learning
CO1	2	1	1	0	3	2	2
CO2	2	1	1	0	3	2	2
CO3	1	1	1	0	3	2	2
CO4	1	1	2	0	3	2	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**			
Unit			**Mks**	**Thr**	**CO1, CO3, CO4**
UNIT 1.0 : Multidisciplinary Nature of Environmental Studies			**09**	**08**	
1.1 Environmental studies : Definition , Scope and Importance					

1.2 Need for Public Awareness			
1.3 Environment & Human Health			
1.4 Environmental Ethics			
1.5 Value Education			
1.6 From Unsustainable to Sustainable Development : Concept and Guidelines			
1.7 Concept of Environmental Audit (EA) Environment Impact Assessment (EIA)			
1.8 Ecological Foot Prints			
UNIT 2.0 : ECOSYSTEM AND BIODIVERSITY	**15**	**13**	**CO1, CO2, CO3, CO4**
2.1 Ecosystem 2.1.1Concept, Structure & functions of ecosystem (Function of producer, consumer and decomposer) 2.1.2 Food chain & Food web- Concept & Examples 2.1.3 Energy flow in Ecosystem 2.1.4 Ecological Pyramids (Inverted & Upright) Pyramid of Number, Biomass & Energy. 2.1.5 Ecological Succession (Primary & Secondary Succession) 2.1.6 Study of Ecosystem: characteristic features structure and functions) Terrestrial(Forest, Grassland, Desert) Aquatic(Pond, River & Ocean)			
2.2 Biodiversity 2.2.1 Definition of Biodiversity 2.2.2. Types of Diversity (Genetic, Species & Ecosystem) 2.2.3. Value of Biodiversity (Consumptive , Productive, Social ,Aesthetic Moral & Optional value) 2.2.4 India as a Mega- diversity Nation 2.2.5 Biogeographical classification of India 2.2.6 Extinct, Endangered, Threatened & Endemic Species -Examples (of India) 2.2.7 Threats to Biodiversity (Habitat loss, Poaching of Wild life & Man Wildlife Conflict) 2.2.8 Reasons for loss of Biodiversity 2.2.9 Conservation of Biodiversity (Insitu & Exsitu conservation)			
UNIT 3.0 : NATURAL RESOURCES	**18**	**15**	**CO1, CO2, CO3, CO4**
3.1 Forest Resource 3.1.1 Direct & Indirect value of Forest 3.1.2 Deforestation-causes & effects 3.1.3 Forest Management **3.2** Water Resource 3.2.1 Water as a scarce Resourc 3.2.2Use and over exploitation of surface and ground water 3.2.3 Need for Water Conservation			

3.2.4 Construction of dams- Benefits and draw backs (Rehabilitation & Resettlement of people) 3.2.5 Rain water Harvesting. 3.2.6 Watershed Management 3.2.7 Conflicts over water in India **3.3** Energy Resource 3.3.1 Renewable & Non-Renewable sources of Energy 3.3.2 Growing Energy Needs. 3.3.3 Alternate Source of Energy (Solar ,Wind, Bio, Geothermal, Hydro & Nuclear Energy)			
3.4 Food Resource 3.4.1 Sources of Food 3.4.2 World Food Problems (Undernourishment & Malnourishment) 3.4.3 Changes caused by agriculture & overgrazing 3.4.5 Effects of modern agriculture on environment (use of synthetic fertilizers & synthetic pesticides in agriculture) **3.5** Mineral Resource 3.5.1 Types of Minerals 3.5.2 Use & Overexploitation of Minerals 3.5.3 Environmental Impact of Mining. **3.6** Land Resource 3.6.1 Pattern of Land Utilization (In India and World) 3.6.2 Land Degradation – Causes & Control Measures			
UNIT 4.0 : ENVIRONMENTAL POLLUTION- Sources , Effects & Control Measures	**24**	**20**	
4.1 Air Pollution 4.1.1 Definition, sources of air pollution(Primary and Secondary air pollutants with examples) 4.1.2 Effects on human health, animals, plants & Materials 4.1.3 Control of Air Pollution. 4.1.4 Removal of Particulate matter 4.1.5 Principles & Application of Control Equipments (Gravity and Inertial Separators, Cyclones, Filters, Electrostatic precipitators, Wet scrubbers) 4.1.6 Removal of Gaseous Pollutants (Combustion, Adsorption, Absorption) 4.1.7 Global Issues Definition, Cause & effects of Green House effect & Global Warming. Ozone layer Depletion, Acid Rain.			**CO1, CO2, CO3, CO4**
4.6 Noise Pollution :-			

4.6.1 Definition. 4.6.2 Sources of Noise Pollution 4.6.3 Effects of Noise Pollution on Human health (Noise Induced hearing loss, Physiological & Psychological Effects) 4.6.4 Control of Noise Pollution.			
4.7. Nuclear Pollution / Radioactive Pollution:- 4.7.1 Definition 4.7.2. Sources of nuclear Pollution (Natural & Man made) 4.7.3. Effects of Nuclear Pollution 4.7.4. Control of Nuclear Pollution 4.7.5.Disposal of Nuclear waste (Low, Medium & High activity waste) 4.7.6 Nuclear Accidents & Holocaust – case study			
4.8 Solid Waste Pollution. Definition: Refuse, Garbage Sources of Solid waste Types of solid waste (MSW, HW, BMW & EW) Effects of Consumerism Segregation of Solid waste at source Treatment of MSW (Open dumping, Land filling, incineration & composting) Waste Utilization (Reuse, Reclaim & Recycle) Solid waste Management System – Flow sheet diagram **4.9** Role of an Individual in Prevention of Pollution.			
UNIT 5.0 : SOCIAL ISSUES & ENVIRONMENT	**09**	**08**	**CO2, CO3, CO4**
5.1 Environmental Legislation Article 47 & Article 51-A(g)of the constitution on Environment. 5.1.1 Protection Functions of Ministry of Environment and Forest Govt. of India Objectives & Functions of Central & state pollution Control Boards Environmental Protection Act. Air (Prevention & Control of Pollution) Act. Water (Preventation & Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Motor vehicle Act.			
5.2 Social Issues 5.2.1Women & Child Welfare 5.2.2 Role of IT in Environment & Human Health 5.2.3 AIDS 5.2.4 Population Growth & Variation among Nations 5.2.5 Human Rights			

COURSE DELIVERY:
The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**MULTI-DISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES**	08	09
2	**ECOSYSTEM AND BIODIVERSITY**	13	15
3	**NATURAL RESOURCES**	15	18
4	**ENVIRONMENTAL POLLUTION**	20	24
5	**SOCIAL ISSUES & ENVIRONMENT**	08	09
	Total	64	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Erach Bharucha	Textbook of Environmental Studies	Universities Press (India) Private Ltd.
2	Dr. Suresh K. Dhameja	Environmental studies	S.K. Kataria & Sons
3	Y. Anjaneyulu	Introduction to Environmental Science	B.S Publications
4	S. Deswal & A. Deswal	A Basic Cource in Environmental Studies	Dhanpat Rai & Co.
5	P. Meenakshi	Elements of Environmental Science and Engineering	Prentice Hall of India (PHI)

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Pandya and Camy	Environmental Engineering	Tata McGraw Hill
2	Asthana D.K. and Asthana Meera	Environmental Problems and Solutions	S. Chand & Co.
3	Gilbert M. Masters	Introduction to Environmental Engineering and Science.	Prentice Hall of India (PHI)
4.	M N Rao & HVN Rao	Air Pollution	Tata McGraw Hill

FIELD ACTIVITIES (OPTIONAL)

1. Visit to Selaulim/ Anjunem Dam.
2. Visit to show Hill cuttings, mining areas.
3. Visit to show Rain water harvesting project / Vermicomposting plant / watershed management project. (Krishi Vigyan Kendra – Old Goa)
4. Visit to Garbage treatment plant.

*__On Completion of visit Report to be submitted.__

GC204) ENGINEERING DRAWING

1. Course Objective: Drawing is a graphical language of engineering field. Engineering technician irrespective of his/her field of operation in an industry is expected to possess a thorough understanding of drawing, which includes visualization of objects and the proficiency in reading and interpreting a wide variety of engineering drawings. It is the skill, which translates an engineering idea into lines and dimensions. Besides this he/she is also expected to possess a certain degree of drafting skills- depending upon his/her job.

2. **TEACHING AND EXAMINATION SCHEME:**

Course Code & Course Title	**Periods/ Week (In Hours)**			**Total Hours**	**Examination Scheme**				
					Theory Marks		**Practical Marks**		**Total Marks**
(GC204)	**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
Engineering Drawing	-	-	5	80	-	-	50	50	**100**

3. Course Outcomes:

On successful completion of the course the student will be able to:
GC204.CO1: Understand different methods of projection, sectioning of solids and development of surfaces.
GC204.CO2: Select the relevant procedural methods for preparing Engineering Drawing.
GC204.CO3: Draw Isometric views and orthographic projection of full and sectioned objects and development of surfaces
GC204.CO4: Examine and Interpret Engineering Drawings

3. Mapping Course Outcomes with Program Outcomes

Relationship- 1:Slight (low) 2:Moderate(Medium) 3: Substantial(High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	Basic and discipline specific knowledge	Problem analysis	Design & development of solution	Engg tools exptn and & testing	Engg Practice for society,sustainability and environment	Project management	Lifelong learning
CO1	3	2	1	3	1	1	1
CO2	3	1	2	3	1	2	2
CO3	2	2	2	3	1	2	2
CO4	2	2	2	2	1	2	3

5. Detailed course Contents/ Micro lesson plan

M=Marks Prhr= Teaching Hrs CO=Course Outcomes

Unit	Mark	Prhr	CO
1. Introduction 1.1 Importance of engineering drawing as a means of communication. 1.2 Planning of drawing sheet as per SP 46(latest revision) 1.3 Indian standard practices of laying out and folding of drawing 1.4 Different types of lines used in engineering drawing. 1.5 Importance of scale in Engineering Drawings. 1.6 Lettering 1.7 Methods of dimensioning, Dimensioning terms and notation -use of SP 46(latest revision), General rules for dimensioning, Dimensioning of cylinder, holes, arcs of circle, narrow space, angles, countersunk hole, taper.	05	05	CO2
2. Geometrical construction & Engineering Curves 2.1Construction of an Equilateral and Isosceles triangle, Square, Regular pentagon & Regular hexagon given length of a side using general method of construction 2.2Construction of Engineering curves like: Ellipse- by focus & directrix method and arcs of circles method Parabola- by focus & directrix method and rectangle method Hyperbola- Focus and directrix method 2.3 Cycloid- by generating circle rolling on a straight line 2.4 Involutes of a circle. 2.5 Draw normal & tangents to the above curves from given point on the curve Curves to be explained with the help of applications.	05	15	CO2
3. Orthographic projection 3.1 Definitions of various terms associated with orthographic projections. Planes of projections. Concept of Quadrants. 3.2 First and third angle method of projection.	18	30	CO1, CO2, CO3, CO4

3.3 Projection of points 3.4Projection of lines Parallel to both Principal planes Parallel to one and Perpendicular to other Principal plane. Inclined to one plane and parallel to other plane. 3.5 Projection of planes:Triangle, Square, circle when inclined to one principal plane & perpendicular to other plane. 3.6 Projection of solids: Cylinder, cone. Right regular solids such as (i) Prism: Square& Pentagonal (ii) Pyramid: Triangular & Square. Projections of above mentioned solids when axis is inclined to one principal plane & Parallel to other principal plane. 3.7 Conversion of simple pictorial views into orthographic views. *Problems where one end of the line is in one quadrant & other end in other quadrant and traces are to be excluded.* *Problems where apparent shape of plane are given, true shape & slope angle are to be drawn are excluded.*			
4. Section of solids Development of lateral surfaces **4.1** Concept of sectioning planes, Auxiliary planes and true shape of section. 4.2 Drawing section of solids like square prism, square pyramid, cylinder and cone with sectioning plane inclined to one principal plane and Perpendicular to the other principal plane (Axis of solid perpendicular to one principal plane and parallel to the other) 4.3Concept and importance of surface development in the engineering field. Methods of development of surfaces-Radial & Parallel line method. Development of surfaces for solids like square prism, square pyramid, cylinder and cone. *Development of solids standing on its base & cut by a plane inclined to HP and perpendicular to VP is also included.*	10	15	CO1, CO3

5. Isometric Views 5.1Difference between Isometric projection & Isometric view. 5.2Isometric view of geometrical planes and solids. 5.3Conversion of orthographic views into isometric views. 5.4Construction of Isometric view for any real object.	12	15	CO3, CO4
Total	50	80	

6. Course Delivery:
The course will be delivered through Practicals, class room interaction and exercises.

7. Specification table for Practical/Macro Lesson Plan

Unit No.	**Unit**	**No. Of Practical Hrs.**	**Marks**
1	Introduction	05	05
2	Geometrical construction & Engineering Curves	15	05
3	Orthographic projection	30	18
4	Section of solids Development of lateral surfaces	15	10
5	Isometric Views	15	12
	Total	**80**	**50**

8. Specification table for Practical/ Termwork:

No.	Practical
1	TYPES OF LINES, LETTERING, DIMENSIONING.
2	GEOMETRICAL CONSTRUCTIONS
3	ENGINEERING CURVES
4	PROJECTION OF POINTS & LINES
5	PROJECTION OF PLANES
6	PROJECTIONS OF SOLIDS
7	ORTHOGRAPHIC PROJECTIONS (First angle)
8	ORTHOGRAPHIC PROJECTIONS(Third angle)
9	SECTIONS AND DEVELOPMENT OF SOLIDS
10	ISOMETRIC VIEWS

9. Learning Resources:

Text Books

S.No.	Author	Title	Publisher
1	N.D. Bhatt	Engineering Drawing	Charoter Publisher,Anand
2.	R. K. Dhawan	Engineering Drawing	S. Chand Publishing
3.	K.R. Gopalakrishna	Engineering Drawing	Subhas Publications.

Reference Books only for further study

S.No.	Author	Title	Publisher
1	P.S. Gill	Geometrical Drawing	Kataria & Sons
2	P.S. Gill	Machine Drawing	Kataria & Sons
3	N.D. Bhatt	Machine Drawing	Charoter Publisher,Anand

Indian and International codes needed

S.No.	Author	Title	Publisher
1.	BIS, India	SP 46. (Latest revision).	BIS, India

(GC205) ENGINEERING MATERIALS

1. COURSE OBJECTIVE:

This course is introduced with an objective of providing knowledge to students regarding properties and composition of materials for engineering applications and enabling them to make comparative study of materials while selecting the appropriate material for various engineering applications.

2. TEACHING AND EXAMINATION SCHEME

Semester	II								
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme			
						Theory Marks		Practical Marks		Total Marks
		L	T	P	H	TH	TM	TW	PR/OR	
(GC205) ENGINEERING MATERIALS		3	--	--	48	75	25	--	--	100

3.COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

GC205.CO1: List out the properties of materials used in engineering applications.

GC205.CO2: Explain the composition and properties of various engineering materials.

GC205.CO3: Classify materials based on composition and properties.

GC205.CO4: Select the appropriate material/s for the given engineering application/s.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentatn & Testing	Engg. Practices for Society,Sustain ability & Environment	Project Management	Life -long Learning
CO1	3	2	0	0	0	0	1
CO2	3	2	1	0	0	0	1
CO3	2	2	2	1	1	0	1
CO4	2	3	3	2	1	0	1

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			M	Thr	CO
1 INTRODUCTION TO ENGINEERING MATERIALS			08	04	
1.1 Classification of Materials: Metal and Non-metal, Ferrous Metal & Non-ferrous Metals, Differences between Metals & Non-metals					CO1, CO2, CO3,
1.2 Properties of Materials:(Note: Properties to be explained with relevant					

examples.) 1.2.1 Physical properties – Melting point, Freezing point, Boiling point, Density, Linear co-efficient of expansion, Thermal conductivity, Electrical resistivity			**CO4**
1.2.2 Mechanical properties – Strength, Elasticity, Plasticity, Ductility, Malleability, Toughness, Brittleness, Hardness, Fatigue, Creep.			
1.2.3 Electrical properties – Resistivity, Conductivity, Temperature coefficient of resistance, Dielectric strength, Thermo-electricity, Super conductivity			
1.2.4 Magnetic properties – Permeability and Coercive force			
1.2.5 Chemical properties - Corrosion resistance and Chemical composition			
2 FERROUS & NON-FERROUS METALS & ITS ALLOYS	**18**	**12**	
2.1 FERROUS ALLOYS: 1.1.1 Low carbon steel, Medium carbon steel, High carbon steel, their carbon percentage, properties & uses. 1.1.2 Cast iron: grey cast iron, white cast iron, their properties & uses 1.1.3 Alloy steels: Constituents of alloy steels such as Phosphorous, Sulphur, Silicon, Manganese and their effect on properties of materials. 1.1.4 Stainless steel, Nickel-chromium-molybdenum steel, its properties & uses. 1.1.5 Tool steel – composition, HSS, properties & uses			**CO1, CO2, CO3, CO4**
2.2 NON-FERROUS METALS & ALLOYS: 2.2.1 Aluminium – Properties & uses 2.2.2 Aluminium alloys – constituents of alloy & their effect on properties of metal 2.2.3 Properties & uses of Duralumin, Y-alloy and Al-Si alloy 2.2.4 Copper – Properties & uses. 2.2.5 Copper alloys – Constituents of alloy & their effect on properties of metal 2.2.6 Properties & uses of Copper – Zinc alloys such as Muntz metal, manganese, bronze, Copper-Tin alloys such as Bronze, Copper-Aluminium alloys such as Aluminium bronzes. 2.2.7 Lead and its hazard to the environment			**CO1, CO2, CO3, CO4**
3 NON-METALLIC MATERIALS	**18**	**10**	
3.1 CONSTRUCTION MATERIALS 3.1.1 Classification of rocks, common building stones and their applications. 3.1.2 Cement: Types of cement, composition and applications 3.1.3 Bricks: Composition, properties, Classification, Special bricks- Refractory and fly-ash bricks and uses 3.1.4 Clay: Types, products of clay- tiles and pipes 3.1.5 Sand- sources – river, crushed aggregates, applications			**CO1, CO2, CO3, CO4**
3.2 ENGINEERING CERAMICS 3.2.1 Refractories: Desirable properties, Properties and Applications of Fire clay and Silica Refractory, Difference between acid, basic & neutral refractories 3.2.2 Glass: Properties & uses of soda glass, borosilicate glass and fibre glass			**CO1, CO2, CO3, CO4**

3.2.3 Glass wool: Composition, properties & uses 3.2.4 Timber: Common varieties of timber, uses of wood products, veneer and plywood 3.2.5 Natural & Synthetic abrasive materials: Introduction, Properties & uses			
4 CONDUCTOR, SEMI -CONDUCTOR, AND INSULATING MATERIALS	**16**	**12**	**CO1, CO2, CO3, CO4**
4.1 Classification of Materials as Conductor, Semiconductor and Insulating materials			
4.2 Conductor Material: 4.2.1 High conductivity materials: Copper, Aluminium, Carbon, Silver, Lead & Tungsten, their properties as conducting materials and applications. 4.2.2 High resistivity materials: nichrome, constantan, manganin and their applications			
4.3 Insulating Materials: Introduction and Characteristics of Good Insulating materials 4.3.1 Solid Insulating materials- wood, paper, rubber, mica, glass fibre, porcelain, PVC, resins, their characteristics as insulating materials and applications			
4.4 Semiconductor Materials: Silicon & Germanium, their specifications as semiconductor material and uses.			
Unit 5 MAGNETIC & COMPOSITE MATERIALS	**15**	**10**	
5.1 Magnetic Materials: Classification as Diamagnetic, Paramagnetic, Ferromagnetic, List of these materials and their applications			**CO1, CO2, CO3, CO4**
5.2 Composite Materials**:** metal matrix, ceramic matrix and polymer matrix composites, types of reinforcement materials and their applications			
5.3 Paints & Lubricants: 5.3.1 Classification: oil based and polymer based paints 5.3.2 Constituents of Paints – resin, binder, pigment, additives, solvents 5.3.3 Lubricants – Functions of lubricants, Types of Lubricants**,** Composition and Applications			
Total	**75**	**48**	

6. COURSE DELIVERY: The Course will be delivered through lectures and class room interactions

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	**Unit Name**	**Number of lectures (hrs)**	**Marks**
1	Introduction to Engineering Materials	04	08
2	Ferrous & Non-Ferrous Metals & its alloys	12	18
3	Non-Metallic Materials	10	18
4	Conductor, Semi-Conductor, & Insulating Materials	12	16
5	Magnetic & Composite Materials	10	15
		48	**75**

8. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	R.S. Khurmi	Material Science	S. Chand
2	R. Srinivasan	Engineering Materials & Metallurgy	Tata McGraw Hill
3	TTTI Madras	Electrical Engineering Materials	McGraw Hill Education, 2004
4	S. K. Hajra Choudhury	Material Science and Processes	Indian book distribution
5	P. C. Varghese	Building Materials	PHI
6	J. B. Gupta	Electrical and Electronic Engineering Materials	Katson

(SB301) BASIC SHIP THEORY I

1. COURSE OBJECTIVES: The theory course content is framed to impart knowledge to students regarding the general aspects of ship geometry, stability and numerical methods of calculating various ship forms and hydrostatic aspects. The practical content will enable the students to acquire the desired competency to prepare plan and section drawings of a ship from a given table of offsets, acquaint himself with numerical rules used in the ship related calculations and experience the calculation of fundamental hydrostatic particulars.

2. PRE-REQUISITES: Knowledge of Maths and Physics.

3. TEACHING AND EXAMINATION SCHEME

Semester	**III**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(SB301) BASIC SHIP THEORY I		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**0**	**3**	**96**	**75**	**25**	**50**	**-**	**150**

4.COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. List and illustrate the nomenclature of floating bodies.
2. Apply the concept of mechanics of floating bodies to derive ship curves
3. Solve problems related to mechanics of floating bodies.
4. Prepare plans of ship geometry and hydrostatic properties.

5. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	2	1	1	1	2	2	2	1	1
CO2	3	2	2	1	2	1	2	3	-
CO3	3	3	2	2	1	2	2	2	-
CO4	3	3	2	3	2	2	2	3	-

Relationship : Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

Unit	**Marks**	**Course Outcomes**
1 INTRODUCTION TO SHIPS		
1.1 TYPES OF SHIPS 1.1.1 Features and functions of cargo ships (General Cargo Ship, Tankers, Container Ships, Bulk Carriers).	12	CO1,CO2, CO3,CO4

1.1.2 Features and functions of Roll-on Roll-off Ships.		
1.1.3 Features and functions of passenger vessels.		
1.1.4 Features and functions of small craft (Hydrofoil, Hovercraft, Catamaran, SWATH, Planing Craft)		
1.1.5 Features and functions of sea going vessels, inland vessels, Fishing Trawlers, Barges, Dredgers, Tugs, LPG Carriers.		
1.2 PRINCIPAL DIMENSIONS AND FORM COEFFICIENTS.		
1.3 PRINCIPLES OF FLOATATION		
1.3.1 Laws of floatation		
1.3.2 Motions of a ship.		
1.4LINES PLAN		
1.4.1 Hull form, Fairing of lines, table of offsets.		
2 INTEGRATION RULES		CO1,CO2, CO3.
2.1 Simpson's rule, Trapezoidal rule, Tchebycheff's rule.	15	
2.2 Application of integration rules in determining areas, volumes, centroids, first moments and moment of inertia of waterplanes of ships.		
3 SMALL ANGLE STABILITY		
3.1 Types of equilibrium. Initial stability: - Heeling and righting moments.	18	CO1,CO2, CO3,CO4
3.2 Statical stability curve-Range of stability, initial GM, maximum GZ, angle of vanishing stability, Point of inflexions. Down-flooding angle.		
3.3 Effect of various factors on stability-Calculations of free surface effect.		
3.4 Longitudinal stability and trim.		
4 INCLINING TEST		
4.1 Effect of shifting of weights, addition, removal and suspended weights on centre of gravity.	12	CO1,CO2, CO3.
4.2 Purpose and procedure of inclining experiment. Determination of center of gravity – Inclining experiment. Precautions in conduct of inclining experiment.		
5 BONJEAN AND HYDROSTATIC CURVES		
5.1 Sectional area curve, Bonjean curve and hydrostatic curves	18	CO1,CO2, CO3,CO4
5.2 Determination of volume of displacement, LCB, VCB from Bonjean curves.		
5.3 Determination of volume of VCB/KB, KM, LCF, LCB, CB, CP, CVP, CM, CWP, MCT, TPC and displacement curves		
Total	**75**	

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Introduction to Ships	**07**	**12**
2	Integration rules	**10**	**15**
3	Small Angle Stability	**12**	**18**
4	Inclining Test	**07**	**12**
5	Bonjean and hydrostatic curves	**12**	**18**
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Unit	Practical	Marks	Course outcomes
1	1	Lines plan drawing – Main particulars, Table of offsets and body plan, half-breadth plan, profile view (buttock lines), diagonal.	20	CO3,CO4
2	1	Fairing of lines and preparation of faired offset table.	10	
3	1	Lines plan drawing -Use of ship design software	-	
4	2	Immersed cross sectional area and vertical moment calculation, and development of Bonjean curves	10	
5	3	Media demonstration on stability concepts (Videos)	-	
6	4	Bonjean calculation & Bonjean curves: Use of Excel sheets.	10	
		Total	50	

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Derett, D. R	Ship Stability for Masters and Mates	Stanford Maritime
2	Rawson, K.J. and Tupper E.	Basic Ship Theory, Vol I & II	Longman
3	Munro-Smith	Ships and Naval Architecture	Institute of Marine Engineers

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	John P. Comstock	Principles of Naval Architecture	SNAME
2	Baxter, B.	Naval Architecture Examples and Theory	Charles Griffin & Co
3	Thomas, Gillmer C.	Introduction to Naval Architecture	E & F.N. Spon
4	Munro – Smith, R	Naval Architecture for the Merchant Navy Exams	Technical Press

5	Stokoe, E.A.	Reed's Naval Architecture for Marine Engineers	Thomas Reed Publisher Ltd.)
6	Muckle. W	Naval Architecture for Maritime Engineers	Butter Worths
7	Hogg, Robert S.	Naval Architecture and Ship Construction	Institute of Maritime Engineers

(SB 302) SHOP FLOOR PRACTICE

1. COURSE OBJECTIVES: To develop different types of skills leading to the achievement of competency – To understand the construction, working operations on different machines used in shipbuilding yards and on ships.As a supervisor in Shipbuilding Engineering Industry, student should know the working principle of various machines used by the Industries, their work range, tools used for different operations. Enough practical exposure is also given to develop minimum skill to perform various operations. The student should be able to select the proper machine and proper tool for a particular operation. The student should be able to perform a given operation on a particular machine and take care of safety of men, machine and tools.

2. PRE-REQUISITES: Knowledge of Basic Engineering Skills.

3. TEACHING AND EXAMINATION SCHEME:

Semester	**III**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(SB 302) SHOP FLOOR PRACTICE		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**0**	**3**	**96**	**75**	**25**	**50**	**-**	**150**

4. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1.Identify the different types of machining processes and machines.

2. Describe the tool geometry and principles associated with basic machining operations.

3. Sketch various machine tools and accessories.

4. Select the proper machines and cutting tools for performing operation on a job.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	2	1	1	2	2	2	1	1	2
CO2	3	2	1	2	1	2	2	-	2
CO3	2	2	2	2	1	2	1	-	1
CO4	2	2	2	2	2	2	1	2	3

Relationship : Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

	MARKS	**COURSE OUTCOMES**
UNIT 1:LATHE MACHINE		
1.1 Introduction, different parts of Lathe and its specification,	15	CO1,CO2 CO3,CO4
1.2 Methods of taper-turning – their advantages and limitations.		
1.3 Thread cutting on lathe,		

1.4 Accessories used on lathe,		
1.5 Different tool materials and cutting fluid.		
UNIT 2: BORING AND DRILLING MACHINES		
2.1 Introduction and Types of Boring machines,	20	CO1,CO2 CO3,CO4
2.1.1 Horizontal Boring machine,		
2.1.2 Horizontal boring machine operations,		
2.1.3 Boring tool mountings for horizontal boring machine.		
2.2 Introduction, types of drilling machines.		
2.2.1 Construction and working of Pillar drilling machine & Radial drilling machine.		
2.2.2 Work holding devices on drilling machine,		
2.2.3 Tool holding devices on drilling machine.		
2.2.4 Operation of drilling machine.		
2.2.5 Tools used on drilling machine		
UNIT 3: MILLING AND SHAPING MACHINE		
3.1 Introduction and Types of milling machines.	18	CO1,CO2 CO3,CO4
3.1.1 Operation carried out on milling machine.		
3.1.2 Types of milling cutters: Plain, Side, Metal Slitting Saw, Angle Milling Cutter, End Mill		
3.1.3 Milling machine attachment: Vertical, Universal, High Speed, Dividing Head Attachment.		
3.2 Introduction and Types of shaping machine.		
3.2.1 Main parts of standard Shaper and their functions		
3.2.2 Shaper operations.		
UNIT 4: BENDING AND PRESS WORK		
4.1 Introduction to Bending, Nomenclature of Bending.	16	CO1,CO2 CO3,CO4
4.1.1 V Bending, Edge Bending, U Bending		
4.1.2 Spring Back in Bending		
4.2 Introduction and Types of presses.		
4.2.1 Construction and working of fly press.		
4.2.2 Power press-driving mechanisms.		
UNIT 5: NC AND CNC MACHINES		

5.1 Introduction and Classification of NC machines.	06	CO1,CO2 CO3
5.2 Advantages and its Limitations		
5.3 Principle of Operation of a NC Machine Tool		
5.4 NC/CNC/DNC System		
5.5 Introduction to G codes & M Codes		
Total	**75**	-

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies.

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Lathe Machine	10	15
2	Boring and Drilling Machines	12	20
3	Milling and Shaping Machine	12	18
4	Bending machine and Press work	10	16
5	NC and CNC Machines	04	06
	Total	**48**	**75**

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks	COURSE OUTCOMES
1.	Introduction to various machinery.		CO1,CO2 CO3,CO4
2.	One job involving facing, plain turning, step turning, taper turning and external threading.		
3.	One job involving internal 'V' threading (Demonstration).		
4.	One job involving Drilling operation.		
5.	One job involving Shaping & Milling operation.		
6.	One job in Pipe Bending (Demonstration).		
7.	One job involving Press Operation (Demonstration).		
8.	Demonstration of CNC Machines		
	Total	50	

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	S.K.Hajra Choudhary, S.K Bose & A.K.Aajra Choudhary.	Elements of workshop Technology Vol-II	Media Promotions & Publishers Pvt. Ltd.
2	Suresh Dalala.	Manufacturing science & Technology Vol-II	Umesh Publications
3	K.N. Gupta & J.P. Kaushish	Workshop Technology Vol-II	New Heights Publishers

4	H.S. Bawa	Workshop technology Vol-II	Tata Mcgraw Hill Publication Company Ltd.

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Jhon A Schey	Introduction to Manufacturing Processes	McGraw Hills International
2	B. S. Pabla and M Adithan	CNC Machines	New Age International Publishers

(SB 303) INTRODUCTION TO THERMODYNAMICS

1. COURSE OBJECTIVES: The course content is designed for students to familiarize with the science of thermodynamic processes and its application. A general survey carried out to determine the competencies required by a diploma in Shipbuilding Engineering student revealed that the student should have an elementary knowledge of Thermodynamics. The knowledge that he acquires in this subject is essential to a student of Marine Engineering. In view of this emphasis has been laid on topics like gas processes, IC Engines, properties of steam, heat transfer and introduction to refrigeration. This subject thus provides the required cognitive skills to the student to take further courses in Marine Engineering.

2. PRE-REQUISITES: Engineering Maths-I, Applied Physics I and Applied Physics II

3. TEACHING AND EXAMINATION SCHEME

Semester	**III**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
SB 303 Introduction to thermodynamics		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**0**	**1**	**64**	**75**	**25**	**25**	**-**	**125**

4.COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. List the terms related to thermodynamics.
2. Explain the various thermal processes.
3. Sketch the various thermal processes and cycles.
4. Solve the problems related to thermal processes.

5. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	2	1	1	1	1	1	1	-	2
CO2	3	1	1	1	1	1	2	-	2
CO3	3	2	2	-	-	1	2	-	2
CO4	3	3	2	-	1	1	2	-	1

Relationship : Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

Unit	Marks	Course Outcomes
Unit 1. **Basic concepts of thermodynamics**		
1.1 Introduction, working substance or medium, system, state, properties of a substance process and cycle	**15**	CO1,CO2,CO3
1.2 System of units, units of pressure, units of volume, units of temperature, units of work & power, units of energy.		CO1,CO2.
1.3 Law of thermodynamics, Zeroth law of thermodynamics, first law of thermodynamics & second law of thermodynamics		CO1,CO2,CO3
1.4 Specific heat, perfect gas laws, characteristic equation for a perfect gas		CO1,CO2,CO3
1.5 Basic concepts of heat transfer, Heat transfer by conduction, Convection and radiation.		CO1,CO2,CO3
1.6 Fourier law of heat by conduction		CO2,CO3,CO4.
Unit 2 Gas Processes		
2.1 • Thermodynamic processes of gases, constant volume process, Processes on P-V diagram. Constant pressure process, Constant temperature process. Calculations of basic thermodynamic properties, work done and heat transferred.	15	CO1,CO2,CO3, CO4
2.2 Adiabatic process. Calculations of work done and heat transferred.		CO2,CO3,CO4
Unit 3 : Internal Combustion Engines		
3.1 • Introduction to air standard cycles – Otto cycle, Diesel cycle, Dual cycle. Representation on PV diagram.	18	CO1,CO2,CO3
3.2 Swept volume, compression ratio, volumetric efficiency, and cubic capacity.		CO1,CO2,CO3.
3.3. Functions of various engine systems of diesel engine		CO1,CO2.
3.4 Working of two and four stroke diesel engine, comparison of two stroke and four stroke diesel Engine.		CO1,CO2,CO3.
3.5. Indicated power and brake power calculation. Mechanical efficiency and Brake thermal efficiency calculation for single acting engines.		CO3,CO4
Unit 4. Properties of steam		
4.1 Introduction, Formation of steam at constant pressure, effect of pressure on boiling point of water.	12	CO1,CO2,CO3
4.2 Saturated steam, dry saturated steam, superheated steam		CO1,CO2,CO3
4.3 Dryness fraction of saturated steam, Sensible heat, latent heat of vaporization.		CO2.
4.4 Elementary problems to determine the properties of steam.		CO3,CO4.
4.5 Application of steam on ships.		CO1
Unit 5 Refrigeration cycles		
5.1 Vapor Compression refrigeration cycle	15	CO1,CO2,CO3

5.2 Introduction to components and their functions		CO1,CO2.
5.3 Refrigerating effect, Coefficient of performance, Refrigeration capacity.		CO2.
5.4 Refrigerants, harmful effects of refrigerants on environment		CO1,CO2.
5.5 Application of refrigeration on ships		CO1
5.6Representation on P-H and T-S chart, Calculations for COP and capacity (for vapour compression cycle with 100% dry vapour entering the compressor and without subcooling).		CO3,CO4
Total	**75**	

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No.	Unit	Number of lectures	Marks
1	Basic Concepts of Thermodynamics	10	15
2	Gas Processes	10	15
3	Internal Combustion Engines	12	18
4	Properties of Steam	08	12
5	Refrigeration Cycles	08	15
		48	**75**

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No.	Practical	Marks	COURSE OUTCOMES
1	Study of different parts of IC engines		CO1,CO2,CO3, CO4
2	Calculation of indicated power, brake power and mechanical efficiency.		
3	Determining the properties of steam using steam table		
4	Study on the elements of heat transfer		
5	Determination of C.O.P of vapour compression refrigeration system.		
	Total	**25**	

10 . LEARNING RESOURCES

Text Books

Sr.No.	Author	Title of book	Publication
1	S-G Patel and Karamchandani	Elements of heat engines Vol. I	Acharya Publication
2	P.L Ballaney	Thermal Engineering	Khanna Publication
3	P.K. Nag	Engineering Thermodynamics	Tata McGraw Hill

Reference Books for further study

Sr.No.	Author	Title of book	Publication
1	Domkundwar	Heat and Mass transfer	DhanpatRai Publication
2	C. P. Arora	Refrigeration and Air-conditioning	Tata McGraw Hill

(CC301) ENGINEERING MECHANICS

3. COURSE OBJECTIVES:

The students will be able to acquire knowledge of Engineering Mechanics is imperative in the analysis of static or dynamic force systems. The related concepts find extensive applications in the analysis of machine elements, fluids, structures, and every engineering problem that involves force or motion. The subject is a basis of myriads of higher-level subjects like Hydraulics, Strength of Materials, Theory of Machines and Machine Design, and practically there is no branch of engineering where the subject renders no scope.

2. TEACHING AND EXAMINATION SCHEME

Semester	III									
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme				
						Theory Marks		Practical Marks		Total Marks
		L	T	P	H	TH	TM	TW	PR/OR	
(CC301) Engineering Mechanics		3	1	1	80	75	25	25	-	125

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CC301CO1: Define various force systems, Equilibrium, centre of gravity, friction & dynamics.

CC301CO2: Explain methods to determine unknown reactions, forces, velocities and accelerations, Centroid, centre of gravity, friction machine efficiency, momentum & impulse.

CC301CO3: Solve problems on equilibrium of rigid bodies, centre of gravity, simple machines, friction, kinetics, momentum & impulse.

CC301CO4: Verify various laws & machine equations.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PS01	PSO2
CO1	3	1	-	-	-	-	-	1	2
CO2	3	2	1	1	-	1	-	1	2
CO3	3	3	2	1	-	1	2	-	2
CO4	3	3	1	2	1	2	2	-	-

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

Unit	Marks	Course Outcomes
1 Forces and Moments.		
1.1 FUNDAMENTALS Definition and unit of force, types of force, characteristics of force, effects of force, principle of transmissibility of force, resultant, equilibrant.	3	

1.2 FORCE SYSTEM System of forces, resolution and composition of forces (Resolution along x and y axis), resolution of force along a plane and perpendicular to it (only introduction, no problems to be framed.)	3	**CO1** **CO2** **CO3** **CO4**
1.3 RESULTANT Application of the principle of resolution to—1) find the resultant of a coplanar, concurrent force system, and 2) determine the missing force when the resultant is given.	6	
1.4 MOMENT Moment—Definition, unit, sign convention (clockwise moment +, anticlockwise -), couple and its characteristics. Avignon's theorem-- statement and application to compute the resultant in magnitude, direction and position in case of coplanar non-concurrent, and coplanar parallel force system.	6	
2 Equilibrium.		
2.1 FUNDAMENTALS Concept of equilibrium of forces, conditions of equilibrium of two forces, three forces, concurrent and non-concurrent force systems, concept and drawing of free body diagram for not more than three bodies.	3	
2.2 LAMI'S THEOREM Lami's theorem- statement and application to problems based on strings with suspended weights, and spheres.	6	**CO1** **CO2** **CO3** **CO4**
2.3 BEAMS Types of beams, types of support, types of loadings. Application of equilibrium conditions to the beams (Beams with simple or roller support at the two ends) with concentrated loading, UDL, partially applied UDL only.	6	
3 Centroid and Centre of gravity.		
Definition of centroid, centroid of rectangle, triangle, circle, semicircle, trapezium. Centroid of simple composite figures (including cut out sections.) Definition of centre of gravity. Centre of gravity of solids-- cone, sphere, cylinder, hemisphere, rectangular solid. Centre of gravity of simple composite solids (including cut out solid portions)	9	**CO1** **CO2** **CO3**
4 Friction and Simple machines		
4.1Friction—FUNDAMENTALS	3	**CO1**

Concept of friction, Coulomb's law of static friction, coefficient of friction, angle of friction, cone of friction, angle of repose.		**CO2** **CO3** **CO4**
4.2 APPLICATIONS Application of concept of friction to a block resting on horizontal or inclined plane, ladder friction.	6	
4.3 FUNDAMENTALS OF SIMPLE MACHINES Definition of simple machine, load, effort, mechanical advantage, velocity ratio, efficiency of machine, law of machine, reversibility of machine, self-locking machine. (Simple problems to be framed, no derivations.)	3	
4.4 STUDY OF SIMPLE MACHINES Simple axle and wheel, single purchase crab, double purchase crab, screw jack. (Simple problems to be framed, no derivation.)	6	
5 Dynamics		
5.1 KINETICS D' Alembert's principle and its applications to solve simple problems related to motion of lift, two bodies connected by a single string passing over a pulley, two string connected bodies of which one is lying on a horizontal plane (or on inclined plane) while the other suspended freely.	9	**CO1** **CO2** **CO3** **CO4**
5.2 MOMENTUM, IMPULSE AND IMPULSIVE FORCE Momentum, impulse and impulsive force—definition and unit. Law of conservation of momentum, simple problems based on momentum, impulse, impulsive force, and law of conservation of momentum.	6	
Total	**75**	

6. COURSE DELIVERY:

The course will be delivered through lectures, class room interactions, exercises and case studies.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Force and moment	10	18
2	Equilibrium	10	15
3	Centroid and centre of gravity	7	9
4	Friction and simple machines	12	18
5	Dynamics	9	15
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS.

Sr. No.	Practical (Minimum six to be conducted)	Marks
1.	Verification of Polygon law of forces.	
2.	Verification of Lami's theorem.	

3.	Determination of coefficient of friction (between any two different surfaces.)	
4.	Calculation of support reactions using Beam apparatus.	
5.	Determination of MA, VR, efficiency and law of machine for any three simple lifting machines.	
6.	Determination of angle of repose.	
7.	Determination of the resultant of coplanar and concurrent forces (Graphical analysis, one sheet.)	
8.	Determination of the resultant of coplanar, non-concurrent forces, and parallel forces. (Graphical analysis, one sheet.)	
No	**Class room Assignments**	
1	At least three assignments covering above units.	
No	**Tutorial Exercise**	
1	At least six problems on each of the units mentioned above.	
	Total	25

9. LEARNING RESOURCES

9.1 Text Books

S. No.	Author	Title of Books	Publishers
1	Dhade, Jamdar and Walawalkar.	Fundamentals of Applied Mechanics	Sarita Prakashan, Pune.
2	R.S.Khurmi	Applied Mechanics	S. Chand
3	A. R. Basu	Engineering Mechanics	Tata MacGraw Hill, Delhi.
4	Patel, Sanghavi and Thakur	Engineering Mechanics	Mahajan Publishing House, Ahmedabad.

9.2 Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Beer-Johnson	Engineering Mechanics	Tata McGraw Hill, Delhi.
2	Joseph F. Shegley	Vector Mechanics for Engineers Vol-1 and 2	Tata McGraw Hill, Delhi.

9.3Internet and Web Resources

S. No.	Author	Title of Books	Publishers
1	WizIQ	https://www.wiziq.com/tutorials/applied-mechanics	-
2	NPTEL	https://nptel.ac.in/courses/122102004	-

9.4 Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	CDs of experiments in Engineering Mechanics.	-
2	NPTEL	CDs of experiments in Engineering Mechanics.	-

(CC302) ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING

1. COURSE OBJECTIVES:

The students will be able to acquire knowledge about electrical and electronics engineering relevant to his job requirement of operation and maintenance in industry. The students will able to acquire basic knowledge of distribution of electrical energy including wiring & Earthing, use of various protective devices, construction & working of Transformer, Motors etc.

2. TEACHING AND EXAMINATION SCHEME

Semester	III								
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme			
						Theory Marks		Practical Marks		Total Marks
(CC302) ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING		L	T	P	H	TH	TM	TW	PR/OR	
		3	-	2	80	75	25	25	-	125

3.COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CC302CO1: Describe concepts in distribution of electrical power.

CC302CO2: Illustrate the construction and working of different types of electrical machines, electrical & electronic devices.

CC302CO3: Sketch simple electrical & electronic circuits.

CC302CO4: Compare different types of electrical machines and simple electronic circuits.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	2	-	-	1	1	-	-	1	2
CO2	2	1	-	1	1	1	2	1	2
CO3	2	-	1	-	-	1	-	1	1
CO4	2	1	1	1	1	2	2	1	1

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

Unit	Marks	Course Outcomes
1 Distribution of Electrical Energy		
1.1 Voltage levels in the various stages in the flow of electrical power from 110KV substation to 11KV/440V distribution transformer (using single line diagram only). Voltage levels for commercial and domestic use.	**15**	**CO1 CO3**
1.2 Features of Overhead and underground distribution systems and their comparison		
1.3 Features of Conduit wiring system- surface and concealed, its advantages and disadvantages.		

1.4Definition of Earthing, its necessity. Types of Earth electrodes—Pipe and Plate electrode. Methods of reducing earth resistance.		
2 Cables, Switching and Protective Devices		
2.1 Construction of three phase PVC insulated power cables. Specifications of PVC cables. Colour codes of single phase and three phase PVC cables. Method of laying underground cables.	18	**CO1** **CO2** **CO3**
2.2 Fuses- Construction and Applications of Rewirable fuses and HRC fuses. Functions and symbols of Switch-Fuse Unit, Fuse-switch Unit, Contactors, MCB, MCCB and ELCB.		
2.3 Construction and operation of a simple electromagnetic relay and limit switches.		
3 Transformers		
3.1 Principle of operation and basic construction of a single-phase transformer (core and winding only). Comparison between core type & shell type arrangement .EMF equation (no derivation and no numerical).	6	**CO1** **CO2** **CO3**
3.2 Losses in a transformer, efficiency and concept & significance of voltage regulation (no derivation and no numerical). Significance of KVA Rating of transformer.		
4 DC and AC Motors		
4.1 Working principle of DC motors, main parts of DC motor and their functions, Classification of DC motors (shunt, series and compound and their applications). Necessity of a starter for DC motors (No study of starters). Methods of reversal of direction of rotation of DC shunt and series motor. Methods of Speed control for DC shunt motors	18	**CO1** **CO2** **CO4**
4.2 Principle of operation of three phase induction motor. Main parts of three phase squirrel cage & Slip Ring Induction motors. Applications of induction motors. Necessity of starter, Names of starters used, reversal of direction of rotation.		
4.3 Working principle of an alternator.		
5 Basic Electronic Devices & Logic Gates		
5.1Semiconductor theory-Construction of Intrinsic and extrinsic semiconductor, P and N type semiconductors, working principle of Diode, diode V-I characteristics,	15	**CO2** **CO3** **CO4**
5.2 Full wave centre-tap and bridge rectifiers- circuit diagram, operation and waveforms, capacitor filter to reduce ripple voltage.		
5.3 Transistor -NPN and PNP, construction, symbol and operation. Transistor CE Amplifier-circuit diagram and operation using waveforms only. Applications of transistors (naming only)		
5.4 Binary number system, Symbols and Truth Tables of AND, OR, NOT, NAND, NOR, X-OR, X-NOR Gates		
Total	**75**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**Distribution of Electrical Energy**	11	15
2	**Cables, Switching and Protective Devices**	10	18

3	**Transformers**	04	09
4	**DC and AC Motors**	12	18
5	**Basic Electronic Devices & Logic Gates**	11	15
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS.

No	Practical (Any eight to be conducted)	Marks
1.	Identification of various components of a Diesel-Engine Generator set and study its operation.	
2.	Connection of a single-phase Transformer and Calculation of its efficiency & Voltage Regulation for different loads.	
3.	Simulation of fuse failure on any one primary phase of a 3-phase transformer and study its effect on the secondary voltages.	
4.	Connection and Starting of three phase induction motor using manual and automatic star delta starter	
5.	Connection, starting, running and speed control of Slip Ring induction motor	
6.	Calculations for selection of PVC cables for different currents.	
7.	Identification of Fuses, MCBs and ELCBs and study of operation of MCB and ELCB for different simulated faults.	
8.	Circuit assembly, measurement of input and output voltages and fault simulation and troubleshooting of Bridge and Centre-tap Rectifiers	
9.	Circuit assembly for ON/OFF control of single-phase loads such as lamps, home appliances, etc. using transistorized circuit and a Relay.	
10.	Verification of truth tables of Logic Gates	
11.	Mini Electronic project	
	Total	25

9. LEARNING RESOURCES

9.1Text Books

S. No.	Author	Title of Books	Publishers
1	B.L. Thereja.	Text book of Electrical Technology Vol I & Vol II	S Chand & Comp. Ltd
2	V.K. Mehta	Principles of Electronics Engineering (Revised Addition)	S Chand & Comp. Ltd

9.2 Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	J B Gupta	Course in Electrical Power (Latest Adddition)	S K Kataria & Sons.
2	B.L. Thereja.	Text book of Electrical Technology Vol IV	S Chand & Comp. Ltd

(MC 304) COMPUTER AIDED DRAFTING

1. COURSE OBJECTIVES:

The students will be able to acquire knowledge of CAD software for preparing 2D and 3D drawings. The market driven economy demands frequent changes in product design to suit the customer needs and the introduction of drafting and designing softwares in manufacturing has made the task of incorporating frequent changes as per requirement easier. This course will make the student capable of creating, editing and plotting quality CAD drawings using CAD software.

2. TEACHING AND EXAMINATION SCHEME

Semester III									
Course code & course title	Periods/Week (in hours)			Total Hours	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
(MC 304)	L	T	P	H	TH	TM	TW	PR/OR	
COMPUTER AIDED DRAFTING	-	-	4	64	-	-	50	50	100

3.COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

MC304CO1: Identify the various Toolbars and commands required for making 2D & 3D drawing.

MC304CO2: Interpret the use of Toolbars & commands in making 2D & 3D drawing.

MC304CO3: Select the correct toolbars & commands in making 2D & 3D Drawings.

MC304CO4: Develop 2D & 3D drawing in CAD environment.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	2	-	1	1	-	1	2	3	1
CO2	2	1	1	1	-	1	2	3	-
CO3	2	2	2	1	-	1	2	1	1
CO4	2	2	3	2	2	2	3	3	1

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS FOR TERM WORK & PRACTICALS

Unit	Marks	Course Outcomes
1 **Introduction and CAD Preliminaries.**	-	
1.1 Computer aided drafting concept.		
1.2 Hardware and various CAD software available		**CO1**

1.3 Components of a CAD software such as various toolbars in respective software's		**CO2**
1.4 File features Management: (like New file, Saving the file, Opening, Import and Export of file)		
1.5 Setting up the CAD environment		
2 Drawing, Editing, Modifying and organizing 2D drawing:	-	**CO1 CO2 CO3 CO4**
2.1 Drawing basic geometric elements		
2.2 All View Commands: (like Zoom all, Zoom Previous, Zoom Extents, zoom window, zoom real time, Zoom Dynamic, Zoom Pan)		
2.3 All Modify commands / Transformation commands: such as Mirror, Array, Move, Scale, Trim, chamfer, fillet.		
2.4 Concepts of layers and blocks.		
3 Dimensioning and Tolerancing	-	**CO1 CO2 CO3 CO4**
3.1 Dimensioning: Types of dimensioning, Linear, Horizontal, Vertical, Aligned, rotated, Baseline, continuous, diameter, radius, angular dimension, Leader.		
3.2 Dimension scale variable, adding geometric tolerances		
3.3 Editing dimensions		
3.4 Text styles: selecting font, size, arrows, alignment, line text, Multiline text.		
4 Solid Modelling	-	**CO1 CO2 CO3 CO4**
4.1 3D features such as understanding co-ordinate system, Viewing in 3D		
4.2 Concept of solid modelling		
4.3 Creating predefined solid primitives such as box, cone, cylinder, sphere, torus, wedge.		
4.4 Creating an extruded solid, creating a revolved solid.		
4.5 Creating composite solids		
4.6 Rendering		
5 Model space, Paper space, viewports, layouts & Printing/Plotting	-	**CO1 CO2**
5.1 Concept of model space and paper space		
5.2 Creating viewports in model space and creating floating viewport in paper space.		
5.3 Shifting from model space to paper space and vice versa.		
5.4 Selecting various plotting parameters such as paper size,		

6.	paper units, drawing orientation, plot scale, plot offset, plot area, print preview.		
	Total	**50**	

COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

07. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS.

No	Practical	Marks
1.	Drafting of common template for all the following assignments with Institute logo and standard title block.	03
2.	At least Five problems on different geometrical shapes using basic commands.	05
3.	At least Three problems with transformation features.	07
4.	Two problems on orthographic views for various Engineering drawing objects covering dimensioning, text.	10
5.	Create at least two solid models, which cover all the features available in solid modelling.	15
6.	Drafting project: a) Civil Engg. & Architectural Engineering: Plan, elevation and section of a single-story residential building. b) Electrical & Electronics and Allied Engg. Branches: Electrical layout of components like bulbs, fan, A.C., T.V. point, telephone point, etc. for a single-story house. c) Mechanical and Allied Engg. Branches: Industrial components such as machines, automobiles, jigs and fixtures with dimensioning, tolerancing, text, title block, Assembly etc. d) Shipbuilding Engg. Body plan of a ship. e) F.T.E.E.: Front View and Bottom View of a Simple truss like Saw Tooth truss, King-Post truss, Snow Tooth truss. (Any one of the three)	10
	Total	50

8. LEARNING RESOURCES

8.1Text Books

S. No.	Author	Title of Books	Publishers
1	P. Nageshwar Rao	AutoCAD for Engineering drawing made easy – P. Nageshwar Rao- Tata McGraw Hill.	Tata McGraw Hill.
2	Sagar Linkan	AutoCAD 2018 training Guide	BPB Publications
3			
4	Sham Tickoo	PRO/ Engineer PTC creo parametric 3.0	Dreamtech Press (2015)
5	Sham Tickoo	Solid Works 2018	BPB Publication
6	Nader G. Zamani.	CATIA V5 Tutorials	SDC Publications

8.2 Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Sham Tickoo	Pro/ENGINEER Wildfire 5.0 for Designers	CADCIM Technologies
2	Sham Tickoo	AutoCAD 2019: A problem Solving Approach	BPB Publication
3	George Omura	Mastering AutoCAD	BPB Publication
4	Sham Tickoo	CATIA V5-6R2017 for Designers 15th Revised Edition	BPB Publication

(MC 401) STRENGTH OF MATERIALS

1. COURSE OBJECTIVES:

Through this course the students will able to understand the fundamentals of solid mechanics, acquire the elementary knowledge of stresses, strains and their effects. They will also analyze the behavior of machine parts under various loads. It is important to understand and analyze various types of loads, stresses and strains, which are the main causes of failure of machine parts. The subject also deals with understanding the properties of engineering materials and applying the same in solving engineering problems.

2. TEACHING AND EXAMINATION SCHEME

Semester	IV								
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme			
						Theory Marks		Practical Marks		Total Marks
(MC 401) Strength of Materials		L	T	P	H	TH	TM	TW	PR/OR	
		3	1	1	80	75	25	25	-	125

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

ME401CO1: Describe behaviour of engineering materials under the action of external loads.

ME401CO2: Represent simple stress & strain, SF & BM, Moment of inertia, bending stresses & torsion.

ME401CO3: Solve various problems on simple stresses & strains, SF & BM diagrams, bending stresses, moment of inertia & torsion.

ME401CO4: Analyse the behaviour of materials under various loads.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	3	1	-	-	2	-	2	2	2
CO2	3	3	1	1	-	1	1	2	3
CO3	3	2	2	1	-	-	2	2	2
CO4	3	3	2	1	1	1	2	2	2

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

Units:	Marks	Course Outcomes
1. SIMPLE STRESS AND STRAIN	15	
1.1 Definition of stress and strain (Numericals on stress and strain)		
1.2 Stress – strain Curve for Ductile Material labeling the significant points on the curve.		
1.3 Concept of elastic limit, Hooks law &Young's Modulus of Elasticity		
1.4 Deformation expression of a body subjected to single force [δl = PL/AE]		CO1
1.5 Numericals based on concept of principle of Superposition [Bars of uniform cross section & Bars of different cross sections only]		CO2 CO3
1.6Concept of lateral strain and Poisson's Ratio. [Numericals on lateral strain & Poisson's Ratio to be covered]		CO4

1.7 Concept of shear stress, shear strain and Modulus of Rigidity.		
1.8 Definition of term- volumetric strain and bulk Modulus [No Numericals] Note: - [Numericals on stresses in composite sections are to be excluded.]		
2. SHEAR FORCE & BENDING MOMENT	15	
2.1 Types of beams and Supports.		**CO1**
2.2 Concepts of shear force & Bending Moment.		**CO2**
2.3 Sign Conventions for shear force & Bending Moment.		**CO3**
2.4 Shear force and bending moment diagram for simple cantilever and simply supported beams subjected to point and uniformly distributed load only.		**CO4**
3. MOMENT OF INERTIA	15	
3.1 Definition of Moment of Inertia		**CO1**
3.2 Perpendicular & Parallel Axis Theorem.		**CO2**
3.3 Expression of M.I of Rectangular, circular, Triangular & hollow Rectangular sections (No derivations, simple numericals).		**CO3**
3.5 Numericals on sections like L section, T section and I section		
4. THEORY OF SIMPLE BENDING	15	**CO1**
4.1 Concept of pure Bending.		**CO2**
4.2 Theory of simple Bending, Neutral Axis and Bending equation.		**CO3**
4.3 Bending stress distribution diagram		**CO4**
4.4 Application of bending equation for solid rectangular, solid circular section, hollow rectangular and hollow circular section. (simple numericals)		
5. TORSION	15	
5.1 Concept of pure Torsion		**CO1**
5.2 Torsion equation assumptions in Theory of pure torsion.		**CO2**
5.3 Strength of circular solid &hollow shaft in pure torsion.		**CO3**
5.4 Shear stress distribution diagram.		**CO4**
5.5 Polar Modulus, power transmitted by shaft.		
Total	**75**	

N.B: - Question paper will not carry questions on derivations

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and tutorials.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	SIMPLE STRESS AND STRAIN	10	18
2	SHEAR FORCE & BENDING MOMENT	10	18
3	MOMENT OF INERTIA	10	15
4	THEORY OF SIMPLE BENDING	09	12
5	TORSION	09	12
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS.

No	Practical (no 1 and 2 are compulsory and any 03 from 3 to 8)	Marks
1.	Tensile Test on M.S or Al using UTM	4
2.	Compression Test on wood/Resin sample using UTM	3
3.	Shear Test on M.S using UTM	3
4.	Brinell Hardness Test on Hardness Testing Machine	3
5.	Rockwell Hardness Test on Hardness Testing Machine	3
6.	Izod Impact Test on M.S or Al.	3
7.	Charpy Impact Test on M.S. or Al.	3
8.	Torsion Test on M.S Specimen.	3
	Total	25
No	**Tutorial Exercise**	
1	Solve atleast 5 problems on unit 1	
2	Solve atleast 5 problems on unit 2	
3	Solve atleast 5 problems on unit 3	
4	Solve atleast 5 problems on unit 4	
5.	Solve atleast 5 problems on unit 5	

9. LEARNING RESOURCES

9.1Text Books

S. No.	Author	Title of Books	Publishers
1	R.S Khurmi	Strength of Materials	S.Chand Publisher
2	S.S. Bhavikatti	Strength of Materials	Vikas Publishing
3	S. Ramamurtham	Strength of Materials	DhanpatRai&Sons
4	R. K. Rajput	Strength of Materials	S.Chand Publisher

9.2 Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	F.L. Singer	Strength of Materials	London Harper & row
2	Timoshenko & Gere	Mechanics of Materials	CBS Publisher & Distributors, New Delhi

(SB401) BASIC SHIP THEORY II

1. COURSE OBJECTIVES: The theory course content is framed to impart sufficient knowledge of stability at large angles, damaged conditions, capacity calculations, launching operation, and strength of ships. The courses contents will enable students to have sufficient knowledge of stability at large angles, damaged conditions, capacity calculations, launching operation, and strength of ships. The practical is designed so that the pass-outs will be able to perform basic hydrostatic and capacity calculations, launching curves and estimation of steel weight for simple structure.

2. PRE-REQUISITES: Knowledge of Maths , physics, and Small angle stability

3. TEACHING AND EXAMINATION SCHEME

Semester	**IV**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(SB401) BASIC SHIP THEORY II		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**0**	**3**	**96**	**75**	**25**	**50**	**-**	**150**

4.COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. List and illustrate the nomenclature of stability, capacity, launching and strength of ships.
2. Understand the concept of mechanics of floating bodies to derive ship curves
3. Apply mechanics of floating bodies to ship structures.
4. Prepare curves of ship geometry and ship motion.

5. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	3	3	2	1	1	1	2	2	2
CO2	3	3	2	1	1	2	2	2	1
CO3	3	3	2	1	1	2	2	3	1
CO4	2	2	1	1	1	2	2	3	2

Relationship : Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

Unit	**Marks**	**Course Outcomes**
1 LARGE ANGLE STABILITY		
1.1 Statical stability curve.	21	CO1,CO2, CO3,CO4.
1.2 Cross curves of stability.		

1.3 Determination of GZ curve from cross curves.		
1.4 Atwood's and wall-sided formula		
1.5 Dynamical stability.		
2 DAMAGE STABILITY		
2.1 Permeability, margin line, subdivision, floodable length and permissible length	18	CO1,CO2, CO3.
2.2 Drafts after flooding		
2.2.1 Lost buoyancy method.		
2.2.2 Added weight method		
2.3 Effect of flooding.		
2.6 Determination of draft, list, trim and stability after flooding for		
3 STRENGTH OF SHIPS		
3.1 Longitudinal strength	18	CO1,CO2, CO3,CO4.
3.1.1 Weight curve,		
3.1.2 Buoyancy curve		
3.1.3 Sheer force and bending moment diagrams for still water condition.		
3.2 Calculation of hull girder section modulus and stresses induced on deck and keel		
3.3 Check on mid-ship section modulus.		
3.4 Wave bending moment.		
4 CAPACITY		
4.1 Capacity	09	CO1,CO2.
4.2 Stowage factor		
4.3 Bale and grain capacity		
4.4 Capacity plan.		
5 LAUNCHING		
5.1Principles and types of launching.	09	CO1,CO2. CO3,CO4.
5.2 Side and end launching.		
5.3 Pivoting and tipping.		
5.4 Launching curves and Characteristics.		
5.5 Launching from graving dock, floating dock and ship lift.		
Total	**75**	

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Large Angle Stability	13	21
2	Damage Stability	12	18
3	Strength Of Ships	12	18
4	Capacity	05	09
5	Launching	06	09
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Unit	Practical	Marks	Course Outcomes
1	1	Calculation of hydrostatic parameters and developing hydrostatic curves	20	CO3,CO4.
2	3	Estimation of steel weight, LCG, VCG of structures with simple configuration and distribution of steel weight.	-	CO1,CO2.
3	4	Tank disposition plan, Capacity calculation and Capacity plan.	15	CO3,CO4.
4	5	Launching calculations and launching curves.	15	CO3,CO4.
		Total	50	

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Derett, D. R	Ship Stability for Masters and Mates	Stanford Maritime
2	Rawson, K.J. and Tupper E.	Basic Ship Theory, Vol I & II	Longman
3	Munro-Smith	Ships and Naval Architecture	Institute of Marine Engineers

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	John P. Comstock	Principles of Naval Architecture	SNAME
2	Baxter, B.	Naval Architecture Examples and Theory	Charles Griffin & Co
3	Thomas, Gillmer C.	Introduction to Naval Architecture	E & F.N. Spon
4	Munro – Smith, R	Naval Architecture for the Merchant Navy Exams	Technical Press
5	Stokoe, E.A.	Reed's Naval Architecture for Marine Engineers	Thomas Reed Publisher Ltd.)

6	Muckle. W	Naval Architecture for Maritime Engineers	Butter Worths
7	Hogg, Robert S.	Naval Architecture and Ship Construction	Institute of Maritime Engineers

(SB403) WELDING IN SHIP CONSTRUCTION

1. COURSE OBJECTIVES: The theory course content is framed to impart sufficient knowledge of general aspects of Welding in ship construction and to familiarize with different welding processes, design, defects and types of joints. It is essential that a technician involved in shipbuilding, ship repair industry should have a thorough knowledge of different welding processes, which plays vital role in fabricating different metals and non- metals. Hence an attempt has been made in Welding in ship construction to brief out different welding processes, welding processes, types of welding joints, etc.

2. PRE-REQUISITES: Knowledge of Physics and Chemistry.

3. TEACHING AND EXAMINATION SCHEME:

Semester	**IV**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
SB 403 Welding in Ship Construction		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**0**	**3**	**96**	**75**	**25**	**50**	**-**	**150**

4. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Identify the different variables associated with the welding processes.
2. Explain the different welding processes, procedures, Defects, application and safety involved.
3. Select the appropriate welding processes and tests.
4. Sketch the welding process and procedure.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	3	2	1	1	1	2	2	1	2
CO2	3	2	1	2	2	3	2	1	2
CO3	2	3	2	2	2	3	2	1	2
CO4	2	2	2	2	2	2	2	2	2

Relationship : Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

	Marks	**Course Outcomes**
UNIT 1: INTRODUCTION TO WELDING & SAFETY PRACTICES	09	CO1, CO2, CO3
1.1 Definition of Welding. Classification of different welding processes.		
1.2 Advantages and Disadvantages of welding.		
1.3 Weldability of steel and carbon equivalent.		
1.4 Comparison of welding with respect to casting and riveting.		

1.5 Health and safety of the worker. Safe welding practices.		
UNIT 2: WELDING EQUIPMENTS & WELDING PROCESSES	21	CO1, CO2, CO3,CO4
2.1 Gas welding process and equipment, Types of Welding Flames, Gas Welding Technique: Leftward, Rightward and vertical, Mani folding system for gas welding. Gas Welding: Advantages , Disadvantages & Applications.		
2.2 MMAW Process & Equipment, MMAW: Advantages , Disadvantages & Applications		
2.3 TIG Welding Process and Equipment, TIG Welding: Advantages , Disadvantages & Applications		
2.4 MIG Welding Process and Equipment, MIG Welding: Advantages, Disadvantages & Applications, Introduction to MAG Welding Process.		
2.5 Submerged Arc Welding Process and Equipment, Weld Backing, Submerged Arc Welding: Advantages , Disadvantages & Applications		
2.6 Types of welding electrodes (consumable and non consumable)		
2.7 Classification of electrodes, electrode coating.		
2.8 Selection of electrodes. Care and storage of electrodes		
2.9 Classification and coding of MS and low alloy steel electrodes: Indian System (IS) , American (American AWS-ASTM) system		
UNIT 3: WELDING DEFECTS AND TESTING	18	CO1, CO2, CO3,CO4
3.1 Cracks, incomplete penetration,		
3.2 Distortion, porosity and blowholes,		
3.3 Poor weld bead appearance, spatter,		
3.4 Poor fusion, undercutting, inclusion and overlapping.		
3.6 Non-destructive testing like, Visual Inspection,		
3.7 Leak test, Radiographic test (X Ray),		
3.8 Magnetic Particle Inspection,		
3.9 Liquid Penetrant Test & Ultrasonic Inspection.		
UNIT 4: WELDING PROCEDURE, SPECIFICATIONS & WELDERS PERFORMANCE QUALIFICATION	18	CO1, CO2, CO3,CO4
4.1 Need for Preheat treatment and post heat treatments of welds	`	
4.3 Destructive tests like Bend test (Free type), Tensile test, Impact test & Hardness test (Brinell Hardness Test).		
a) Welding procedure Specification (WPS) Purpose and Constituents of writing of a welder procedure specification		
b) Welder's performance Qualification (WPQ) : Requirement of Welder Qualification and Names of codes for welder qualification.		
4.4 Different welding positions Representations: Flat, Horizontal, Vertical Overhead (For Plates Only)		
4.5 Welding symbols Representation.		
UNIT 5 SPECIAL APPLICATIONS OF WELDING & METAL		CO1,

CUTTING PROCESSES		CO2, CO3,CO4
5.1 Spot welding	09	
5.2 Use of bimetallic strips		
5.4 Under water welding Processes: TIG, MIG		
5.5 Oxyacetylene cutting, Plasma cutting, Arc Cutting.		
Total	**75**	-

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Introduction to Welding & Safety Practices	08	09
2	Welding Equipments &Welding Processes	14	21
3	Welding defects and Testing	10	18
4	Welding Procedure, specifications & welders Performance qualification	10	18
5	Special applications of welding & metal cutting processes	06	09
	Total	**48**	**75**

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS:

No	Practical	Marks	COURSE OUTCOMES
1.	Introduction to welding equipment and safety		CO1, CO2, CO3,CO4
2.	Striking of Arc		
3.	Stringer Beading in flat, horizontal & vertical position.		
4.	Fillet joint in horizontal position.		
5.	Square Butt joint in flat position		
6.	Demonstration of Gas Welding & Gas Cutting.		
7.	Exposure to TIG, MIG, SAW Welding processes.		
	Total	**50**	

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	O. P. Khanna	Welding Technology	Dhanpat Rai Publication
2	Raymond Sacks	Welding Principles & Practices	Bennett & Knight Publishing Company
3	S.V. Nadkarni	Modern Arc Welding	Oxford & IBH Publication Co. Pvt. Ltd.

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	American Welding Society (AWS)	Welding Handbook	The Macmillan press Ltd.
2	J. A. Oates	Welding Engineers Handbook	D.B. Taraporevala Sons & Co. Pvt. Ltd.

(SB 404) MARINE ENGINEERING - I

1. COURSE OBJECTIVES: The theory course content is framed to impart knowledge to students regarding the general aspects of ship systems and related marine equipment. It is essential that as engineers involved in shipbuilding and ship have a thorough knowledge of pipeline system with fittings, type of valves and their selection, types of Marine pumps, boilers types, diesel engines working cycles and components. Having studied this subject, a student shall be able to choose material for pipes depending on ship systems for installation on board. Select valves for particular applications. Know various types of boilers in Marine usage, with mountings, accessories and basic installation features.

2. PRE-REQUISITES: Knowledge of Science and engineering fundamentals.

3. TEACHING AND EXAMINATION SCHEME

Semester	**IV**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
SB404 MARINE ENGG. - I		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**0**	**2**	**80**	**75**	**25**	**25**	**25**	**150**

4.COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Identify the various marine engineering components.
2. Understand the function of marine engineering components.
3. Explain the constructional aspects and working principle of marine engineering components.
4. Sketch the various marine engineering components

5. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	2	-	1	2	1	2	3	1	2
CO2	3	1	2	-	1	2	3	1	3
CO3	3	1	2	1	1	2	3	-	3
CO4	3	1	2	1	-	2	3	2	2

Relationship : Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

Unit	**Marks**	**Course Outcomes**
1 Valves and Fittings		
1.1 Types of valves used-on-board and their applications 1.1.1Globe valve, gate valve, relief valve, quick closing valve, reducing valve	18	CO1,CO2,CO3,CO4
1.1.2 Storm valve, butterfly valve, ball valve and Cocks. SD and SDNR valve		

1.1.3 Valve chests, shipside valves and their requirements		
1.2Detailed sectional drawing of globe valve, gate valve and butterfly valve only.		
1.3Strainers, steam traps		
2 Fluid Pumps		CO1,CO2,CO3,CO4
2.1 Types of pumps.	16	
2.2 Characteristics and Marine applications of reciprocating, centrifugal, rotary pumps used on ships.		
2.3 Definition and terminology, impeller characteristics.		
2.4 Safety features, care and maintenance of pumps.		
2.4.1Testing of pumps, starting and stopping of pumps.		
3 Ship Systems		CO1,CO2,CO3,CO4
3.1Engine room layout.	22	
3.2 Ship piping systems i.e bilge and ballast, fresh water. fuel oil and lubrication oil systems, Compressed air piping starting air system (External circuit only- up to engine)		
3.3Hydrophore, steam piping, fire fighting mains.		
4 Marine boilers		
4.1Classification of boilers in Marine applications. Fire tube and water tube boilers	09	CO1,CO2
4.1.2 Main, Auxilary, Exhaust gas, Composite boilers and Packaged boilers (detailed construction not included).		CO1,CO2,CO3
4.2 Mountings and accessories and safety features.		CO1,CO2
4.3Air supply and fuel supply.		CO1,CO2,CO4
5 Compressors		
5.1 Types- Reciprocating – single and multistage, centrifugal and rotary.	10	CO1,CO2,CO3,CO4
5.2 Constructional features of reciprocating compressor only.		
5.3 Air receivers and mountings. Safety features.		
5.4 Applications of compressors.		
Total	**75**	

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No.	Topic	Teaching Hours/Semester	Marks
1	Valves and Fittings	**12**	**18**
2	Fluid Pumps	**09**	**16**

3	Ship Systems	**14**	**22**
4	Marine boilers	**06**	**09**
5	Compressors	**06**	**10**
		48	**75**

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No.	Practical	Marks	Course Outcomes
1	To study pipeline fitting such as Elbows, Tees, Unions, Sockets, Reducers, Bulkhead/Deck piece, Flange joint, welded joint, different jointing materials and gland packing. Nomenclature of pipes.		CO1, CO2, CO3, CO4
2	To dismantle and assemble various types of valves i.e. globe valve, non return valve, butterfly valve, quick closing valve.		
3	To dismantle assemble & study principle of working of reciprocating, centrifugal, rotary & semi rotary pumps		
4	To study boiler mountings		
5	Study of reciprocating air compressor.		
	Total	25	

10. LEARNING RESOURCES

Text Books

Sr.No.	Author	Title of book	Publication
1	D.A. Taylor	Introduction to Marine Engg	Butterworths, 1983, The University press, Cambridge.
2	David D Smith	Marine Auxiliary Machinery	Butterworths, London.
3	H. James Milton & M. Roy Leach	Marine Steam boiler	(Butterworths)

Reference Books for further study

Sr.No.	Author	Title of book	Publication
1	C. C. Pounder	Marine Diesel Engines	Butterworths, London.
2	Harrington	Marine Engineering	Sname, New York.

(SB405) SHIP CONSTRUCTION TECHNOLOGY

1. COURSE OBJECTIVES: The theory course content is framed to impart knowledge of ship's structures to students. It is essential that Engineers involved in shipbuilding are able to manage the jobs during construction of a ship. He should be acquainted with all practical technical know-how of fabrication and alignment of various ship structures. The course content has been so designed that the students acquire knowledge and skill in execution of projects pertaining to structures in shipbuilding. Having studied this subject, students should be able to know nomenclature used to describe ship structural components.

2. PRE-REQUISITES: Knowledge of Engineering fundamentals.

3. TEACHING AND EXAMINATION SCHEME:

Semester	**IV**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
		L	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
(SB405) SHIP CONSTRUCTION TECHNOLOGY		**3**	**0**	**2**	**80**	**75**	**25**	**25**	**-**	**125**

4. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Identify the various components of ship's structure.
2. Understand the function of structural components.
3. Explain the constructional aspects of ship's structure
4. Sketch the various components of ship's structure.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	2	1	1	-	1	1	1	1	1
CO2	3	1	2	-	1	2	2	2	2
CO3	3	1	2	1	1	2	2	2	2
CO4	3	2	1	2	1	2	2	2	2

Relationship : Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**		
Unit			**MARKS**	**COURSE OUTCOMES**
UNIT 1: SHIP STRUCTURE				CO1 CO2 CO4
1.1 General arrangement and Mid-ship sections of a Bulk Carrier.			06	
1.2 General arrangement and Mid-ship sections of a Tanker.				

1.3 General arrangement and Mid-ship sections of a Container ship.		
UNIT 2: BOTTOM, SIDE SHELL, DECK AND BULKHEAD STRUCTURE		CO1,CO2, CO3,CO4
2.1 Bottom structure	30	
2.1.1 Single bottom construction.		
2.1.2 Double bottom construction – Keels, types of floors, Girders		
2.1.3 Bottom frames – transverse and longitudinal framing.		
2.1.4 Bilge keel.		
2.2 Side shell and Decks		
2.2.1 Transverse and longitudinal framing, side transverses.		
2.2.2 Deck transverse/ beams, Deck longitudinals, stringers, deck girders.		
2.2.3 Cargo hatches.		
2.3 Bulkheads		
2.3.1 Transverse and longitudinal.		
2.3.2 Ordinary Stiffened Bulkhead.		
2.3.3 Corrugated Bulkhead.		
2.3.2 Pillars.		
UNIT3: FORE END, AFT END, ENGINE ROOM AND DECKHOUSE STRUCTURE		
3.1 Fore End structure.	24	CO1,CO2, CO3,CO4
3.1.1 Stem-Normal raked bow, stem bar, panting stringers, breast hooks, Deep floors.		
3.1.2 Chain locker.		
3.1.3 Bulbous bow.		
3.1.4 Hawse pipe.		
3.1.5 Bow thruster tunnel.		
3.2 Aft End structure.		
3.2.1 Cruiser stern.		
3.2.2 Transom stern.		
3.2.3 Stern frames for different types of rudders.		
3.2.4 Shape of propeller aperture.		
3.2.5 Types of rudders, rudder trunk, steering gear flat.		
3.2.6 Stern tube, A-bracket and Bossing.		
3.3 Engine room structure- engine girders, platform decks.		

3.4 Deckhouse and superstructure construction including engine casing.		
UNIT 4:CLOSING APPLIANCES		CO1,CO2, CO4
4.1 Construction of doors.	09	
4.2 Windows and scuttles.		
4.3 Hatches.		
4.4 Construction of skylights, ventilator covers.		
UNIT 5:DECK MACHINERY ARRANGEMENT & LAYOUT		CO1,CO2, CO4
5.1 Mooring arrangements.	06	
5.2 Masts.		
5.3 Life boats launching arrangements.		
5.4 Access ladders and Gangways.		
Total	**75**	

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies.

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of lectures	Marks
1	Ship Structure	04	06
2	Bottom, Side Shell, Deck and Bulkhead Structure	19	30
3	Fore End, Aft End, Engine Room and Deckhouse Structure	16	24
4	Closing Appliances	05	09
5	Deck Machinery arrangement & Layout	04	06
	Total	**48**	**75**

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS:

No	Practical	Marks	COURSE OUTCOMES
1	Sketching & labeling of Mid-ship section of a Bulk Carrier, tanker and Container ship.		CO1,CO2, CO3,CO4
2	Sketching & labeling of Single bottom construction details.		
3	Sketching & labeling of Double bottom, types of floors & their application.		
4	Sketching & labeling of Bulkheads – Plain ordinary, Corrugated, transverse, longitudinal, stiffening arrangement.		
5	Sketching & labeling of Fore-peak structure - Stem bar, Pantingstringers, Breast hooks and deep floors.		
6	Sketching & labeling of Aft structure – Cruiser stern, Transom stern.		
	Total	25	

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1.	D.J.Eyres	Ship Construction	Elsevier
2.	D. A. Taylor	Merchant Ship Construction	Buttersworth Hienemann
3.	R. Taggart	Ship Design & Construction	SNAME

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1.	Pursey	Merchant ship construction	Brown, son & Ferguson
2.	Reed's series	Ship Construction for Marine students	Thomas Reed
3.	Hogg.	Ship Construction for Marine Engineering	The Institute of Marine Enginners, London

(CC501) ENTREPRENEURSHIP DEVELOPMENT

1. **COURSE OBJECTIVES:** Student will able to start his own venture with all fundamentals of business.Today Entrepreneurship is given importance by the government to bring the youth of our country to overcome the problem of unemployment and bring them in the main stream of global business to strengthen Indian economy by Make in India philosophy. Government has announced various financial schemes for young youth and women to support them for setting up an enterprise. To fulfill this, youth are to be prepared for setting an enterprise. The students undergoing this course will be develop entrepreneurial traits and confidence within themselves and choose entrepreneurship as a career to brighten their future.

2. **PRE-REQUISTES**: Fundamentals of Mathematics.

3. **TEACHING AND EXAMINATION SCHEME**

Course Code & Course Title	Periods/ Week (In Hours)			Total Hours	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
CC501 Entrepreneurship Development	**L**	**T**	**P**	**H**	**-**	**-**	**PR/OR**	**TW**	25
	-	-	2	32	-	-	-	25	

4. **COURSE OUTCOMES:**

CO1: List the terms associated with Entrepreneurship Development.

CO2: Explain the terminologies and procedures involved in Entrepreneurship Development.

CO3: Identify legal implications for Entrepreneurs.

CO4: Develop the project report for new enterprise.

5. **Mapping Course Outcomes with Program Outcomes**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	1	-	-	-	2	3	2	1	1
CO2	1	-	-	-	1	3	2	1	1
CO3	-	1	2	-	-	-	2	1	1
CO4	3	2	2	-	2	-	2	1	1

Relationship : Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS

Unit	Marks	Course outcomes
1 Introduction to Entrepreneurship Development	3	CO1,CO2, CO3,CO4
1.1 Introduction to Entrepreneurship Development (EDP): Need		
1.2 Entrepreneur definition, Types of Entrepreneur, Characteristics of entrepreneur and entrepreneurship		
1.3 Enterprises: Micro, Small and Medium Enterprises (MSME), Service industry, Manufacturing Industry, Franchises and Start up.		
1.4 Organisations: Sole proprietorship, Partnership, Public, Co-operative Society.		
2. Identification of business opportunity		CO1,CO2, CO3,CO4
2.1 Business ideas- Exploring business ideas in terms of marketability, technical feasibility, financing and authorities	5	
2.2 Business terms: - Clients, vendors market description, demand, supply, banking, & non-banking, financing companies, Loans of various types, GST, peers Promoters, Lenders, Consortium.		
2.3Government Departments: - IDC, EDC, Civic Body, Pollution Control department.		
3. Market Research		CO1,CO2, CO3,CO4
3.1 Data Collection: - Data collection of Business idea such as Number of players, Total demand, Total supply,	3	
3.2 Analysis of Data: - Analysis of data and projection of data with respect to various factor (such as GDP, Climate etc through case studies).		
3.3 Questionnaire: - Preparing a questionnaire for business idea to assess business opportunity.		
4. Legal Aspect		CO1,CO2, CO3,CO4
6.1 Legal Financial Term: - Know the various terms such as Resources, Assets, Liabilities, Advances, Depreciations, Investments, Fixed Capital, Working Capital (cash credit), Employee Cost, Miscellaneous Expense, Other Income, Profit & Loss Statement, Cash Flow Analysis, and Balance Sheet.	8	

6.2 Legal Aspects: - Procedure for Registration with various government agencies, GST, PAN, Slab of Income Tax. Difference in use of electricity, water & LPG for domestic purpose and industrial applications.		
6.3 Business Analyses: - 1) Swot Analysis 2) Break – Even Analysis		
5. Project Report		CO1,CO2, CO3,CO4
5.1 Need for project report, Importance of Project report, Scope of project report: Economic aspects, Technical aspects, Financial aspects, Managerial aspects, Production aspects. List the contents of a project report. Proforma of a project report which includes: -Introduction, Schemes, Profitability and Projections, Infrastructure, Break Even Point, Names and Addresses of suppliers, remarks.	6	
5.2 Project Profile: - Project appraisal criteria: - Technical feasibility, Financial feasibility, Economic viability, Commercial viability, Managerial competency, Political and Labour considerations		
5.3 Scope of Business: - Further scope with Capital infusion, Exit plan Analysis.		
Total	25	

7. COURSE DELIVERY:

Videos / Lectures/ Practicals /Expert lectures / Industry visits

8. SPECIFICATION TABLE FOR PRACTICALS

Unit No.	Topic	Teaching Hours/ Semester	MARKS
1	**Entrepreneurship Development**	4	3
2	**Identification of business opportunity**	6	5
3	**Market Research**	4	3
4	**Legal Aspect**	10	8
5	**Project Report**	8	6
TOTAL		**32**	**25**

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICAL HOURS

No	**Classroom Assignments**	**Marks**
1.	Prepare a Case Study on leading enterprise	
2.	Prepare a Case Study on small scale unit	
3.	Prepare a report on various government schemes for startup.	
4.	Prepare SWOT analysis for a new business idea.	
5.	Prepare Project Report for a new business idea.	
	Total	**25**

10. LEARNING RESOURCES

S.No.	Author	Title of Books	Publisher
1.	Sharad Jawadekar, Shobha Dodlani,	Business entrepreneurship	Suvichar prakashan mandal, pune,
2.	S.S. Khanna	Entrepreneurship development	S. Chand & Co. Ltd, New Delhi,
3.	Vasant Desai	Management of small-Scale Industry in India	Himalaya Publishing House
4.	Dilip Sarwate	Entrepreneurial development Concepts and practices	Everest Publication House, Pune
5.	CB Gupta and P Srinivasan	Entrepreneurship Development	S. Chand and Sons, New Delhi

(TR501) INPLANT TRAINING PHASE I

1. COURSE OBJECTIVES: The training imparted through this course should be such that the theory learned during first 4 semesters of Shipbuilding Engineering is linked with the Industrial practices and the outcome of the inplant training should aid in understanding the subjects of further semesters. The objective of the training is to correlate theory and shipbuilding practices. Through training, the students will be able to get hands on experience in the various job activities associated with ship construction and obtain practical knowledge and experience in the installation, operation and maintenance of marine machinery. The students will be exposed to industrial environment, obtain experience in working under factory discipline, associate with workers and understand their psychology and work habits, and get familiarised with various materials, structural members of ship, processes and shop floor practices.

2. PRE-REQUISITES: Knowledge of introductory subjects of Naval Architecture, Marine Engineering and ship structure.

3. TEACHING AND EXAMINATION SCHEME:

Semester	**V**						
Course code & course title		**Total Weeks**	**Examination Scheme**				
			Term-work Marks		**Practical Marks**		**Total Marks**
(TR501) Inplant Training Phase I		**21 Weeks**	**Presentation**	**Daily Dairy**	**Report**	**Orals**	
			50	50	50	50	**200**

4. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

TR501.CO1: Relate and reinforce knowledge of theory concepts learnt in earlier semesters withpractical work at industry.

TR501.CO2: Describe clearly the shipbuilding activities/jobs performed by them during the training.

TR501.CO3: Prepare a report and give presentations detailing all the jobs activities performed at theyard and the specific projects undertaken by them.

TR501.CO4: Distinguish various machines, equipments, tools, software etc, under the guidance andmentorship of industrial personnel.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	3	2	1	2	2	2	3	1	2
CO2	2	-	-	1	1	1	2	1	1
CO3	2	-	1	-	-	1	2	-	1
CO4	2	-	-	1	-	-	2	1	2

Relationship : Low-1 Medium-2 High-3

6. DETAILED CONTENTS:

Unit	**CO**
UNIT 1: SHIP STRUCTURE	**CO1,CO2, CO3, CO4**
1.1 Basic structural members of Ship	
1.2 functions of structural members of Ship	
UNIT 2: LOFTING	
2.1 Preparation of offset	
2.2 Fairing of full scale lines	
2.3. Preparation of templates.	
UNIT 3:STEEL PREPARATION & FABRICATION	
3.1 Plate preparation	
3.1.1 Shot blasting	
3.1.2Priming	
3.1.3 Marking	
3.1.4 Cutting of plate using pug cutting machine	
3.1.5 Edge preparation	
3.2 Use of grinding wheel	
3.3Plate bending	
3.4 CNC cutting.	
3.5 Fabrication	
3.5.1Welding	
3.5.2Arc welding	
3.5.3 Gas welding	
3.5.4 Erection of sub assembly	
3.5.5 Structural components	

3.5.6 Preparation of skids
3.5.7 Alignment of sub-assemblies.
3.5.8Block Fabrication.
UNIT 4:OUT-FITTING
4.1Pipe-fabrication,
4.1.1Preparation of templates
4.1.2 System assembly
4.1.3 Pressure testing
4.1.4commissioning of piping system.
4.2Rudder installation
4.3Propeller mounting
4.4Chock fasting
4.5 Shaft alignment.
4.6 Machinery installation
4.7 Fabrication of machinery seating
4.8 Machinery alignment
4.9 Testing and commissioning.
UNIT 5: LAUNCHING & MATERIAL HANDLING
5.1Side Launching
5.2 End launching
5.3 Balloon launching
5.4 Dock launching.
5.5 Material handling
5.5.1Types of Cranes,
5.5.2 Trolleys,
5.5.3Pallets,
5.5.4 Winches and other accessories.

7. DAILY DAIRY: The students are required to maintain a daily diary as a day to day record of their attendance at the factory, indicating clearly the activities/jobs performed by them during the day. End of the training the daily dairy needs to be submitted for evaluation by the faculty.

8. REPORT: Doing the daily diary, the students will prepare a report detailing all the jobs activities performed at the yard and in full detail the specific projects undertaken by them. The report will also cover the layout of the yard, facilities and infrastructure, types of ships under construction, etc. The report is to be in typed format complete with illustrations and drawings.

9. GRADING

Grade	**Marks**
A	>270
B	Between 240 to 269
C	Between 210 to 239
D	Between 180 to 209
E	Between 150 to 179
F	Between 120 to 149
Fails	<120

(SB 601) MARINE ENGINEERING - II

1. COURSE OBJECTIVES: The theory course content is framed to impart knowledge and upkeep of diesel engines and other related marine equipment's. Engineers involved in shipbuilding, ship repairs, and operation, are required to have a thorough knowledge of diesel engines, steam turbine, marine gears, stern gears. Having studied this subject, student shall be able to prepare sketches of diesel engine components and trace system integral with diesel engine. They should understand principle of operation, constructional details of steam turbines. They should study types of stern gear for inland & ocean going vessels. Engineers involved in shipbuilding should understand various types of deck machinery drives and their positions and installations. Due importance has also been given to fire protection system, ventilation, air-conditioning and refrigeration system. They should understand basic concepts and applications of Electrical Machinery. They should know different types of steering gear
i.e. mechanical, hand hydraulic, Electro hydraulic.

2. PRE-REQUISITES: Marine engineering I and Introduction to Thermodynamics.

3. TEACHING AND EXAMINATION SCHEME

Semester	**VI**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(SB 601) Marine Engg.- II		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**0**	**2**	**80**	**75**	**25**	**25**	**25**	**150**

4. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

SB601.CO1: Identify and distinguish various marine engineering systems.

SB601.CO2: Understand the function of marine engineering systems.

SB601.CO3: Explain working principle of different marine engineering systems.

SB601.CO4: Sketch the various marine engineering systems.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	1	-	1	2	2	2	3	1	2
CO2	2	2	2	1	2	2	3	1	3
CO3	2	2	3	1	2	2	3	1	3
CO4	2	2	3	1	-	2	3	2	2

Relationship : Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**M**	**Thr**	**CO**
1 DIESEL ENGINES	32	20	
1.1 Introduction to marine I/C Engines and its applications & specifications			CO1 CO2 CO3 CO4
1.2 Diesel Engine Systems Internal circuits of engine cooling system, engine fuel oil system, engine lubricating oil system.			
1.3 Scavenging, super-charging and turbochargers,Pulse and constant pressure turbocharger			
1.4 Principles of combustion.			
1.5Basic features and simple sketches of the principal components of diesel engines, e.g cylinder head, cylinder liner, piston and piston rings, cross-heads, connecting rods, camshafts with drives, crank shafts, tie rods, bed-plate, main bearing, top end and bottom end bearings and thrust bearing.			
1.6 Simple governor			
1.7Safety features used in diesel engine- High cooling water temperature, low lub oil pressure, engine overspeed and crankcase mist detector, , Crankcase relief valve.			
2 VENTILATION, REFRIGERATION AND AIR CONDITIONING	16	10	CO1 CO2 CO3 CO4
2.1 Ventilation-Natural and forced.			
2.2 Principle of vapour compression refrigeration cycle.			
2.2.1Basic features and functions of equipment involved i.e compressor, condenser, expansion valve and evaporator			

2.3 Air-conditioning. Provision chambers. Brine refrigeration system, and cargo hold conditioning.			
3 DECK MACHINERY	12	08	CO1 CO2 CO3 CO4
3.1Types of drives- electrical, electro-hydraulic.			
3.2 Deck machinery positions and installation.			
3.3Description and working principles of anchor windlass, cargo and mooring winches, cargo handling crane, capstans, and hatch cover operating machinery with simple sketches.			
4 STEERING GEAR	06	04	
4.1Types of steering gear-mechanical, hand hydraulic, electro hydraulic and rotary vane type their construction and operation.			
4.1.1 Control system and statutory requirements**.**			
5 ELECTRICAL MACHINERY ONBOARD	09	06	
5.1 Basic concepts and applications of Electrical Machinery – alternators, motors, transformer.			
5.2 Main switch board, and distribution system, emergency source of power, preferential tripping, protective devices.			
5.3Shore connection and inter lock.			
5.4 Introduction to Automation.			
Total	**75**	**48**	

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No.	**Topic**	**Teaching Hours/Semester**	**Marks**
1	Diesel Engines	**20**	**32**
2	Ventilation, Refrigeration and Air conditioning	**10**	**16**
3	Deck Machinery	**08**	**12**
4	Steering Gear	**04**	**06**
5	Electrical Machinery Onboard	**06**	**09**
	Total	**48**	**75**

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No.	Practical	Marks	CO
1	To prepare sectional sketches of important diesel engine components- bed plate, cylinder liner, piston, and cylinder head. Line sketch of engine structure		CO1 CO2 CO3 CO4
2	To prepare line sketches of fuel oil, lubricating oil, cooling water and starting air circuits from an actual diesel engine		
3	To prepare sketches of natural and forced draft vents.		
4	To prepare line sketch of vapour compression refrigeration system with equipment.		
5	To visit inland vessel/ocean going vessel and prepare deck machinery layout, physical arrangement of steering gear		
	Total	**25**	

10. LEARNING RESOURCESText

Books

Sr. No.	Author	Title of book	Publishers
1	D.A. Taylor	Introduction to Marine Engineering	Butterworths.
2	David D. smith	Marine Auxilary Machinery	Butterworth,
3	Dirnie, S-G	Marine Steam Engine & Turbines	Butterworth,

Reference Books for further study

Sr.No.	Author	Title of book	Publishers
1	C.C. Pounder	Marine Diesel Engines	Butterworth, London
2	Harrington	Marine Engineering	SNAME – New York

(SB 602) SHIP REPAIR ENGINEERING

1. COURSE OBJECTIVES: The theory course content is framed to impart sufficient knowledge of activities in present day Ship repair yard. The course content is designed to meet the needs of the present day ship repair yard. The engineer is trained: To know how vessels are berthed and dockedwhen brought for repair work. To identify the areas needing repairs. To acquaint themselves with various aspects of survey carried out when vessel is at the berth and in the dry dock. To know the regular maintenance aspects of a vessel and how it is maintained under class.

2. PRE-REQUISITES: Knowledge of Ship construction technology and Marine Engineering.

3. TEACHING AND EXAMINATION SCHEME:

Semester	**VI**									
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**				
						Theory Marks		**Practical Marks**		**Total Marks**
(SB 602)		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
Ship Repair Engineering		**4**	**0**	**2**	**96**	**75**	**25**	**25**	**25**	**150**

4. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

SB602.CO1: List the activities required in a ship repair yard

SB602.CO2: Explain methods of survey and repairs to ships structure, machinery and equipment andrecognize safety aspects.

SB602.CO3: Analyse the deficiencies needing repair to ships structure, machinery and equipment.

SB602.CO4: Apply the various repair techniques for ships structure, machinery and equipment.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	1	1	1	1	-	1	2	-	2
CO2	2	2	2	1	2	3	2	-	3
CO3	2	2	3	2	2	2	2	-	3
CO4	1	2	3	2	2	3	2	-	3

Relationship : Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**M**	**Thr**	**CO**
UNIT 1 SHIP REPAIR FACILITIES, ACTIVITIES AND SERVICES	09	08	CO1 CO2 CO3
1.1 Docking systems – Description, comparison			
1.2 Docking plan details and significance			
1.3 Services to ships in dock			
1.4 Supporting repair shops			
1.5 Nature of jobs involved in ship repairs			
UNIT 2 REPAIRS TO HULL AND UNDER WATER EQUIPMENT, AND SAFETY ASPECTS	21	18	CO1 CO2 CO3 CO4
2.1 Repairs to Hull			
2.1.1Hull surveys and types of defects			
2.1.2 Methods of gauging, areas of maximum wastage, areas susceptible to erosion, buckling, dents, cracks.			
2.1.3 Preparation for hull repairs, cleaning, gas freeing, ventilation, access, staging, additional supports			
2.1.4 Procedure for repairs, sequence of gas cutting, fitting and welding. Fitting doublers and inserts.			
2.1.5 Marking, use templates for odd size and shape.			
2.1.6 Temporary repairs, cement box.			
2.1.7 Testing of repaired areas and compartment.			
2.2 Repairs to Under water equipments			
2.2.1Withdrawal of propeller and tail end shaft. Propeller drop measurement. Inspection and repairs of propeller, shaft, stern tube and A-bracket bearings, Static balancing of propeller			

2.2.2 Rudder drop and bearing clearance measurement. Rudders removal, repairs and refitting. Repairs of Rudder stock, pintles,			
ushes.			
2.2.3 Ranging anchors and cables - Inspection, gauging, acceptable levels, rearrangement. Repair of chain links, shackles and anchors.			
2.2.4 Sea chest and connections.			
2.2.5 Underwater fittings. Anodes cathodic protection.			
UNIT 3. REPAIR OF HULL FITTINGS, SAFETY EQUIPMENT, HULL PROTECTION AND INSULATION	27	18	CO1 CO2 CO3 CO4
3.1 Repairs to Hull fittings			
3.1.1 Load line survey and repairs. Hatch covers, watertight doors, scuttles, air pipes, freeing ports, railing, and bulwark.			
3.1.2 Testing water tightness of closing appliances.			
3.1.3 Ventilators, scuppers, cargo gear inspection, repairs and testing.			
3.1.2 Pipe line repairs. Use of blanks and spectacle flanges. Making template and Fabrication of pipe. Expansion joints, clamps, pipe testing.			
3.2 Repairs to Safety Equipments			
3.2.1 Safety equipment surveys.			
3.2.2 Repairs of fibre glass boats			
3.2.3 Testing CO2 system by compressed air..			
3.2.4 Maintenance and testing of fire mains, hydrants, hoses and nozzles			
3.3 Hull protection and insulation			
3.3.1 Methods of descaling. H.P. water wash, sand blasting			
3.3.2 Chipping Standards of surface finish.			
3.3.3 Painting scheme for underwater hull, shipside, deck, cargo hold, ballast tank, F.W. tank, and superstructure.			
3.3.4 Deck sheathing/ deck composition, bulkhead insulation, and paneling.			

UNIT 4. GENERAL REPAIR METHODS OF ENGINE ROOM MACHINERY, AND SAFETY ASPECTS	12	14	CO1 CO2 CO3 CO4
4.1 Maintenance schedule.			
4.2 Appreciation of engineering requirements for general maintenance and repairs of the Main Engine.			
4.3 Appreciation of engineering requirements for general maintenance and repairs of the Auxiliaries such as Generators, Boilers and Boiler mountings.			
4.4 Repairs of other reciprocating and rotating machineries.			
4.5 Repairs to Heat exchangers.			
UNIT 5. OFFICE PROCEDURES AND COSTING.	06	06	CO1 CO2 CO3
5.1Defect list, quotation, job order and work done certificate.			
5.2 Records of repairs and maintenance - Shell expansion and structural plans			
5.3 Costing cost components.			
5.4 Estimation of material, manpower and time requirement.			
5.5 Bill preparation			
Total	**75**	**64**	

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies.

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Ship Repair facilities, activities and services	08	09
2	Repairs to Hull and Under Water Equipment, and Safety Aspects	18	21
3	Repair of Hull fittings, Safety Equipment, Hull protection and Insulation	18	27
4	General Repair methods of Engine Room Machinery, and Safety Aspects	14	12
5	Office Procedures and Costing.	06	06
	Total	**64**	**75**

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks	CO
1	Sketching layout of a ship repair yard and labeling the various facilities.		CO1 CO2 CO3 CO4
2	Sketching and describing Docking Plan of a ship showing necessary details.		
3	Sketching and describing hull repairs details- bottom shell/ side shell; plate/ section renewal and welding.		
4	Propeller shaft inspection, withdrawal, reconditioning and refitting – listing out chronological events and methods.		
5	Anchor and cables inspection and repairs – Equipment number, chain size, sketching kenter shackle.		
6	Painting scheme for a ship – describing a painting scheme for different areas of ship with DFT.		
	Total	**25**	

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	D. Benkovsky	Ship Repair Technology	MIR Publications
2	S.G.Khare	Hull Repairs	Society for Industrial & Technical Education in Goa.

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	R. Taggart	Ship Design & Construction	SNAME
2	Hogg.	Ship Construction for Marine Engineering	The Institute of Marine Enginners, London
3	D. A. Taylor	Introduction to Marine Engineering	Butterworth-Heinemann
4	H. D. McGeorge	Marine Auxiliary Machinery	Butterworth-Heinemann

(SB603) SHIP DRAWING & CALCULATIONS

1. COURSE OBJECTIVES: The course content is designed to enable the students to perform Ship Drawing calculations. The course content is designed to enable the students to perform intact stability calculation, and floodable length calculations. It also enables students to understand the mid-ship section, design process, and determine scantlings from classification society rules. The student will be also able to perform longitudinal strength calculation.

2. PRE-REQUISITES: Knowledge of Maths, Science, Basic ship theory

3. TEACHING AND EXAMINATION SCHEME

Semester	VI								
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme			
						Theory Marks		Practical Marks		Total Marks
SB603 Ship Drawing & Calculations		L	T	P	H	TH	TM	TW	PR/OR	
		1	-	6	112	75	25	25	25	150

4. COURSE OUTCOMES:

On successful completion of the course, the student will be able to: **SB603.CO1:** Interpret the techniques for ship drawing & calculations **SB603.CO2:** Calculate the properties relating mechanics of ships.

SB603.CO3: Apply Classification Society Rules to ship drawing & calculations

SB603.CO4: Sketch the ship drawing curves.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	3	2	2	1	1	2	2	2	-
CO2	2	2	2	1	1	2	3	2	1
CO3	3	2	2	3	2	3	3	3	1
CO4	3	3	3	3	1	3	3	3	2

Relationship : Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**M**	**Thr**	**CO**
1 CROSS CURVES OF STABILITY	**18**	**03**	CO1
1.1 Introduction to Cross curves.			CO2
1.2 Calculation and drawing of cross curve.			CO3
1.3 Features of Cross curves and its applications.			CO4
2 STATICAL STABILITY CURVE FROM CROSS CURVES	**06**	01	CO1
2.1 Drawing of statical stabilitycurve and calculation of initial meta-centric height.			CO2 CO3
2.2Dynamical stability			CO4
3 MID SHIP SECTION CALCULATIONS & DRAWING	**15**	**04**	CO1
3.1 Introduction to classification society.			CO2
3.2 Application of classification rules for ship structure.			CO3
3.3 Calculation of hull girder section modules.			CO4
3.3.1 Check on mid- ship section modulus.			
3.3.2 Stresses induced on deck and keel.			
4 FLOODING CALCULATIONS	**21**	**04**	CO1
4.1Introduction to subdivision and floodable length curves.			CO2
4.2Determination of draft, list, trim and stability after flooding for vessels of simple configuration.			CO3 CO4
4.3Calculation on subdivision and floodable length.			
4.4Drawing of floodable length curves.			
5 STRENGTH CURVES	**15**	**04**	CO1
5.1 Introduction to strength curves.			CO2
5.2Longitudinal strength calculation.			CO3
5.3Cargo and hull weight distribution.			CO4
5.4Load curve, shear Force and bending moment diagrams.			
Total	**75**	**16**	

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Cross curves of stability	03	18
2	Statical stability curve from cross curves	01	06
3	Flooding calculations	04	15
4	Mid ship section drawing	04	21
5	Strength curves	04	15
	Total	16	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Number of lectures	Marks	CO
1.	Development of Cross curves of stability	30		CO1
2.	Carrying out Flooding calculations	18		CO2
3.	Development of Mid ship section drawing	30		CO3
4.	Construction of Strength curves	18		CO4
	Total	96	25	

10. LEARNING RESOURCESText

Books

S. No.	Author	Title of Books	Publishers
1	Rawson, K.J. & Tupper.	Basic Ship Theory Vol.1 & 2	Longman
2	Edward V. Lewis	Principles of Naval Architecture	SNAME
3	D.J. Eyres.	Ship Construction	Butterworth Heinemann
4	Rawson, K.J. & Tupper.	Basic Ship Theory Vol.1 & 2	Longman

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Baxter, B.	Naval Architecture Examples and Theory	Charles Griffin & Co
2	Taggart	Ship Design and Construction	SNAME
3	NA	Rules for Building and Classing Steel vessels	American Bureau of Shipping
4	NA	Classification of Ship-Rules and Regulation	Lloyd's Register of Shipping.

(CC 602) BUSINESS COMMUNICATION

1. COURSE OBJECTIVES:

The students will able to:

1. use speaking, writing and presentation skills to communicate effectively.
2. develop business etiquettes, manners, grooming and improve personal appearance
3. improve non-verbal forms of communication.

2. TEACHING AND EXAMINATION SCHEME

Semester	VI									
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme				
						Theory Marks		Practical Marks		Total Marks
(CC602) Business Communication		L	T	P	H	TH	TM	TW	PR/OR	
		-	-	2	32	-	-	25	25	50

3.COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CC602.CO1: Apply principles of effective communication in business environment

CC602.CO2: Use ICT in business communication effectively

CC602.CO3: Demonstrate soft skills required in business environment

CC602.CO4: Prepare Technical Writing for various functions of business communication.

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	1	0	1	0	1	2	2	0	1
CO2	2	2	2	1	2	2	3	1	2
CO3	2	2	2	1	2	2	3	1	2
CO4	1	1	1	1	2	3	3	0	3

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Phr = Practicals hours**	**CO = Course Outcomes**		
Unit		**M**	**Phr**	**CO**
1 COMMUNICATION SKILLS AT WORKPLACE			**04**	
1.1 **Principles of communication in business** Importance of communication in a business organization, types of communication (formal and informal Internal and External Communication), Channels of communication: Vertical, Horizontal, Diagonal, Grapevine				CO1 CO2 CO3 CO4
1.2 **Modern Office technology for communication**: email communication and sending text (etiquettes, components, tips for writing effective emails, spellcheck), internet and use of social media for work (to communicate, search for information about suppliers, specifications, networking, quick feedback, e-commerce, video conferencing)				
2 SEMINARS			06	
2.1 **Organization of seminars and workshops** Organizers role: planning, objectives, topic selection, planning the date, time, venue, creating event organization material: creating facebook page, WatsApp group, invitations, advertisement on pamphlet, hand-outs, signage, name badges, registration form, press note, inviting key note speaker, schedule				CO1 CO2 CO3 CO4
2.2 **Presentation** Speakers role: Gathering relevant material, organization of the material, knowing the occasion and audience, preparing handouts for distribution, time management, ,interaction with audience, non-verbal communication. (Checklist of significant aspects of oral presentation to be provided)				
2.3 Role of audience Audience's role: Listening effectively and asking relevant questions, note taking				
3 TECHNICAL WRITING			10	
3.1 Reports **Understanding objective report writing, types of reports, parts of a formal report, illustrations** inspection reports: procedure and format, Project Report				CO1 CO2 CO3 CO4
3.2 Business letters				

Sales letters: parts of sales letter complaint letters: elements of a complaint letter adjustment letters: elements of an adjustment letter			
3.3 Tenders procedure, Preparation, Types of tenders, Single tender, limited tender, Open tenders, government e tender, structure of a tender document, tender notice, terms and conditions, payment details, specification, documents to be submitted, drafting advertisement for tender.			
3.4 Generic notices, notice for meetings: purpose, format of notice for meeting, agenda, quorum and writing minutes			
4 JOB INTERVIEWS		06	
4**.1 Job application and resume** draft job application and resume, draft letter of acceptance and cold contact letter			CO1 CO2 CO4
4. 2 **Job interviews** preparing for job interview, guidelines on facing job interviews, mock interviews			
5 SOFT SKILLS		06	
5.1Business etiquettes Importance of business etiquettes and manners, Tips for good business etiquettes			CO1 CO2 CO3 CO4
5.2 **Nonverbal Communication** grooming, personal appearance, hygiene, deportment and body language			
5.3 **Interpersonal skills** Leadership skills, team work, active listening			
5.4 **Critical thinking** How to improve critical thinking, tips for critical thinking			
Total	**50**	**32**	**-**

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	**Practical**	**Marks 50**
	Practical Title	
1.	Modern office technology	
2.	Seminar	
3.	Technical writing	
4.	Job interviews	
5	Soft skills	
No	**Class room Assignments**	
1	Email communication	
2	Power point presentation	
3.	drafting seminar invites	
4.	Drafting hand outs for seminars	
5	Drafting sales letter	
6	Drafting complaint letters	
7	Drafting adjustment letters	
8	Drafting tender notice	
9.	Filling maintenance reports	
10.	Drafting inspection reports	
11	Drafting abstract	
12	Drafting notice for meetings	
13	Drafting agenda of meetings	
14	Drafting minutes of meeting	
15	Drafting resume and job application	
16	Drafting letter of acceptance	
17	Drafting cold contact cover letter	
18	Group discussions	
19	Debates	
20	Group presentations	

8. LEARNING RESOURCES

8.1 Reference books

S. No.	**Author**	**Title of Books**	**Publishers**
1	P.Prasad, Rajendra k. Sharma	The functional aspects of communication skills	s.k. kataria &sons
2	Pal & Roruallling	Essentials of business communication	Sultan chand & sons
3	Grount Taylor	English conversation practice	Tata MCgraw Hill
4	R.C. Sharma & Krishna Mohan	Business Correspondence & report writing	Tata MCgraw Hill

(SB604) SHIP RESISTANCE & PROPULSION

1. COURSE OBJECTIVES: The course contents are framed to impart knowledge to students to understand the relevance of resistance and propulsion system in ships. The course contents are framed to impart knowledge to students to understand the relevance of resistance, estimate ship resistance, select main propulsion plant based on resistance calculations, known various aspects of resistance and the dependence on hull-form, know different types of propellers and their application, familiarize with propeller data series.

2. PRE-REQUISITES: Knowledge of Maths and science

3. TEACHING AND EXAMINATION SCHEME

Semester VI									
Course code & course title	Periods/Week (in hours)			Total Hours	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
	L	T	P	H	TH	TM	TW	PR/OR	
(SB604 Ship Resistance and Propulsion)	4	0	0	64	75	25	-	-	100

4. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

SB604.CO1: List the terms related to ship propulsion systems.

SB604.CO2: Explain the various ship propulsion systems.

SB604.CO3: Solve the problems related to resistance and powering of ships.

SB604.CO4: Sketch the various components of ship propulsion systems

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	3	3	3	2	0	0	1	1	1
CO2	2	2	2	1	1	1	2	2	1
CO3	3	3	3	2	1	2	3	1	1
CO4	1	2	2	1	0	2	3	2	2

Relationship : Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**M**	**Thr**	**CO**
1 RESISTANCE	24	21	CO1 CO2 CO3 CO4
1.1 Components of resistance: Frictional resistance, wave making resistance, Eddy resistance, viscous pressure drag, air resistance, wind resistance, residuary resistance.			
1.2 Dimensional analysis-Froude's No., Reynold's No.			
1.3 Model testing 1.3.1 Geometric, kinematic and dynamic similarity. 1.3.2 Froude's law of similarity. 1.3.3 Procedure for model testing. 1.3.4 Model ship correlation			
1.4 Estimation of frictional resistance.			
1.5 Calculation of effective power.			
1.6 Shallow water effect.			
1.7 Estimation of resistance from Guldhammer's and Harvald's diagram.			
2 SCREW PROPELLERS	12	11	CO1 CO2 CO3 CO4
2.1 Geometry of propeller- Pitch rake, skew, diameter. Blade sections.			
2.2 Interaction between hull and propeller-wake, slip, thrust deduction.			
2.3 Open water tests and Self-propulsion test.			
2.4 Cavitation.			
2.5 Propeller materials.			
3 POWERING	12	10	CO1
3.1 Effective power, Thrust Power, Delivered power, Shaft Power,			CO2

Brake horse Power, Indicated horse power(IHP), Maximum continous Rating (MCR).			CO3 CO4
3.2 Propulsion efficiencies.			
3.3 Powering calculations.			
4 SPECIAL TYPES OF PROPELLERS	12	10	CO1 CO2 CO3 CO4
4.1 Ducted propellers			
4.2 Vertical axis propellers			
4.3 Controllable pitch propellers			
4.4 Tandem and Contra rotating propellers			
4.5 Super cavitating propellers			
5 STERN GEAR	15	12	CO1 CO2 CO3 CO4
5.1 Stern tube			
5.1.1types of stern tubes			
5.2 A-brackets			
5.3 Reduction and reversing gears.			
5.4 Types of rudders.			
5.4.1 Angle of heel due force exerted on rudder			
5.4.2 Angle of heel while turning			
Total	**75**	**64**	

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies.

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	**Unit**	**Number of lectures**	**Marks**
1	Resistance	21	24
2	Screw propellers	11	12
3	Powering	10	12
4	Types of Propellers	10	12
5	Stern gear	12	15
	Total	64	**75**

9. LEARNING RESOURCESText

Books

S. No.	Author	Title of Books	Publishers
1	Rawson, K.J. and Tupper E.	Basic Ship Theory, Vol I & II	Longman
2	Munro-Smith	Ships and Naval Architecture	Institute of Marine Engineers

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Edward V. Lewis	Principles of Naval Architecture	SNAME
2	A. A. Harvald	Resistance and Propulsion of Ships	Wiley Interscience Publication
3	Baxter, B.	Naval Architecture Examples and Theory	Charles Griffin & Co
4	D.G.M. Watson	Practical Ship Design	Elsevier Ocean Engg. book series

(SB611) MARINE REGULATION

1. COURSE OBJECTIVES: Understanding marine regulations with regards to shipping and shipbuilding industry. Shipping and Shipbuilding are global enterprises involving many nations. Each nation has its own rules and regulations concerning shipping. A commonality of rules and regulations is required for global enterprises to function. The International Maritime Organisation (IMO) is the body that ensures commonality of rules and regulations in the marine field. The member countries of the IMO incorporate the rules and regulations framed by the IMO, in the rules and regulations of their respective countries and set up mechanisms for administering these rules. These rules relate to Safety of ships, ship's personnel and passengers, and the marine Environment. The students should understand this regulatory frame work and the essential features of these rules and regulations.

2. PRE-REQUISITES: Basic knowledge of Ship construction technology, Ship Drawing and Calculation.

3. TEACHING AND EXAMINATION SCHEME

Semester	VI									
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme				
						Theory Marks		Practical Marks		Total Marks
		L	T	P	H	TH	TM	TW	PR/OR	
(SB611) Marine Regulation		3	0	2	80	75	25	25	25	150

4. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

SB611.CO1: Identify the general provisions of Marine regulations.

SB611.CO2: Explain Marine regulatory frame work and the essential features of Marine rules andregulations.

SB611.CO3: Apply these rules for Safety of ships, ship's personnel and passengers, and the marineEnvironment.

SB611.CO4: Interpret the technical implications of Marine rules and regulations in shipbuilding andShipping Industry

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	1	0	0	0	3	0	2	1	0
CO2	1	2	0	0	3	2	2	2	0
CO3	2	3	2	0	3	2	2	2	2
CO4	1	2	0	0	3	2	2	2	2

Relationship : Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**M**	**Thr**	**CO**
1 MARINE REGULATIONS –UNIT 1.	16	10	CO1 CO2 CO3 CO4
1.1 Shipping & Shipbuilding industry (Introductory Lesson) : Explaining functions of the two industries. Interplay among organizations connected with these industries.			
1.2 Functions of Organisations related to Marine Regulations : Introducing Regulatory Organisations such as Classification Socs., IRS, IACS, Flag State, IMO, ILO, Other related Organisations.			
1.3 IMO : Structure, How regulations are made and Implemented. Contents: IMO committees' functions, Conventions, Ratification.			
1.4 Indian Merchant Shipping Act, MS Rules. Implementation . Contents of important Parts of Act., Titles of Rules relevant to Shipbuilding Industry, Process of implementation of IMO and Indian Rules.			
2 MARINE REGULATIONS –UNIT 2. **Load Line Regulations**	12	9	CO1 CO2 CO3 CO4
2.1 Application, and General provisions of the Regulations, Provisions in the Regulations			
2.2 Conditions of Assignment, Various conditions of assignment discussed.			
2.3 Implementation Assignment of Freeboard, Load line Mark explained			
2.4 Surveys. Items of Load line survey discussed.			
3 MARINE REGULATIONS –UNIT 3. **SOLAS**	24	15	CO1 CO2 CO3 CO4
3.1 Part 1 -- Chapter I General provisions General provisions of SOLAS, Chapter demarcations.			
3.2 Chapter II-1 Construction Structure, subdivision and stability, machinery and electrical installations.			

3.3 Chapter II-2 Construction- Fire protection, fire detection and fire extinction.			
3.4 Chapter III – VII Life-saving appliances, Radio communications, Safety of navigation, Carriage of cargoes, Carriage of dangerous goods.			
4 Marine Regulations –Unit 4. **MARPOL**	15	10	CO1 CO2 CO3 CO4
4.1 Annex I Regulations Prevention of Pollution by Oil.			
4.2 Annex II Regulations. Prevention of Pollution by Noxious Liquid Substances in Bulk,			
4.3 Annex II-VI Regulations Prevention of Pollution byHarmful Substances Carried by Sea in Packaged Form, Sewage, Garbage, Air Pollution			
5 MARINE REGULATIONS –UNIT 5. **Two recent IMO regulations.**	8	4	CO1 CO2 CO3 CO4
5.1 Ballast Water Management. Basic provisions of the regulation			
5.2 Recycling of ships Basic provisions of the regulation.			
Total	**75**	**48**	

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	**Unit**	**Number of lectures**	**Marks**
6	Marine Regulations –Unit 1	10	16
7	Marine Regulations –Unit 2	9	12
8	Marine Regulations –Unit 3	15	24
9	Marine Regulations –Unit 4	10	15
10	Marine Regulations –Unit 5	4	8
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Unit	Practical	Marks	CO
1	1	Delineation of processes of Implementation of IMO and Indian Safety regulations,		CO1 CO2 CO3 CO4
2	2	Delineation of the process of Load line Survey		
3	3	Q&A regarding some of SOLAS regulations		
4	4	Q&A regarding some of the MARPOL regulations		
5	5	Summarising "B.W. Management" and "Recycling of ships"		
		Total	25	

10. LEARNING RESOURCESText

Books

S. No.	Author	Title of Books	Publishers
1	D G Shipping	Merchant shipping Rules.	DG Shipping Website
2	IMO	Load line, SOLAS, MARPOL 73/78	IMO
3	IMO	Ballast Water Management. Recycling of ships	IMO Website

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	IMO	LSA Code, FFA Code	IMO

(FB 604) QUALITY CONTROL & INSPECTION

1. COURSE OBJECTIVES :

A technician working in quality control and inspection department must develop quality consciousness in performing his duties. He must be familiar with processes and methods which build quality into his product or service. This course is designed to develop these abilities and skills.

2. PRE-REQUISITES:

Students should know

1. Strength of Material
2. Welding in Ship Construction

3. TEACHING AND EXAMINATION SCHEME

Semester	VI								
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme			
						Theory Marks		Practical Marks		Total Marks
FB604 Quality Control & Inspection		L	T	P	H	TH	TM	TW	PR/OR	
		3	0	2	80	75	25	25	25	150

4. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

FB604.CO1: Acquire the knowledge of quality, quality control, inspection and testing.

FB604.CO2: Use various testing equipment.

FB604.CO3: Select appropriate testing method for required quality parameters of weldedcomponents.

FB604.CO4: Conduct quality checks for welded component.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	3	1	2	1	1	3	3	1	3
CO2	3	3	1	3	1	3	3	2	3
CO3	3	3	2	2	1	3	3	1	3
CO4	3	3	3	3	3	3	3	2	2

Relationship : Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**		
Unit			**M**	**Thr**	**CO**
1 BASIC CONCEPTS OF QUALITY & QUALITY CONTROL					
1.1 Basic concepts of Quality: Definition of quality as fitness for use, Quality characteristic, Parameters of fitness for use: (a) quality of design (b) quality of conformance (c) abilities – availability, reliability & maintainability (d) field service, Factors affecting quality of a product.			6	3	CO1
1.2 Basic concepts of Quality Control: Definition of Control, Regulatory process of control, Definition of Quality control, Basic objectives, Advantages of quality control, Role of technician in promoting quality mindedness among workers and operators.			3	3	CO1
1.3 Broad areas of applications of quality control: incoming materials control, process control, product control.			3	2	CO1
1.4 Approach to solution of quality problems (Briefly): Engineering, Statistical and Management.					CO1
1.5 Quality value, Quality cost, Balance between quality cost and value			3	2	CO1
1.6 Categories of quality cost: prevention, appraisal, internal failure, external failure.					CO1
			15	**10**	
2 QUALITY ASSURANCE					
2.1 Definition			9	6	CO1
2.2 Tools of Quality Assurance (in brief), TQM, ISO 9000, 5S, Quality Circle, Zero defect, 6 sigma, Kaizen					CO1, CO2, CO3, CO4
			9	**6**	
3 INSPECTION					
3.1 Definition and Meaning			3	1	CO1
3.2 Difference between inspection and quality control					CO1
3.3 Aims of inspection			3	1	CO1
3.4 Classifications of inspection:- (i) Based on work performance (ii) Based on location					CO1
3.5 Duties of inspector			6	5	CO1
3.6 Inspection planning					CO1
3.7 Tools of inspection				1	CO1
			12	**8**	

4 DESTRUCTIVE TESTING			
4.1 Tensile Test: Preparation of specimen, Test procedure	6	2	CO1, CO2, CO3, CO4
4.2 Bend test: Purpose, Free bend test, Guided bend test, Transverse bend test, Longitudinal bend test, Side bend test.		2	CO1, CO2, CO3, CO4
4.3 Impact test: Principle, Types of tests: Charpy test & Izod test, Test procedure.	3	2	CO1, CO2, CO3, CO4
4.4 Etch Test: Concept, Etching reagents, Preparation of test specimen, Types of tests: Macro & Micro, Test Procedure.	6	1	CO1, CO2, CO3, CO4
4.5 Nick Break Test: Purpose, Preparation of specimen, Test procedure		1	CO1, CO2, CO3, CO4
4.6 Hardness test: Purpose, Types of tests: Brinell test, Rockwell test & Vikers Hardness test, Test Procedure.		2	CO1, CO2, CO3, CO4
	15	**10**	
5 NON DESTRUCTIVE TESTING			
5.1 Visual Inspection	3	2	CO1, CO2, CO3, CO4
5.2 Acoustic Test / Sound Test			CO1, CO2, CO3, CO4
5.3 Leak Test: Concept, Purpose, Types, Procedure, Water soluble paper test with aluminium foil.	3		CO1, CO2, CO3, CO4
5.4 Magnetic Particle Testing: Principle, Procedure, Magnetising the specimen, Applying magnetic particles, Locating the defects, Advantages, Disadvantages	6	3	CO1, CO2, CO3, CO4

5.5 Dye Penetrant Inspection: Principle, Procedure, Advantages, Disadvantages, Applications, Fluorescent process	6	1	CO1, CO2, CO3,
			CO4
5.6 Ultrasonic Inspections: Principle, Procedure, Advantages, Limitations, Applications		3	CO1, CO2, CO3, CO4
5.7 Eddy Current Testing: Principle, Procedure, Advantages, Limitations, Applications.			CO1, CO2, CO3, CO4
5.8 Radiographic Testing: principle of X-rays, X-ray radiography, Advantages, Disadvantages, Applications, principle of Gamma-rays, Gamma-ray radiography, Advantages, Disadvantages, Applications, Penetrameters.	6	5	CO1, CO2, CO3, CO4
	24	**14**	
Total	**75**	**48**	

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	BASIC CONCEPTS OF QUALITY& QUALITY CONTROL	10	15
2	QUALITY ASSURANCE	6	9
3	INSPECTION	8	12
4	DESTRUCTIVE TESTING	10	15
5	NON DESTRUCTIVE TESTING	14	24
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1	Study of different defects in welded joints.	5
2	Visual Inspection & Sound Test	5
3	Dye penetrant test.	

4	Fluorescent penetrant test	
5	Magnetic particle test	5
6	Tensile tests on welded specimens (Welded by MMAW, GMAW or Gas Welding)	5
7	Bend tests on welded specimen	5
8	Impact tests on welded specimen	
	Total	25

10. LEARNING RESOURCESText Books

S. No.	Author	Title of Books	Publishers
1	J. M. Juran & F. M. Gryna	Quality Planning & Analysis	TATA McGraw-Hill Pub.
2	-----	Metals Handbook ASM, Vol 6	-- -- -

(SB 612) MATERIALS HANDLING AND SAFETY ENGINEERING

1. COURSE OBJECTIVES: The shipbuilding & ship repair industry involves handling of materials at every stage in the form of raw materials, semi finished, and finished products. A student therefore who is involved in such or related industry should have a proper knowledge of the various materials handling methods, material flow storage and warehousing, inventory control, plant layout and related functions. We are also aware that the accident occurring can do immense damage to life and property. So in the safety-engineering topic more stress is given on prevention aspects of accidents, fire fighting equipment, handling of tools and various types of hazards, safety rules etc.

2. PRE-REQUISITES:Engineering Materials

3. TEACHING AND EXAMINATION SCHEME

Semester	**VI**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
SB612 Material Handling & Safety Engineeering		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**-**	**2**	**80**	**75**	**25**	**25**	**25**	**150**

4. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

SB612.CO1: Explain the basic concept of material handling and facility location.
SB612.CO2: Discuss the material handling principles and tools used in inventory management. **SB612.CO3:** Apply the material handling concepts and explain the material handling equipments. **SB612.CO4:** Use safe working practices in material handling environment.

5. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	2	0	0	0	2	2	1	0	0
CO2	2	1	1	0	2	2	2	0	1
CO3	3	1	1	1	2	2	1	1	1
CO4	3	1	1	1	3	2	2	1	2

Relationship : Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**			
Unit 1			**M**	**Thr**	**CO**
Unit 1. **Introduction to Material Handling**			12	7	CO1 CO2 CO3 CO4
1.1 Definition and scope, system concept, Classification of Materials Handling-Unit and Bulk					
1.2 Objectives of material handling. Unit Load concept, Pallets, Skids and Containers.					
1.3 Facility location: Factors for consideration in site selection. Plants Layout and Material Handling					
1.4 Types of Layout, Inter relationship between Plant Layout and Material Handling.					
2 Unit 2: **Flow in Material Handling**			18	12	CO1 CO2 CO3 CO4
2.1 Overall system of material flow cycle. Material Handling Principles. Flow Patterns (vertical flow lines excluded).					
2.2 Designing of Material Flow Pattern. Material Handling equation, advantages of planned material flow.					
2.3 Approach to solve Material Handling problems.					
2.4 Inventory and its Control, Inventory and its functions, need for its controls.					
2.5 significance of EOQ, Selective inventory Control techniques .					
2.6 Materials Management and its objectives, Materials Handling and Productivity.					
Unit 3:**Handling Equipments-Trucks, Conveyors& accessories**			12	8	CO1 CO2 CO3 CO4
3.1 • Industrial Hand Trucks: Basic types, Powered industrial Truck.					
3.2 Forklift, description of forklift, characteristics, application, and Maintenance aspects.					
3.3.Conveyor's-Belt conveyors, Chain conveyors.					
3.4 Wire ropes, Chains, Hooks, Knots, Slings and Grabs, Chain pulley blocks, and sheaves, winches and capstan.					
Unit4. **Handling Equipments-Cranes and Hoists.**			15	10	CO1 CO2 CO3 CO4
4.1 Cranes: Classification, characteristics, description and application of derrick crane, Overhead crane - Bridge crane, Gantry crane .					
4.3 Hoists: Manually operated, Electric power operated hoist, limit switches and overload limit device.					
Unit **5 Safety Engineering** cycles			18	11	CO1 CO2 CO3 CO4
5.1 Safety Laws and Role of Factory Inspector, Regulating bodies OSHA, ANSI, etc. Risk Assessment.					
5.2 First Aid, Artificial respiration. Personal Protective equipment.					
5.3 Hazards and its types Machine Hazards. Noise and control of noise, Dust Control. Hazards in welding & gas cutting operation..					
5.4 Fire hazards, extinguishers, prevention of fire, types of fires.					

5.5 Pressure vessel hazards, safety precautions in Marine Boilers			
5.6 Electrical hazards and safety requirements.Chemical hazards			
5.7 House Keeping, Insurance coverage. Working in confined spaces and common explosions.			
5.8 Definition of Accident. Causes and costs, types of accidents, Accident report and Analysis .Safety Awareness			
Total	75	48	

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No.	Unit	Number of Lectures	Marks
1	Introduction to Material Handling	07	12
2	Flow in Material Handling	12	18
3	Handling Equipments-Industrial trucks, conveyors &Acessories.	08	12
4	Handling Equipments-Cranes and hoists	10	15
5	Safety Engineering	11	18
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks	CO
1.	Assignment on accidents and accident Report.		CO1
2	Assignment on Safety Laws and Role of Factory Inspector		CO2
3	Presentation on First Aid and artificial respiration		CO3
4	Assignments of Hazards and their types.		CO4
5	Common accidents and Insurance coverage in Shipyards.		
	Total	25	

10. LEARNING

RESOURCES Text Books

Sr.No.	Author	Title of book	Publication
1	S. C. Sharma	Material Handling and Material Management	Khanna Publishers
2	Meinsdroft	Industrial Safety	Prentice Hall
3	R. B. Chowdary& G.R.N. Tagore.	Material Handling Equipment	Khanna Publishers

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	James M. Apple	Material Handling System Design	John-Willlwy and Sons Publication, NewYork.
2	Saxena A. N	Industrial Safety	National Productive council New Delhi

(MC 403) MECHATRONICS

1. COURSE OBJECTIVE: To understand the applications of Mechatronics in Automation.Modern industry demands lot of flexibility in product design and manufacturing processes. While satisfying this need industries cannot afford to compromise with quality, cost and delivery schedule. The area of Mechatronics has a tremendous potential to address such challenges by integrating Mechanical engineering with electrical, Electronics and software components. We can hardly find any field wheremechatronics is not applicable. Basic knowledge of this course will definitely enhance the employability of pass-out students in various engineering areas.

2. PRE-REQUISITES: Elements of Electrical and Electronics Engineering,

3. TEACHING AND EXAMINATION SCHEME

Semester	**VI**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(MC 403) Mechatronics		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**-**	**2**	**80**	**75**	**25**	**25**	**25**	**150**

4. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

MC403.CO1: Identify basic elements of mechatronic systems.

MC403.CO2: Select basic types of sensors and actuators.

MC403.CO3: Experiment with simple circuit on Arduino board.

MC403.CO4: Develop simple ladder programs on PLC.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	3	2	1	0	0	0	0	0	1
CO2	3	2	1	3	0	0	0	0	1
CO3	3	3	3	3	1	1	2	0	0
CO4	3	3	3	3	1	1	2	0	1

Relationship : Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**			
Unit			**M**	**Thr**	**CO**
1. Introduction to Mechatronics			**9**	**4**	**CO1**
1.1 Introduction to Mechatronics and its scope.					
1.2 advantages and disadvantages of mechatronics.					
1.3 Comparison between Traditional and Mechatronics system					
1.4 Two types of Mechatronic systems – (i)Measurement type and (ii) Control type; Elements of Measurement system (Block diagram) and examples, Elements of Open loop & Closed loop Control systems (Block diagrams) and examples; Applications of Mechatronics.					
1.4 Case studies of Mechatronics systems: - (i) Measurement type - Digital thermometer (ii) Control type- Engine Management system, Automatic Washing Machine,					
2. Sensors and Transducers			**18**	**12**	**CO2**
2.1 Introduction of sensors and Transducers, Difference between sensor and transducer.					
2.2 Performance Terminology related with sensor, 2.2.1 Static characteristics - range and span, error, accuracy, sensitivity, repeatability, stability, resolution. 2.2.2 Dynamic characteristics - response time, settling time.					
2.3 Classification of sensors- A) Based on type of Output- (i) Analog (ii) Digital B) Based on need of external power: – (i) Active (ii) Passive C) Based on sensed parameter: – (i) Pressure, Force (ii) Temperature (iii) Motion (displacement, Velocity, Acceleration) (iv) Flow and level (v) light (vi) smoke (vii) Colour (viii) touch (ix) Humidity (x) Proximity (xi) Infrared (IR)					
2.4 Working principle and application of following sensors / Transducers: - **(i)** Potentiometer (ii) Strain gauge (iii) Linear Variable					

Differential Transformer (LVDT) (iv) Optical Encoder (v) Photoelectric Proximity sensor (vi) Tach generator (vii) Thermocouple (viii) RTD sensor.			
2.5 Selection criteria for sensors.			
2.6 Signal Conditioning – need, process, functions, ADC and DAC. Block diagram of DAQ.			
3. Actuations Systems	15	10	**CO2**
3.1 Introduction and Classification of Actuators.			
3.2 Pneumatic Actuation System: Basic Elements of Pneumatic System. Hydraulic Actuation Systems: Basic Elements of hydraulic system.			
3.2 Working principle, schematic diagram and symbols of following: - Valves: - Direction control valves (Spool type) - 3/2 DC Valve and 5/2 DC Valve; actuation methods of DC Valves; Check valve, Pressure relief valve, Flow control Valves.			
3.3 Cylinders: - Single Acting and Double acting cylinder. Rotary Actuators: - Gear motors and Vane Motors.			
3.4 Electrical Actuation systems: - Switching devices: Relays, Solenoid type devices: Solenoid valves, Drive systems: Stepper Motor and servo motor (Brief Working with neat sketches).			
4. Microcontroller	15	12	**CO3**
4.1 Microcontroller: - Introduction, characteristics, classification and applications, Basic Block diagram. Introduction to Arduino platform.			
4.2 Atmel ATmega328 microcontroller: - Pin layout and other features. Arduino UNO R3 Board: - Hardware, main features, input output pins, powering, IDE and its installation, connecting to computer, program (sketch) compilation and uploading,			
4.3 Introduction to basic Arduino circuit components: – LED, Resistor, Diode, Bread Board, Jumper, Button, Servo, LCD, LDR, IR			

LED, Relay.			
4.4 Writing, compiling, uploading and running following programs: – Digital output (LED blinking), Analog output (LED fading).			
4.5 Arduino applications- Home and Industry automation, Robotics and control systems.			
5. Programmable Logic Controller (PLC)	18	10	**CO4**
5.1 Introduction to PLC: Need for PLC, Definition, Advantages and disadvantages of PLC, PLC sizes.			
5.2 Criteria for selection of PLC.			
5.3 PLC system layout (Basic block diagram). Input/output processing. PLC function and operation.			
5.4 ladder programming: Concept of Ladder Diagram, sequence of ladder programming, logic functions, use of latching, internal relays, timers, counters in elementary level Ladder diagrams like motor start and stop, water level control, Output interlock, logic functions.			
Total	**75**	**48**	

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures hrs	Marks
1	Introduction of Mechatronics	04	09
2	Sensors and Transducers	12	18
3	Actuations Systems	10	15
4	Microcontroller	12	15
5	Programmable Logic Controller (PLC)	10	18
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	**Experiment on sensor trainer to understand working and application of different Sensors used in Automated System.** For example - Temperature sensor, Pressure sensor, Flow sensor, level sensor, proximity sensor. Force sensor Etc.	
2.	**Identification, working of different actuating elements:** Relay, solenoid valve, stepper motor, Servo motors, valves, cylinders etc	
3 & 4	**III) Experiment to build any two simple Pneumatic circuits.**	
5,6,7	**Any three experiments on Arduino Board.** **For example-** i) Blinking and fading effects on LED ii) Turn on LED with button iii) Move the Servo to commanded angle iv) Print "Hallo world" in LCD v) Using a sensor	
8,9,10	**Any three experiments on PLC trainer by developing ladder diagram:** **For example-** i) Output interlock ii) Logic Functions iii) Timers and Counters iv) Water Level control v) Conveyor Belt control vi) Traffic Light control	
11	**Demonstration and working of any Mechatronic system.**	
	Total	**25**

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	W. Bolton	Mechatronics	Pearson Education Ltd
2	John W. Webb	Programmable Logic Controller	PHI
3	Andrew Parr	Hydraulics and Pneumatics	JAICO
4	Massimo Benzi	Make: Getting Stareted with Arduino	Maker Media

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	R. K. Rajput	Mechatronics	S. Chand Publications
2	K.Shanmugasundaram	Hydraulic and Pneumatic Conrols	S. Chand
3	K.P. Ramachandran	Mechatronics	Wiley

AUDIT COURSE

(AC102) INDIAN CONSTITUTION

1. COURSE OBJECTIVES:

As a proud citizen of this country every student must be aware about the Indian Constitution to appreciate the provisions available for the people of this biggest democracy in Indian Constitution so that the youth of this country plays active role in development of the country by participating in the formation of sensitive and proactive Government at national and state level.This course intends to make students aware about various constituents of the Indian Constitution.

2. TEACHING AND EXAMINATION SCHEME

Semester	VI							
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme		
						Theory Marks	Practical Marks	Total Marks
(AC102) Indian Constitution		L	T	P	H	TH	TM	TW
		2	-	-	32	-	-	-

3. Course Content

Unit 1 – The Constitution - Introduction • The History of the Making of the Indian Constitution • Preamble and the Basic Structure, and its interpretation • Fundamental Rights and Duties and their interpretation • State Policy Principles
Unit 2 – Union Government • Structure of the Indian Union • President – Role and Power • Prime Minister and Council of Ministers • Lok Sabha and Rajya Sabha
Unit 3 – State Government • Governor – Role and Power • Chief Minister and Council of Ministers • State Secretariat

Unit 4 – Local Administration • District Administration • Municipal Corporation • Zila Panchayat
Unit 5 – Election Commission • Role and Functioning • Chief Election Commissioner • State Election Commission

4. Suggested Learning Resources:

Title of Book Author Publication
1. Ethics and Politics of the Indian Constitution Rajeev Bhargava Oxford University Press, New Delhi,2008
2. The Constitution of India B.L. Fadia Sahitya Bhawan; New edition (2017)
3. Introduction to the Constitution of India DD Basu Lexis Nexis; Twenty-Third 2018 edition

5. Suggested Software/Learning Websites:

a. https://www.constitution.org/cons/india/const.html
b. http://www.legislative.gov.in/constitution-of-india
c. https://www.sci.gov.in/constitution
d. https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-ofindia/

(SB701) ELEMENTARY SHIP DESIGN

1. COURSE OBJECTIVES: The course contents are framed to impart knowledge to students to be ableto produce the preliminary design of a ship. The course content is designed to enable the students to understand design features of various ships, factors influencing design, rules and regulations of statutory bodies. The design stages in Ship design process as considered in Design spiral to be explained to the students.The students should also be introduced to submission drawing like General Arrangement, Freeboard Calculation and Tonnage Calculations. They should also be explained about Specifications and Contracts prepared during preliminary stage.

2. PRE-REQUISITES: Knowledge of Maths, Science, Basic ship theory, and marine engineering.

3. TEACHING AND EXAMINATION SCHEME

Semester VII									
Course code & course title	Periods/Week (in hours)			Total Hours	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
	L	T	P	H	TH	TM	TW	PR/OR	
(SB701 Elementary Ship Design)	5	0	0	80	75	25	-	-	100

4. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

SB701.CO1: Identify the stages and components of concept and preliminary design of ships. **SB701.CO2:** Explain the stages and components of concept and preliminary design of ships. **SB701.CO3:** Solve the problems related to concept and preliminary design of ships.

SB701.CO4: Prepare the plans associated with concept and preliminary design of ships.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	2	3	2	0	1	1	2	3	0
CO2	2	2	1	0	2	1	1	1	0
CO3	2	2	3	0	1	2	2	2	0
CO4	2	1	1	0	3	1	2	1	0

Relationship : Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | Thr = Teaching hours | CO = Course Objectives			
Unit	**M**	**Thr**	**CO**
1 FACTORS IN CONCEPT DESIGN	09	10	CO1 CO2 CO3 CO4
1.1 Specific design features of different types of ships,			
1.2 Trading patterns, Owner's requirement.			
1.3 Ship Design Data.			
1.4 Specification and contracts.			
2 PRELIMINARY DESIGN	33	34	CO1 CO2 CO3 CO4
2.1 Design spiral			
2.2.1 Determination of main dimensions: Dimensional Relations and ratios.			
2.2.2 Design categories- Deadweight carrier, volume carrier, displacement equation, volume equation and displacement coefficient.			
2.2.3Checking of preliminary dimensions for deadweight.			
2.3 Estimation of form coefficients and hydrostatic particulars.			
2.4.1 Lightship Weight and Machinery Weight estimation.			
2.4.2 Light ship mass-Steel mass, outfit mass, engine plant mass, power estimation, Admiralty coefficient.			
2.5 Estimation of cargo capacity.			
3.FREEBOARD & TONNAGE CALCULATIONS	12	13	CO1 CO2 CO3 CO4
3.1Freeboard			
3.1.2Load Line rules, Load Line marking.			
3.1.3Types of freeboards.			
3.1.4Calculations of freeboard and freeboard corrections.			
3.2 GRT and NRT.			
3.2.1Enclosed spaces and Exempted spaces.			

3.2.2 Tonnage rules and certificate.			
4 GENERAL ARRANGEMENT& MACHINERY SELECTION	12	13	CO1
4.1 General Arrangement			CO2
4.1.1Introduction.			CO3
4.1.2Factors influencing the general arrangement			CO4
4.1.3Location of cargo spaces ,and machinery spaces			
4.1.4 Cargo spaces.			
4.1.5 Machinery spaces.			
4.1.6 Crew, passenger accommodation, and galley, safety regulations.			
4.1.7 Passages and Stairs			
4.2 Machinery Selection			
4.2.1 Introduction and criteria for choosing the main engine			
4.2.2 Selection of Main engine types such as slow-speed diesels, Medium-speed diesels & High-speed diesels.			
4.2.3Selection of Auxiliary Power.			
4.2.4 List of other engine room auxiliaries and equipment.			
4.2.5 Fuel economy through Ship Design-introductory concept.			
5 STABILITY AND TRIM REQUIREMENTS & SAFETY PLANS	09	10	CO1
5.1 Merchant ship stability standards			CO2
5.2 Intact stability standards			CO3
5.3 Trim and stability booklets (Trim fully loaded and Ballast trim)			CO4
5.4 Fire Protection: Zones, A class divisions, Means of escape and fire detection and extinguishing rules.			
5.5 Life Saving Appliances: Passenger Ship Requirements and Cargo Ship requirements			
Total	**75**	**80**	

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies.

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	**Unit**	**Number of lectures**	**Marks**
1	Factors in concept design	10	09
2	Preliminary design	34	33
3	Freeboard Calculations & Tonnage Calculations	13	12
4	General arrangement & Machinery Selection	13	12
5	Stability and Trim Requirements & Safety Plan	10	09
	Total	**80**	**75**

9. LEARNING RESOURCESText

Books

S. No.	Author	Title of Books	Publishers
1	Munro-Smith.	Elements of Ship Design	IME, London
2	D.G.M. Watson	Practical Ship Design	Elsevier Ocean Engg. book series

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	H. Schneekluth	Ship design for Efficiency & Economy	Butter Worths
2	John Comstock	Principles of Naval Architecture	SNAME
3	Taggart	Ship design and construction	SNAME

(SB704) COMPUTER APPLICATION IN SHIP DESIGN

1. COURSE OBJECTIVES: The course contents are framed to impart introductory knowledge to students about modern ship design process using computers. The course content is designed to enablethe students to have introductory knowledge of modern ship design process using computers which will help students to appreciate the latest technology developed in Ship design. The students will be introduced to Ship Design software for basic design and detailed design.

2. PRE-REQUISITES: Knowledge of Maths, Science, Basic ship theory, and Marine engineering.

3. TEACHING AND EXAMINATION SCHEME

Semester VII									
Course code & course title	Periods/Week (in hours)			Total Hours	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
	L	T	P	H	TH	TM	TW	PR/OR	
(SB704) Computer Application In Ship Design	0	0	4	64	-	-	50	50	100

4. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

SB704.CO1: Understand the basic and detail design of hull structure and outfitting of a ship. **SB704.CO2:** Calculate the parameters of detail design of hull structure and outfitting of a ship. **SB704.CO3:** Solve numerical on basic and detail design of Hull structure.

SB704.CO4: Prepare the detail design of hull structure and outfitting of a ship using software.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	2	3	2	-	1	1	2	3	-
CO2	2	2	1	-	2	1	1	1	-
CO3	2	2	3	-	1	2	2	2	-
CO4	2	1	1	-	3	1	2	1	-

Relationship : Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Pract= Practical hours** | **CO = Course Objectives**			
Unit	**M**	**Pract hrs**	**CO**
1 HULL FORM DESIGN	-	01	CO1 CO2 CO3 CO4
1.1 Sectional Area Curve.			
1.2 Development of Sectional area curve from main particulars.			
1.3 Modification of sectional area curve of the basis ship.			
1.4 Development of lines from sectional area curve.			
2 MODIFICATION OF HULL FORM	-	01	CO1 CO2 CO3 CO4
2.1 Modification of sectional area curve of the basis ship			
3.USE OF SOFTWARE IN BASIC DESIGN (HULL FORM DEVELOPMENT)	-	01	CO1 CO2 CO3 CO4
3.1 Development of Hull forms.			
3.1.1 Defining hull geometry			
3.1.2 Various forms of data input for hull form generation			
3.1.3 Generation of curves and surfaces			
3.1.4 Producing output (numerical and graphics reports).			
3.1.5 Interactive development of hull form using basic parameters			
4.USE OF SOFTWARE IN BASIC DESIGN (HULL FORM ANALYSIS)	-	01	CO1 CO2 CO3 CO4
4.1 Determination of Hydrostatic data, intact and damaged stability using ship design software			
4.2 Computation of capacities			
4.3 Computation of Hydrostatics			
4.4 Computation of Intact Stability			
4.5 Computation of damage stability			

5.USE OF SOFTWARE IN DETAIL DESIGN	-	60	CO1 CO2 CO3 CO4
5.1 Detailed design of basic structural sub-assemblies.			
5.2 Detailed design of Hull and Piping components.			
5.3 Generation of database of hull components and use of the same for detail design.			
5.4 Generation of production documents using ship design software.			
Total	-	**64**	

7. COURSE DELIVERY:

The Course will be delivered through Laboratory interactions, exercises and case studies.

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks	CO
1.	Assignment on Hull form generation & Modification.		CO1 CO2 CO3 CO4
2.	Assignment on double bottom- 3D detailed model/drawing		
3.	Assignment on Bulkhead drawing and midship drawing		
4.	Assignment on Outfitting – 3D pipe modeling.		
	Total	**50**	

9. LEARNING RESOURCESText

Books

S. No.	Author	Title of Books	Publishers
1	Rawson, K.J. & Tupper.	Basic Ship Theory Vol.1 & 2	Longman
2	Edward V. Lewis	Principles of Naval Architecture	SNAME

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	H. Schneekluth	Ship design for Efficiency & Economy	Butter Worths
2	John Comstock	Principles of Naval Architecture	SNAME
3	Taggart	Ship Design and Construction	SNAME

(SB703) SHIPBUILDING PROJECT

1. COURSE OBJECTIVES: The course content is designed to enable the students to identify a shipbuilding problem. Solution of a problem involves definition of problem, background data toanalyse the problem, analysis of data, alternative solution and positive solution with conclusion.

2. PRE-REQUISITES: Knowledge of Maths, Science, Basic ship theory, and Marine engineering.

3. TEACHING AND EXAMINATION SCHEME

Semester VII									
Course code & course title	Periods/Week (in hours)			Total Hours	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
	L	T	P	C	TH	TM	TW	PR/OR	
(SB703) Shipbuilding Project	0	0	6	96	-	-	100	50	150

4. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

SB703.CO1: Identify the problem based on knowledge of theory concepts learnt in earlier semesters
SB703.CO2: Analyze and Solve the problem. **SB703.CO3:** Draft

the solution in-terms of report. **SB703.CO4:** Develop technical

and management skills.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	2	2	1	1	1	2	1	1	1
CO2	2	1	2	1	1	2	1	1	2
CO3	2	1	2	1	1	2	2	2	2
CO4	1	1	1	1	2	3	2	1	2

Relationship : Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Pract= Practical hours** | **CO = Course Objectives**			
Unit	**M**	**Pract hrs**	**CO**
1 TYPE OF PROJECT		05	**CO1 CO2 CO3 CO4**
1.1 Deciding on choosing a topic whether Study / Construction Activity / Design or Any other related to Shipbuilding.			
2 MAIN OBJECTIVE & DATA GENERATION	-	10	
1.1 Identifying a problem .			
1.2Method to be followed to develop the solution.			
1.3Feasibility of the project.			
1.4Summarizing of Literature/ Trends survey and Data.			
3.PROBLEM STATEMENT	-	15	
3.1 Defining the problem statement.			
3.2 Predicting solutions to be problems.			
4.WORKDONE IN THE PROJECT	-	30	
4.1 Data accumulation, calculations, drawings.			
4.2Review of first Presentations			
4.2Review of Second Presentations			
4.2Outcome of the Project.			
5.REPORT WRITING	-	20	
Total	-	**80**	

7. COURSE DELIVERY:

The Course will be delivered through Laboratory interactions, exercises and case studies.

(CC601) INDUSTRIAL ORGANISATION AND MANAGEMENT

1. COURSE OBJECTIVES:

Management is the basic need of any organization. Organization consists of multiple activities which are to be systematically managed for effective output. The course covers various principles related to organization and management. The areas covered are finance, human resource, project management etc. After completion of the course, the student will be acquainted with management and other related aspects so that he/she will be able to apply this knowledge in order to achieve the organizational goals.

2. TEACHING AND EXAMINATION SCHEME

Semester VII	Periods/ Week (in hours)			Total Hours	Examination Scheme				
Course Code & Course Title					Theory Marks		Practical Marks		Total Marks
CC601 Industrial Organisation and Management	L	T	P	H	TH	TM	TW	PR/OR	100
	3	-	-	48	75	25	-	-	

3. COURSE OUTCOMES

On successful completion of the course, the student will be able to:

CC601.CO1: Describe types of business organizations.

CC601.CO2: Apply the principles of managing Men, Machines, and Materials in an industry.

CC601.CO3: Evaluate financial status of an industrial organization.

CC601.CO4: Develop problem solving skills in project management**.**

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	2	0	0	0	0	1	0	0	2
CO2	2	1	1	1	1	2	2	0	3
CO3	3	2	1	2	3	3	2	0	3
CO4	3	3	2	2	2	3	3	2	3

Relationship: Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS/ MICRO-LESSON PLAN

M=Marks | **Thr= Teaching hours** | **CO= Course Outcomes**			
Unit	**M**	**Thr**	**CO**
1. Business Organization **1.1** Types of business organizations: Individual proprietorship, Partnership, Joint Stock Companies: Private Ltd and Public Ltd, Co-operative societies, Public sector **1.2** Structure of business organization: Line organization, Functional organisation, Line and staff organization, Project organization	**10**	**6**	CO1 CO2
2. Business Management **2.1 :** Concept of management and administration, management as an art and science, evolution and growth of scientific management- contribution of F.W Taylor. **2.2** Basic functions of management: planning, organizing, staffing, directing, controlling. Other functions: forecasting, coordinating and decision- making. **2.3** Functions in Industry: Basics of procuring, store- keeping, material handling, production, packing and forwarding, marketing and sales, supervision, research and development. **2.4** Supervisory skills required in industry	**16**	**9**	CO1 CO2 CO3
3. Basics of Finance **3.1** Sources of finance **3.2** Cost Concepts: Necessity of costing, elements of cost: material, Labour and expense; prime cost, overhead cost, total cost, break- even analysis. **3.3** Materials management: Inventory control-standard order, reserve stock, reorder point, lead time. Economic order quantity, ABC Analysis. Introduction to Just in time (JIT) system **3.4** Depreciation: Definition and causes. Methods of calculating depreciation charges: Straight Line Method, Diminishing Balance Method, Sinking Fund method **3.5** Obsolescence- definitions and reasons. **3.6** Introduction to GST.	**18**	**13**	CO1 CO2 CO3 CO4

4. Human Resource Management **4.1** Functions of Personnel Department**:** Human resource planning, selection and recruitment, training, promotion and transfer, welfare of employees. **4.2** Industrial Relations**:** Employer-employee relations, trade union, settlement of disputes of employees, collective bargaining, conciliation, arbitration, grievance handling mechanism. **4.3** Wages and Incentives**:** Factors influencing wages, types of wage plans – time rate and piece rate, Incentive – objectives and types, individual and group incentive plan, characteristics of a good wage or incentive plan, difference between incentive and wage. **4.4** Industrial Acts: Introduction to the following Industrial Acts: Industrial Disputes Act 1947/1956; The Indian Factories Act 1948 The Workmen's Compensation Act 1923	**21**	**14**	CO1 CO2 CO3 CO4
5. Project Management **5.1** Introduction to Project Management **5.2** Network Analysis (Introduction to basic concepts with simple problems) CPM- Critical Path Method: Definition, network diagrams, critical path, advantages PERT- Programme Evaluation and Review Technique: Definition, network diagrams, advantages. Comparison of PERT and CPM.	**10**	**6**	CO1 CO2 CO3 CO4
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**Business Organization**	**6**	**10**
2	**Business Management**	**9**	**16**
3	**Basics of Finance**	**13**	**18**
4	**Human Resource Management**	**14**	**21**
5	**Project Management**	**6**	**10**
	Total	**48**	**75**

8. LEARNING RESOURCES

Text Books

S.No	Author	Title of Book	Publisher
1	O.P. Khanna	Industrial Engineering and Management	DhanpatRai Publications
2	T.R.Banga ,S.C. Sharma	Industrial Organisation and Engineering Economics	Khanna Publishers
3	Awate,Chunawala, Patel,Bhandarkar, Sriniwasan	Industrial Organisation and Management	Vrinda Publication
4	MartandTelsang	Industrial Engineering and Production Management	S.Chand& Company Ltd

(SB711) MARINE STRUCTURAL DESIGN

1. COURSE OBJECTIVES: The theory course content is framed to impart knowledge elementary knowledgeof Marine structure design to the students. A general survey carried out to determine the competencies required by a diploma in Shipbuilding Engineering student revealed that the student should have an elementary knowledge of Marine structure design. The knowledge that he acquires in this subject is essential for the shipbuilders. In view of this emphasis has been laid on topics like structural analysis of fixed and continuous beams, design of joints, stress analysis of mid-ship section.

2. PRE-REQUISITES: Strength of Material, Basic ship theory-II.

3. TEACHING AND EXAMINATION SCHEME

Semester	**VII**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(SB711) Marine Structural Design		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**-**	**2**	**80**	**75**	**25**	**25**	**25**	**150**

4.COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

SB711.CO1: Define the various terms and methods used in marine structural design

SB711.CO2: Explain the different loads and stresses induced in marine structures.

SB711.CO3: Solve the problems related to marine structures.

SB711.CO4: Prepare graphical representation of loads and stresses.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	2	0	1	2	1	1	2	1	0
CO2	2	3	2	3	1	1	2	2	0
CO3	2	3	3	2	1	1	3	2	1
CO4	1	2	2	3	0	1	3	1	2

Relationship: Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**			
Unit			**M**	**Thr**	**CO**
1 Introduction			**10**	**08**	CO1 CO2 CO3 CO4
1.1 General consideration in design					
1.2 General procedure in design					
1.3 Classification of structural analysis					
1.4 Ship load and stresses					
1.5 Failure mode of ship's structures					
1.6 Factor of safety and general consideration in selecting factor of safety					
1.7 Theories of failures					
2 Fixed and Continuous Beam			**20**	**14**	CO1 CO2 CO3 CO4
2.1 Factors governing the design of Beams-bending moment, shear force, deflection, web buckling and web crippling.					
2.2 Determination of fixed end moments for the beams carrying point loads and U.D.L. on full and part span.					
2.3 Construction of shear force diagrams and bending moment diagram of fixed beam.					
2.4 Statically Indeterminate Beams.					
2.5 Clapeyron's three moment method					
2.6 Construction of shear force diagrams and bending moment diagram of continuous beam.					
3 Stresses in Ship Structure			**15**	**10**	CO1 CO2 CO3 CO4
3.1Section modulus of mid-ship section about centroidal axis					
3.2 Bending stresses in ship structure due to horizontal and vertical bending moment at even keel					
3.3 Bending stresses in ship structure due to horizontal and vertical bending moment when heeled					
3.4 Deflection of ship's hull girder					
3.5 Double integration method					
3.6 Deflection at any point along the length of the ship					
4 Bolted and Welded connections			**15**	**08**	CO1 CO2
4.1 Types of Bolts, Permissible stresses in bolts. Advantages and					

Disadvantages of bolts, Bolts of uniform strength. High strength bolts			CO3 CO4
4.2 Design of Axially loaded bolts,			
4.3 Design of Eccentrically loaded bolts with moments in the plane and perpendicular the plane of the bolts.			
4.4 Types of weld, weld size, throat thickness, effective length, overlap of weld, weld symbols, permissible stresses in welds.			
4.5 Strength of welded joint, determination of weld length, minimum length of weld for Axially loaded welded joints			
5 Introduction to Finite Element Method	**15**	**08**	CO1 CO2 CO3 CO4
5.1 Characteristics of FEM			
5.2 Fundamentals of FEM			
5.3 Procedure of FEM and Application of FEM			
5.4 Mesh Division and Degrees of Freedom			
5.5 Loading and Supporting Condition			
Total	**75**	**48**	

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Introduction	08	10
2	Fixed and Continuous Beams	14	20
3	Stresses in Ship Structures	10	15
4	Bolted and Welded connections	08	15
5	Introduction to Finite Element Method	08	15
	Total	48	75

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1	Bending moment and Shear force diagram of Fixed beams	
2	Bending moment and Shear force diagram of continuous beams	
3	Stress distribution at mid-ship section	
4	Design of bolted joints	
5	Design of welded joints	
	Total	25

11. LEARNING RESOURCESText

Books

S. No.	Author	Title of Books	Publishers
1	Yasuhisa Okumoto, Yu Takeda,	Design of ship hull structures	Springer
2	S. Ramamurutham	Strength of Materials	Dhanpat Rai & Sons
3	F.L. Singer	Strength of Materials	London Harper and Row
4	-	Strength of Materials	Schaum Series
5	Timoshenko and Gere	Mechanics of materials	CBS Publishers and distributors New Delhi.

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Bhavikatti S S	Strength of Materials for Polytechnic	Vikas
2	Bhandari V. B.	Design of Machine Elements	Mcgraw Hill
3			

Indian and International codes needed

S. No.	Author	Title of Books	Publishers
1	Mahadevan K.	Design data handbook	CBS Publisher
2			

Internet and Web Resources

S. No.	Author	Title of Books	Publishers
1		www.nptel.ac.in	MHRD
2		www.machinedesign.top	

(SB712) DIESEL ENGINE OPERATION & MAINTENANCE

1. COURSE OBJECTIVES: To have thorough knowledge of the operation and maintenance of the most widely used prime mover, the diesel engine. The course content is designed for students to specialize in heat power engineering and to have thorough knowledge of the operation and maintenance of the diesel engine. The course provides for familiarization with the various applications of diesel engine, engine systems and role of maintenance associated with them. Wide range of actives vis-à-vis operations of diesel engine are also covered in this course. The course aims at providing a brief introduction to various maintenance strategies and thorough knowledge about troubleshooting and over hauling of diesel engines.

2. PRE-REQUISITES: Basic Engineering Practice, Introduction to Thermodynamics.

3. TEACHING AND EXAMINATION SCHEME

Semester VII									
Course code & course title	Periods/Week (in hours)			Total Hours	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
SB712 Diesel Engine operation & maintenance	L	T	P	H	TH	TM	TW	PR/OR	
	3	-	2	80	75	25	25	25	150

4. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

SB712.CO1: Identify the particulars related to operation and maintenance of the diesel enginesystems.

SB712.CO2: Explain methods associated to operation and maintenance of the diesel engine systems.

SB712.CO3: Analyse the areas needing repair in the diesel engine systems.

SB712.CO4: Sketch the details related to operation and maintenance of the diesel engine systems.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	2	1	2	2	2	1	2	0	2
CO2	2	1	2	2	2	1	2	0	2
CO3	2	2	2	2	2	2	2	0	3
CO4	2	2	2	2	2	2	2	0	3

Relationship : Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**			
Unit			**M**	**Thr**	**CO**
1 DIESEL ENGINE SYSTEMS			**15**	**9**	CO1 CO2 CO3 CO4
1.1 Air intake system.					
1.2Super-charging,scavenging					
1.3 Cooling system. Methods of piston cooling.					
1.4 Lubricating properties,need for oil change,Multigrade oil. Lubricating System,need for oils.					
1.6 Cylinder Lubrication.					
1.7 Fuel systems types,Systemrequirements,fuel line priming,fuel oils..					
1.9 Starting Systems					
2 DIESEL ENGINE OPERATION			18	12	CO1 CO2 CO3 CO4
2.1 Starting of diesel engines					
2.2 Operating parameters,precautions to be taken. Maintaining records					
2.4Opration of Fuel Injector,Opreration of a Governor,Operation of Fuel Pump and Turbocharger .					
2.4.1Attached pump, gear pump					
2.5 Crankcase ventilation,crank-case explosion					
2.6 Scavenge fire,Cylinder relief valve					
2.7 Engine cut-out due to lubricating oil, cooling temperature and overspeed control					
3 DIESEL ENGINE MAINTENANCE			16	10	CO1 CO2 CO3 CO4
3.1Maintenance strategies,preventive maintenance checks					
3.2Standard maintenance,Predictive Maintenance – concept and implementation.					
3.3Trouble shooting chart ,Engine tune up					

3.4Need for overhauling, diagnosis before overhauling.			
Unit 4. **Tools & spares**	8	5	
4.1 Tools used such as Torque wrench spanners, feeler gauges, dial, gauges, bore gauges, piston expander			
4.2 Service and parts catalogues			
5 ENGINE OVERHAULING AS APPLICABLE TO MEDIUM SPEED 4 STROKE ENGINE	18	12	CO1 CO2 CO3 CO4
5.1 Assembly and dismantling of Cylinder head			
5.2 Rocker arm-valve assembly.			
5.3 Piston- connecting rod assembly.			
5.4 Inspection of cylinder block, Liners.Crankshaft,Main bearings, Piston and rings, Valves.			
5.5 Salvaging of worn out components. Crankshaft grinding, line boring,honing, valve lapping.			
5.6 Safe working practices.			
5.7 Commissioning of overhauled engine.			
Total	**75**	**48**	

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies.

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Diesel engine systems	09	15
2	Diesel engine operation	12	18
3	Diesel engine maintenance	10	16
4	Tools & spares	05	08
5	Engine overhauling as applicable to medium speed 4 stroke engine	12	18
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks	CO
1	Dismantling and assembly of Diesel Engine		CO1 CO2 CO3
2	Study/inspection for defects of engine components.		
3	Demonstration/construction/testing of a fuel injector.		

4	Engine tune-up : Adjustment of valve tappet clearance.		CO4
6	Demonstration of the use of hand tools like torque wrench etc.		
	Total	25	

LEARNING RESOURCESText Books

S. No.	Author	Title of Books	Publishers
1	Kirpal Singh	Automobile Engg.	Standard Publishers
2	D. A. Taylor.	Int. to Marine Marine	Elsevier, Delhi
3	Mathur& Sharma	A course in internal combustion engine	DhanpatRai Publications

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Boyce Dwiggins	Automobile Repair Guide	Taraporewala, Mumbai
2	A.J. Wharton.	Diesel Engines	Elsevier, Delhi

(FB714) OFF SHORE STRUCTURES

1. COURSE OBJECTIVES :

New commercial sources of energy and minerals critical to human existence are being sought from the oceans due to the depletion of conventional land- based resources. Through this course students will learn the various aspects of ocean environment, types of offshore structures, materials and equipments used for construction. The installation of submarine pipeline used for transfer of oil &gas will be studied along with the repair works.

2. PRE-REQUISITES: Students should know

1. Strength of material
2. Welding in Ship Construction
3. Ship Construction Technology
4. Ship Repair Engineering

3. TEACHING AND EXAMINATION SCHEME

Semester	VII								
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme			
						Theory Marks		Practical Marks		Total Marks
FB714 Off Shore Structures		L	T	P	H	TH	TM	TW	PR/OR	
		3	-	2	80	75	25	25	25	150

4. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

FE614.CO1: State the different types of off shore structures, buoyancy principles, materials and methods of fabrication in marine environment.

FE614.CO2: Understand the ocean environment, installation of pipelines process underwater

FE614.CO3: Choose appropriate method for laying pipelines and for erection ofoff shore structures

FE614.CO4: Undertake repair and maintenance work underwater

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	2	1	1	1	-	-	-	2	3
CO2	1	2	2	1	-	2	2	1	3
CO3	1	2	2	1	-	2	1	2	3
CO4	1	2	1	1	2	1	2	1	2

Relationship : Low-1 Medium-2 High

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**M**	**Thr**	**CO**
1 OCEAN RESOURCES			
Minerals – poly metallic nodules, placer deposits, oil and gas, gas hydrates	4	2	CO1
2 OCEAN ENVIRONMENT			
Waves- wave height , wave period, wave direction, design wave height	8	5	CO2
Tides- different tide levels			
Currents- Variation of currents with depth.			
Wind- Variation of Wind speed and direction, wind speed during cyclones.			
Seabed characteristics- brief note on marine geotechnical investigations, geophysical survey, drilling and sampling procedures, in situ testing techniques.			
Temperature and salinity variations with dept.			
3. TYPES OF OFFSHORE STRUCTURES INCLUDING BASIC DESIGN CRITERIA			
Exploratory drilling structures- Jack –up-rigs, semi- submersibles, drill ships, Productions platforms- fixed structures (gravity and piled)- compliant structures (TLP and articulated tower) Single point mooring system; Mention of forces acting on the structures .	16	12	CO3
4. SUBMARINES PIPELINES	8	5	
Installation methods- Lay barge method, reel barge method, tow method, pipeline trenching methods- Jetting method, mechanical cutting, fluidization method, plowing method.			CO3
5.. EQUILIBRIUM OF FLOATING BODIES			

Archimedes Principle; Buoyancy centre of Buoyancy- Metacentre- Type of equilibrium of floating body- maximum length of body floating in water, Numerical problems.	12	8	CO1
6. MATERIALS AND FABRICATION IN MARINE ENVIRONMENT			
Steel structures for offshore environment – types of steel and its strength requirements , fabrication and welding details- erection of structural steel- coatings and corrosion protection- Non –destructive testing of weld, concrete mixes and their proportion concept of pre- stressed concrete- placing of concrete-curing. Causes failure and of structures.	12	8	CO4
7. CONSTRUCTION TECHNOLOGY			
Marine operations- cranes-barge-derrick barges-jack-up barge, launch barges: Installation of offshore structure- steel jackets- removal of jacket from barge lifting and launching – Installation of the sea floor; Driving and underwater works: underwater concreting and grouting: Repair and maintenance of offshore structures, Repair methods- surface welding, hyper- baric welding, mechanical connectors, full encirclement sieves, flexible pipe repair .	15	8	CO3 , CO4
Total	75	48	-

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Ocean Resources	2	4
2	Ocean Environment	5	8
3	Types Of Offshore Stuctures Including Basic Design Criteria	12	16
4	Submarines Pipelines	5	8
5	Equilibrium Of Floating Bodies	8	12
6	Materials And Fabrication In Marine Environment	8	12
7	Construction Technology	8	15
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	Rotary drilling rig and its components Power system- Hoisting system- Circulating system- Well- controlled equipment, Auxiliaries	
2	Preparing the layout drawings of different offshore platforms	
	Total	25

10. LEARNING RESOURCES

Text Books

Sr. No.	Author	Title of Books	Publishers
1	Ben C. Gerwick Jr.	Construction of marine and offshore structures	A Wiley Interscience publications, John Wiley & Sons, New York Chichester Brishare, Toronto Singapore.
2	F.L.L.B Carneiro	Offshore Structure Engg-I	Gulf Publishing Co. Book Division, Houston, London, Paris, Tokyo.
3	F.L.L.B Carneiro	Offshore Structure Engg-II	Gulf Publishing Co. Book Division, Houston, London, Paris, Tokyo.
4	Charkraba rti, S.K. 1987	Hydrodynamics of offshore structures	Coputational Mechanics Publications, Southampton, Boston, 440p
5	Dawson. T.H. 1983	Offshore structural engineering	Prentice Hall Inc., Englewood Cliffs, new Jersey 346p
6	DNV,1977	Rules for the design construction and inspection of offshore structures	Det Norske Ventas, Norway,67p
7	Graff, W.J. 1981	Introduction to offshore structures: Design, fabrication, Installation.	Gulf Publishing Company, Honston, USA,345 p
8	Khurmi, R. S.1983	A textbook of Applied Mechanics	S. Chand & Company, New Delhi, 669p
9	Mousselli , A. H, 1981	Offshore pipeline design, analysis and methods	Penn well Books, Pennwell publishing Company, Oklahoma, 193 p
10	Poulos, H.G. ,1988	Marine Geotechnics	Unwin Hyman, London, UK, 473 p

(SB723) DEFENCE SHIP CONSTRUCTION

1. COURSE OBJECTIVE: The Government of India has initiated a much needed emphasis on being 'ATMANIRBHAR', including in the field of defense production. Many shipyards, which earlier primarily catered for commercial ship building, are gearing up for defense ship production.

This course content is designed as an elective subject for students of the VII semester of Ship building Engineering, who have a basic knowledge of merchant ships and are conversant with commercial ship construction. The aim of this course is to introduce to these students different types of warships and basic consideration for design, arrangement of spaces, special features of structural arrangement and arrangement of propulsion systems. The students will also be introduced to the special features of piping systems, outfit items, and various fighting equipment fitted on modern warships. It is intended that after this course, the students would be able to appreciate the rigors of stringent quality assurance measures followed in construction of warships and would be better prepared for initiation into shipyards building defense ships, and related industries.

2. PRE-REQUISITES: Knowledge of Ship Construction Technology, Marine Engineering I.

3. TEACHING AND EXAMINATION SCHEME:

Semester	**VII**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(SB 723) Defence Ship Construction		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**0**	**2**	**80**	**75**	**25**	**25**	**25**	**150**

4. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

SB723.CO1: Identify the various components of defence ship structure and outfitting.

SB723.CO2: Understand the function of defence ship structure and outfitting. **SB723.CO3:** Explain the constructional aspects of defence ship structure and outfitting. **SB723.CO4:** Sketch the various components of defence ship structure and outfitting.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	2	1	1	-	1	1	1	2	1
CO2	3	1	2	-	1	2	2	2	2
CO3	3	1	2	1	1	2	2	2	1
CO4	3	2	1	2	1	2	2	2	2

Relationship: Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**M**	**Thr**	**CO**
1 INTRODUCTION TO DEFENCE SHIP CONSTRUCTION	21	14	CO1, CO2, CO3 CO4
1.1 Functions - Merchant ships vs Defence ships.			
1.2 Types of Defence ships.			
1.3 General features of surface warships.			
1.4 Procurement process of Indian Naval ships.			
1.5 Shipyard infrastructure, functions and systems - Important differences in building Defence ships from building Merchant ships.			
1.6 Quality Control, Cleanliness, Safety, Security.			
2 GENERAL ARRANGEMENTS AND STRUCTURE OF SURFACE SHIPS	18	11	CO1, CO2, CO3 CO4
2.1 Typical arrangements and spaces in Surface ships			
2.2 Design rules- Definition of terms used in design.			
2.3 Damage stability considerations.			
2.4 Loads for structural design.			
2.5 Materials in defence ship construction.			
3 OUTFITTING	15	10	CO1 CO2 CO3 CO4
3.1 Deck Outfitting.			
3.2 Anchoring arrangement.			
3.3 Piping Systems.			

3.3 HVAC.			
3.4 Fighting outfit.			
4 PROPULSIVE MACHINERY ARRANGEMENTS	15	10	CO1 CO2 CO3 CO4
4.1 Various arrangements of propulsive machinery.			
4.2 Gas turbines.			
4.3 Gears and shafting.			
4.4 Shock loading			
5 STEALTH FEATURES	06	03	CO1 CO2 CO3 CO4
5.1 Radar signature.			
5.2 Acoustic signature.			
5.3 Mechanical vibration signature.			
5.4 Infrared heat (IR) signature.			
5.5 Electro-magnetic signature.			
Total	**75**	**48**	

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	**Unit**	**Number of lectures**	**Marks**
1	Introduction to defence ship construction	14	21
2	General Arrangements and structure of Surface ships	11	18
3	Outfitting	10	15
4	Propulsive machinery arrangements	10	15
5	Stealth Features	03	06
	Total	**48**	**75**

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

The assignment are designed to reinforce the learning of various topics taught in the theory classes.

No	Unit	Practical	Marks	CO
1	1	Types of defence ships, Delineating the features of any one specific type.		CO1 CO2 CO3 CO4
2	2	Drawing profile of a Defence surface ship showing arrangement of spaces.		
3	3	Describing with a sketch any one item of outfit.		
4	4	Explaining one propulsive machinery arrangement with a sketch.		
5	5	Explaining categories of stealth features.		
		Total	25	

10. LEARNING RESOURCESText

Book

S. No.	Author	Title of Books	Publishers
1	R. Taggart.	Ship Design & Construction	SNAME

(SB713) SHIPYARD PRACTICE

1. COURSE OBJECTIVE: The theory course content is framed to impart sufficient knowledge of general aspects of construction as outlined in Shipbuilding Engineering Course. The course contentis designed for students to understand the general aspects of construction as outlined in Shipbuilding Engineering Course. It is designed for students to understand fairing of lines, the subsequent marking and cutting of plates and the production practices followed in a Shipyard including safety aspects. The students should know the installation and testing of various ship's machinery, equipment & systems carried out during construction phases. The students should knowlaunching arrangements and test & trials during and on completion of hull construction.

2. PRE-REQUISITES: Knowledge of Ship Construction Technology, Ship Drawing and Calculation.

3. TEACHING AND EXAMINATION SCHEME:

Semester VII									
Course code & course title	Periods/Week (in hours)			Total Hours	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
	L	T	P	H	TH	TM	TW	PR/OR	
(SB 713) Shipyard Practice	3	0	2	80	75	25	25	25	150

4. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

SB713.CO1: List the activities carried out in a shipyard.

SB713.CO2: Explain methods of construction of ships, machinery installation ,launching

an

drecognize safety aspects.

SB713.CO3: Apply the various construction and installation techniques for ships structure,machinery and equipment.

SB713.CO4: Sketch the details related to shipyard works.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	2	0	2	2	1	2	2	2	2
CO2	2	1	1	2	1	2	3	2	2
CO3	2	1	2	3	1	1	3	1	3
CO4	2	1	1	0	3	3	2	1	2

Relationship: Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**M**	**Thr**	**CO**
1 HULL CONSTRUCTION & APPLICATION OF WELDING	32	20	CO1, CO2, CO3 CO4
1.1 Fairing of lines, shell expansion and shell development .			
1.2 Marking, cutting (Manual and Computer aided). Plate preparation, template making, Construction of skids. Prefabrication, Block construction and advanced outfitting.			
1.3 Erection of blocks on Building berth/ in building dock /on an inclined slipway.			
1.4 Assessment of weights and position of C.G. of prefabricated units			
1.5 Sequences of erection, alignment and welding, consolidation by welding, & tests.			
1.6 Pre-launching activities and Launching of hull.			
1.7 Basics of FRP hull construction.			
2 MACHINERY INSTALLATION & ALIGNMENT	18	12	CO1, CO2, CO3 CO4
2.1 Stern gear and rudder gear installation and alignment			
2.2 Machinery installation,			
2.3. Installation of steering gear.			
2.4. Main propulsion shafting and engines alignment			
3 MACHINERY AND SHIP TRIALS	13	08	CO1 CO2 CO3 CO4
3.1 Process for launching of ships.			
3.2 Dock trials			
3.3 Inclining experiment			
3.3 Sea trials and delivery.			

4 PLANNING IN SHIPYARDS	06	04	CO1 CO2 CO3 CO4
4.1 Application of Flow-chart, Bar chart.			
4.2 Application of PERT, CPM.			
4.3 Procurement of materials and scheduling.			
5 SAFETY ASPECTS	06	04	CO1 CO2 CO3 CO4
5.1 Personal Protective equipment.			
5.2 Hazards and its types Machine Hazards, Pressure vessel hazards, Hazards in welding & gas cutting operation, Electrical hazards and safety requirements, Chemical hazards and Fire hazards.			
5.3 House Keeping.			
5.4 Working in confined spaces and common explosions.			
Total	**75**	**48**	

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	**Unit**	**Number of lectures**	**Marks**
6	Hull Construction & Application of Welding	20	32
7	Machinery Installation & Alignment	12	18
8	Machinery and Ship Trials	08	13
9	Planning in Shipyards	04	06
10	Safety Aspects	04	06
	Total	**48**	**75**

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Unit	Practical	Marks	CO
1	1	Example of Fairing of lines.		CO1 CO2 CO3 CO4
2	1	Preparation of Shell Expansion plan		
3	2	Rudder and stock Calculations		
4	3	Assignment on Sea Trails		
5	4	Specimen of flow chart, bar chart – PERT & CPM		
		Total	25	

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	D. A. Taylor	Merchant Ship Construction	Buttersworth Hienemann
2	John P. Comstock	Principles of Naval Architecture	SNAME
3	D.J Eyres	Ship Construction	Elsevier

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	R. Taggart.	Ship Design & Construction	SNAME
2	Hogg, Robert S.	Naval Architecture and Ship Construction	Institute of Maritime Engineers

(SB714) MARINE DRAWING PRACTICE

1. COURSE OBJECTIVE: The course content is designed to enable the students to sketch simple views of machine parts. The course content is designed to introduce the students to some of the many engineering components, learning to sketch them and prepare assembly drawing. These drawings thus help to represent the proper working relationships of the several components of a structure or mechanism.

2. PRE-REQUISITES: Knowledge of Maths, Science, Marine Engineering,

3. TEACHING AND EXAMINATION SCHEME

Semester VII									
Course code & course title	Periods/Week (in hours)			Total Hours	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
SB714 Marine Drawing Practice	L	T	P	H	TH	TM	TW	PR/OR	
	3	-	2	80	75	25	25	25	150

4. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

SB714.CO1: Recognize features of a machine.

SB714.CO2: Sketch intersection details of joints.

SB714.CO3: Sketch sectional view of simple isometric/3D objects.

SB714.CO4: Relate to assembly drawing of marine components in isometric/orthographic sectionsand demonstrate free hand sketching of keys, nuts, couplings and similar marine components.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	2	1	1	1	1	1	1	1	0
CO2	2	1	1	1	1	1	2	3	0
CO3	2	1	1	1	1	1	2	3	0
CO4	1	1	1	1	1	2	2	3	0

Relationship :Low-1 Medium-2 High-3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**M**	**Thr**	**CO**
1 INTRODUCTION TO MACHINE FEATURES	**15**	**10**	CO1 CO2 CO3 CO4
1.1 Conventional representation of common machine features.			
1.2 To draw hexagonal headed, square headed bolt and nut.			
1.3Using approximate method to draw the teeth profile of a spur gear, and spring.			
2 INTERSECTION OF SURFACES	12	08	CO1 CO2 CO3 CO4
2.1Intersection of surfaces.			
2.2Importance of intersection of objects, drawing intersection of cylinder with cylinder to represent pipe joints.			
2.3Development of pipe bend/elbow			
3 SECTIONAL VIEWS	**15**	**10**	CO1 CO2 CO3 CO4
3.1 Sectional views.			
3.2 Types: Full section, Half section, Offset section, Partial section, Removed section, Aligned section.			
3.3 Sectional view of simple isometric/3D objects.			
4 ASSEMBLY DRAWING	**25**	**16**	CO1 CO2 CO3 CO4
4.1Assembly drawing: Introduction and importance.			
4.2Choosing appropriate scale to draw assembly drawing full section front view of parts shown in Orthographic section.			
4.2.1Non return valve.			
4.2.2Stuffing box.			
4.2.3 Footstep bearing,IC engine piston (trunk type).			
4.2.4 IC engine piston (trunk type).			
4.3Drawing of full sectional front view assembly of parts shown disassembled in isometric sections.			
4.3.1Bilge suction strainer.			
4.3.2Sealed Ball joint			
4.3.3Gear pump.			
4.3.4Cylinder Relief valve.			
5 FREE HAND SKETCHING	**08**	**04**	CO1 CO2 CO3 CO4
5.1 Keys –Sunk taper key, Saddle key, Woodruff key , Spline shaft.			
5.2Joints- Socket and spigot joint, Universal coupling.			
5.3Washers, eye bolt, cup headed bolt, stud, castle nut, eye foundation bolt.			
Total	**75**	**48**	

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
6	Introduction to Machine features.	10	15
7	Intersection of surfaces.	08	12
8	Sectional views	10	15
9	Assembly drawing	16	25
10	Free hand sketching	04	08
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Number of lectures	Marks	CO
1.	Assignment to draw spur gear profile.	06		CO1 CO2 CO3 CO4
2.	Assignment on Intersection of two cylinders.	08		
3.	Assignment on sectional views.	06		
4.	Full sectional F.V. Assembly drawings.	08		
5.	To prepare free hand sketches	04		
	Total	32	25	

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	R. V. Mali B. S. Chaudhari	Mechanical Engineering Drawing	Vrinda Publication
2	N. D. Bhatt	Machine Drawing	Charotar Publishing House
3		Reeds Engineering Drawing for Marine Engineers.	

(MC601) MACHINE DESIGN

1. COURSE OBJECTIVES:

To enable the student to design and draw simple machine components used in small- and large-scale industries. To recall fundamental knowledge of applied Mechanics, Strength of Materials, Engineering Materials and Theory of Machines in designing simple machine parts and also to develop analytical abilities to give solutions to engineering design problems.

2. TEACHING AND EXAMINATION SCHEME:

Semester VII									
Course code & course title	Periods/Week (in hours)			Total Hours	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
MC601 Machine Design	L	T	P	H	TH	TM	TW	PR/OR	
	4	-	2	96	75	25	25	25	150

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

MC601.CO1: Recall the design procedures, design fundaments, modes of failures and steps indesign & selection of simple machine parts, Shafts, keys, Couplings, Power Screws, Springs, fasteners & antifriction bearings.

MC601.CO2: Demonstrate the steps in design & selection of simple machine parts, Shafts, keys, Couplings, Power Screws, Springs, fasteners & antifriction bearings.

MC601.CO3: Use design data books and different codes of design for designing machine components.

MC601.CO4: Design and prepare part assembly drawings of simple machine parts, Shafts, keys,Couplings & Power Screws.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	2	1	1	1	1	1	2	1	1
CO2	3	2	3	2	2	1	2	1	2
CO3	3	2	2	3	2	1	2	0	1
CO4	3	3	3	2	2	2	2	1	0

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Outcomes**			
Unit 1	**M**	**Thr**	**CO**
Introduction to Design	**12**	**10**	
1.1 Machine Design philosophy and procedures			CO1 CO2
1.2 General Considerations in Machine Design, Factor of safety and factors governing the selection of factor of safety			
1.3 Fundamentals: - Types of loads, concept of stress, strain, Stress-Strain Diagram for ductile and brittle materials, Types of Stresses, such as Tension, Compression, Shear, Bearing Pressure Intensity, Crushing, Bending and Torsion, creep Strain and Creep Curve			
1.4 Fatigue, S-N curve, Endurance limit			
1.5 Stress Concentration- Causes & Remedies Properties of Engineering Materials, Designation of materials as per IS and introduction to International Standards & advantages of Standardization, use of design data book, use of standards in design and preferred numbers series.			
1.7 Theories of Elastic Failures-maximum Principal Stress theory and maximum shear stress theory.			
Unit 2	**M**	**Thr**	**CO**
Design of simple machine parts	12	08	CO1 CO2 CO4
2.1 Cotter joint, knuckle joint			
2.2 Design of levers: -Right angled Bell crank Lever			
2.3 Design of C- Clamp, Off-set links, arms of pulley.			
Unit 3	**M**	**Thr**	**CO**
Design of Shafts, keys and Couplings, Power Screws, Springs and fasteners	42	36	CO1 CO2 CO3 CO4
3.1 Types of shafts, Shaft materials, Standard sizes			
3.2 Design of shafts (Hollow and solid) using strength and rigidity criteria			
3.2 ASME code of design for line shafts supported between bearings with one or two pulleys in between.			
3.3 Design of sunk keys, Effect of keyways on strength of shaft			
3.4 Design of couplings- Muff coupling, Protected type Flange Coupling.			
3.5 Thread Profiles used for Power Screws, relative merits and demerits of each			
3.6 Torque required to overcome thread friction, self-locking and overhauling conditions.			
3.7 Efficiency of power screws, types of stresses induced			
3.8 Design of Screw Jack (limited to screw, nut, Head & lever)			

3.9 Classification and applications of springs, Spring-Terminology, Materials and specifications. Stresses in springs, Wahl's correction factor, Deflection of springs, Energy stored in springs			
3.10 Design of Helical tension and compression springs subjected to uniform applied loads Leaf springs-construction and application			
3.11 Stresses in Screwed fasteners, bolts of uniform strength.			
3.12 Design of bolted joints subjected to eccentric loading.			
3.13 Design of parallel and transverse fillet welds, axially loaded unsymmetrical section, Merits and Demerits of screwed and welded joints.			
Unit 4	**M**	**Thr**	**CO**
Antifriction bearings	04	05	CO1 CO3
4.1 Classification of bearings-Sliding contact and rolling contact			
4.2 Terminology of Ball bearings- life load relationship, basic static load rating and basic dynamic load rating, limiting speed. Selection of ball bearings using manufacturer's catalogue.			
Unit 5	**M**	**Thr**	**CO**
Ergonomics & Aesthetic of design	05	05	CO1 CO3
5.1 Ergonomics of design- Man-Machine relationship. Design of Equipment for control, environment & safety.			
5.2 Aesthetic considerations regarding shape, Size, color & surface finish.			
Total	**75**	**64**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Introduction to Design	10	12
2	Design of simple machine parts	08	18
3	Design of Shafts, keys and Couplings, Power Screws, Springs and fasteners	36	42
4	Antifriction bearings	05	04
5	Ergonomics & Aesthetic of design	05	05
	Total	64	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical (pract no 1,2, 5 ,6 and any one of 3 or 4).	Marks
1.	Assignment on selection of materials for given applications [at least five applications should be covered] using design data book. List the mechanical properties of material selected. **2 Hrs**	03
2.	Problems on design of simple machine parts like Cotter Joint, Knuckle Joint, Bell Crank Lever, off – Set link, Arm of Pulley (One example on each component) with free hand sketches. **8 Hrs**	05
3.	Design Project: Observe the system where transmission of power takes place through shaft, Keys, coupling, pulley and belt drive. Get the required information regarding power transmitted (power output by motor or engine etc.). By selecting suitable materials, design the shaft, key and coupling. Also select suitable Ball Bearing from Manufacture's catalogue. Prepare design report and assembly drawing indicating overall dimensions, tolerances, and surface finish. Also prepare bill of materials. (Activity should be completed in a group of five to six students) **8 Hrs**	08
4.	Design a power screw & draw its assembly drawing **4 Hrs**	08
5.	Assignments on design of Helical Springs, Screwed joints, Welded joints [one each] with free hand sketches. (numerical problems) **2 Hrs**	04
6.	CAD Drawing of minimum one machine component designed in practical No 2 should be prepared and print out should be attached along with respective drawing sheets. **8 Hrs**	05
	Total	25

9.

10. LEARNING RESOURCES

10.1 Text Books

S. No.	Author	Title of Books	Publishers
1	R.S.Khurmi, J.K.Gupta	A Textbook of Machine Design	S. Chand ,2014
2	V.B.Bhandari	Introduction to Machine Design	Tata Mc. Graw Hill,2002
3	R.K.Jain	Machine Design	Khanna Publications, 1998
4	Pandya & Shah	Machine Design	Dhanpat Rai & Sons, 1992
5	PSG Coimbtore	Design Data Book	PSG Coimbtore ,2000

AUDIT COURSE

AC101 ESSENCE OF INDIAN KNOWLEDGE AND TRADITION

Course Objective:

This course aims at imparting basic principles of thought process, reasoning and inferencing by human being. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature. Holistic life style of Yogis, science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.The course thus focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view, basic principles of Yoga and holistic health care system.

2. TEACHING AND EXAMINATION SCHEME

Semester	VI							
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme		
						Theory Marks	Practical Marks	Total Marks
(AC101) Essence of Indian Knowledge and Tradition		L	T	P	H	TH	TM	TW
		2	-	-	32	-	-	-

Course Content :

Basic structure of Indian Knowledge system:
(i) , (ii) (, , ,), (iii) (, , , , ,), (iv) (, , ,)
Modern Science and Indian Knowledge SystemYoga and Holistic Health Care
Case studies.

References:

S. No.	Title of Book	Author	Publication
1.	Cultural Heritage of India-Course Material	V. Sivaramakrishna	Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2.	Modern Physics and Vedant	Swami Jitatmanand	Bharatiya Vidya Bhavan
3.	The wave of Life	Fritzof Capra	
4.	Tao of Physics	Fritzof Capra	
5.	Tarkasangraha of Annam Bhatta, Inernational	V N Jha	Chinmay Foundation, Velliarnad, Amaku,am
6.	Science of Consciousness Psychotherapy and Yoga Practices	RN Jha	Vidyanidhi Prakasham, Delhi, 2016

(TR801) INPLANT TRAINING PHASE II

1. COURSE OBJECTIVE: The training imparted through this course should be such that the theory learned during first 7 semesters of Shipbuilding Engineering can be linked with the Industrial practices and the outcome of the inplant training should aid in enhancing students employability in industry. objective of the training is to correlate theory and practice and make the students employable in industry. Through training the students will be able to get hands on experience in the various job activities associated with ship construction, ship repair and obtain practical knowledge and experience in the installation, operation and maintenance of marine machinery. The infrastructure, equipment and practices of the ship building industry are unique and the training would enable the students to acquaint themselves with these and relate them to the theory learnt. The students will be exposed to industrial environment, obtain experience in working under factory discipline, associate with workers and understand their psychology and work habits.

2. PRE-REQUISITES: Knowledge of core subjects of Naval Architecture, Marine Engineering and ship structure.

3. TEACHING AND EXAMINATION SCHEME

Semester **VIII**						
Course code & course title	**Total Weeks**	**Examination Scheme**				
		Termwork Marks		**Practical Marks**		**Total Marks**
(TR801) Inplant Training Phase II	**21 Weeks**	**Presentation**	**Daily Dairy**	**Report**	**Orals**	
		50	50	50	50	**Grade**

4. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

TR801.CO1: Identify the layout of the yard, facilities and infrastructure, types of ships underconstruction.

TR801.CO2: Distinguish functioning of various shipbuilding departments and processes in theindustry.

TR801.CO3: Prepare technical documents related to the work undertaken or observed.

TR801.CO4: Relate and reinforce knowledge of theory concepts learnt in earlier semesters withpractical work at industry.

5. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	3	2	1	2	2	2	3	2	2
CO2	2	0	0	1	1	2	2	1	3
CO3	2	0	2	0	0	2	2	2	2
CO4	2	0	0	1	0	2	2	2	2

Relationship : Low-1 Medium-2 High-3

6. DETAILED CONTENTS

Unit	**CO1 CO2 CO3 CO4**
1 SHIPYARD PRACTICES	
1.1 Material estimation	
1.2 Work scheduling	
1.3 Material planning	
1.4 Material procurement	
1.5 Project management	
1.6 Quality control	
1.7Compliance with statutory requirements and classification society.	
2 FABRICATION	
2.1 Stockyard	
2.2 Steel preparation operation	
2.3 CNC steel cutting operation,	
2.4 Marking system of plates,	
2.5 Assembly	

2.6 Recording of weights.
3 OUT-FITTING
3.1 Engine Room machinery installation and alignment
3.2 Commissioning of machinery and machinery trials
3.3 Deck machinery installation
3.4 Commissioning and trials.
4 LAUNCHING
4.1 Launching calculation
4.2 Preparation for launching
4.3 Pre-launching checks
4.4 Precaution at launching & launching ceremonies
4.5 Types of launching, their advantages and disadvantages.
5 SHIP REPAIR
5.1 Survey of hull
5.2 Renewal of wasted areas
5.3 Preparation of templates
5.4 Welding procedures
5.5 Propeller, rudder and shaft survey
5.6 Repair procedure
5.7 Machinery removal and replacement after repairs
5.8 Overhauling of pumps ,pipe and valves,

7. DAILY DAIRY: The students are required to maintain a daily diary as a day to day record of their attendance at the factory, indicating clearly the activities/jobs performed by them during the day. End of the training the daily dairy needs to be submitted for evaluation by the faculty.

8. REPORT: Doing the daily diary, the students will prepare a report detailing all the jobs activities performed at the yard and in full detail the specific projects undertaken by them. The report will also cover the layout of the yard, facilities and infrastructure, types of ships under construction, etc. The report is to be in typed format complete with illustrations and drawings.

9. GRADING

Grade	Marks
A	>270
B	Between 240 to 269
C	Between 210 to 239
D	Between 180 to 209
E	Between 150 to 179
F	Between 120 to 149
Fails	<120