VELS

INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)
(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)
PALLAVARAM - CHENNAI
NAAC ACCREDITED WITH 'A' GRADE
Marching Beyond 25 Years Successfully

B. Tech.
Naval Architecture and Offshore Engineering

Curriculum and Syllabus
(Based on Choice Based Credit System)
Effective from the Academic year
2018-2019

Department of Naval Architecture and Offshore Engineering

School of Ocean Engineering

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

PEO1: Build their career as a successful and distinguished Naval Architect or Offshore Engineer

PEO2: Pursue higher education and research in Marine sector, other engineering streams and specializations

PEO3: Acquire innovative and creative thinking skills to augment their professional growth

PEO4: Nurture in design, analysis and implementation skills to innovation technology in Naval Engineering with global context.

PEO5: Develop the awareness among the students about the various social responsibilities related to Engineering ethics and human values with ecological.

PROGRAM OUTCOME (PO)

PO1: **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: **Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

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

PO8: **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO1: Be able to acquire core Naval Engineering knowledge and able to solve industrial as well as societal problems with ethical and environmental consciousness.

PSO2: Be well versed in the various Offshore structures and Subsea systems with specific areas like Risers, Mooring Lines, Pipelines, etc.

PSO3: Be competent in the fundamentals of ship design, ship production, seakeeping and Maneuvering and Demonstrate knowledge on the decommissioning of ships and offshore structures

PSO4: Discuss the advancements in the Offshore Structural Engineering, like operation in ultra-deep waters, Arctic sea conditions.

PSO5: Be able to build the nation, by imparting technological concepts and tools on emerging fields through the Managerial and entrepreneurs' skills.

BOARD OF STUDIES

S. No	NAME	AFFILIATION	ROLE
1.	Mr. T S Arvind Kishor,	HOD(i/c), Dept of Naval Architecture and Offshore Engineering	Chairperson
2.	Mr. S Mathivanan	Assistant Manager & Lead	Expert member
3.	Mr. R Soundarapandian	HOD (i/c), Petroleum Engineering	Internal Member
4.	Dr. T Ilango	HOD, Civil Engineering	Internal Member
5.	Dr. S Paulraj	HOD, Physics	Internal Member
6.	Dr R. Krishnakumar	HOD, Electrical and Electronics Engineering	Internal Member
7.	Mr. G.K. Duraimurugan	Assistant Professor	Internal Member
8.	Mr. P Deepak	Assistant Professor	Internal Member

Curriculum

VELS INSTITUTE OF SCIENCE TECHNOLOGY & ADVANCED STUDIES, CHENNAI

SCHOOL OF OCEAN ENGINEERING

B. TECH - NAVAL ARCHITECTURE & OFFSHORE ENGINEERING

Total Number of Credits: 170

Category	Code	Title of Course	Hours/Week			Credits	Maximum Marks		
			Lecture	Tutorial	Practical		CA	SSE	Total
SEMESTER 1									
HSC	18ETN001	English	2	0	0	2	40	60	100
BSC	18ETN002	Physics (Oscillation, Waves and Optics)	3	1	0	4	40	60	100
BSC	18ETN003	Mathematics – I (Calculus and Linear Algebra)	3	1	0	4	40	60	100
ESC	18ETN004	Basic Electrical Engineering	3	1	0	4	40	60	100
ESC	18ETN005	Engineering Graphics & Design	1	0	4	3	40	60	100
BSC	18ETN006	Physics Lab	1	0	3	2	40	60	100
ESC	18ETN007	Electrical Engineering Lab	0	0	2	1	40	60	100
HSC	18ETN008	English Lab	0	0	2	1	40	60	100
Total			13	3	11	21	40	60	100

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SCHOOL OF OCEAN ENGINEERING

B. TECH - NAVAL ARCHITECTURE & OFFSHORE ENGINEERING

Category	Code	Title of Course	Hours/Week			Credits	Maximum Marks		
			Lecture	Tutorial	Practical		CA	SSE	Total
SEMESTER 2									
BSC	18ETN009	Chemistry	3	1	0	4	40	60	100
BSC	18ETN010	Mathematics – II (Probability and Statistics)	3	1	0	4	40	60	100
ESC	18ETN011	Programming for Problem Solving	3	0	0	3	40	60	100
BSC	18ETN012	Chemistry Lab	0	0	4	2	40	60	100
ESC	18ETN013	Programming for Problem Solving Lab	0	0	4	2	40	60	100
ESC	18ETN014	Workshop/Manufacturing Practices	1	0	4	3	40	60	100
Total			10	2	12	18	40	60	100

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SCHOOL OF OCEAN ENGINEERING

B. TECH - NAVAL ARCHITECTURE & OFFSHORE ENGINEERING

Category	Code	Title of Course	Hours/Week			Credits	Maximum Marks		
			Lecture	Tutorial	Practical		CA	SSE	Total
SEMESTER 3									
BSC	18ETN015	Mathematics – III (Fourier Series and Transformations)	3	0	0	3	40	60	100
ESC	18ETN016	Fluid Mechanics	3	0	0	3	40	60	100
ESC	18ETN017	Engineering Mechanics	3	0	0	3	40	60	100
PCC	18ETN018	Basic Ship Theory	3	0	0	3	40	60	100
PCC	18ETN019	Fundamentals of Offshore Structures	3	0	0	3	40	60	100
PCC	18ETN020	Marine Engineering	3	0	0	3	40	60	100
PCC	18ETN021	Basics of CADD Software	0	0	3	1	40	60	100
ESC	18ETN022	Strength of Materials and Fluid Mechanics Lab	0	0	3	1	40	60	100
EEC	18ETN101	Personality Development - I	2	0	0	2	40	60	100
EEC	18ETN151	Industrial Safety	2	0	0	2	40	60	100
Total			22	0	6	24			

VELS INSTITUTE OF SCIENCE TECHNOLOGY & ADVANCED STUDIES, CHENNAI
SCHOOL OF OCEAN ENGINEERING
B. TECH - NAVAL ARCHITECTURE & OFFSHORE ENGINEERING

Category	Code	Title of Course	Hours/Week			Credits	Maximum Marks		
			Lecture	Tutorial	Practical		CA	SSE	Total
SEMESTER 4									
BSC	18ETN023	Mathematics – IV (Numerical Methods)	3	1	0	4	40	60	100
ESC	18ETN024	Theory of Structures	3	0	0	3	40	60	100
PCC	18ETN025	Hydrodynamic, Resistance & Propulsion of Ships	3	0	0	3	40	60	100
PCC	18ETN026	Strength of Ships	3	0	0	3	40	60	100
PCC	18ETN027	Marine Electrical Technology	3	0	0	3	40	60	100
PCC	18ETN028	Ship Design Calculation Drawing & Drafting – I (SDCADD-I)	0	0	3	1	40	60	100
PCC	18ETN029	Ship Design Software - Maxsurf	0	0	3	1	40	60	100
HSC	18ETN152	Environmental Science and Engineering	3	0	0	3	40	60	100
EEC	18ETN102	Personality Development - II	2	0	0	2	40	60	100
HSC	18ETN152	Yoga	0	0	2	1	40	60	100
Total			20	1	8	24			

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SCHOOL OF OCEAN ENGINEERING
B. TECH - NAVAL ARCHITECTURE & OFFSHORE ENGINEERING

Category	Code	Title of Course	Hours/Week			Credits	Maximum Marks		
			Lecture	Tutorial	Practical		CA	SSE	Total
SEMESTER 5									
PCC	18ETN030	Finite Element Analysis	3	1	0	4	40	60	100
PCC	18ETN031	Ship Production I	3	0	0	3	40	60	100
PCC	18ETN032	Advanced Offshore Engineering	3	0	0	3	40	60	100
PCC	18ETN033	Ship Design	3	0	0	3	40	60	100
PCC	18ETN034	Marine Materials and Metal Joining Techniques	3	0	0	3	40	60	100
PEC	18ETN__	Professional Elective I	2	0	0	2	40	60	100
EEC	18ETN103	Personality Development - III	2	0	0	2	40	60	100
PCC	18ETN035	Ship Design Calculation Drawing & Drafting – II (SDCADD-II)	0	0	3	1	40	60	100
PCC	18ETN036	Offshore Design Software - SACS	0	0	3	1	40	60	100
Total			19	1	9	23			

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SCHOOL OF OCEAN ENGINEERING
B. TECH - NAVAL ARCHITECTURE & OFFSHORE ENGINEERING

Category	Code	Title of Course	Hours/Week			Credits	Maximum Marks		
			Lecture	Tutorial	Practical		CA	SSE	Total
SEMESTER 6									
PCC	18ETN037	Sea Keeping and Maneuvering	3	0	0	3	40	60	100
PCC	18ETN038	Structural Design of Ships	3	0	0	3	40	60	100
PCC	18ETN039	Structural Design of offshore Structures	3	0	0	3	40	60	100
PCC	18ETN040	Ship Production II	3	0	0	3	40	60	100
PEC	18ETN___	Professional Elective II	2	0	0	2	40	60	100
OEC	18ETN___	Open Elective I	3	0	0	3	40	60	100
EEC	18ETN104	Personality Development - IV	2	0	0	2	40	60	100
PCC	18ETN041	Ship Design Calculation Drawing & Drafting – III (SDCADD-III)	0	0	3	1	40	60	100
EEC	18ETN047	Shipyard Training	0	0	3	1	40	60	100
EEC	18ETN048	Minor Project	0	0	3	1	40	60	100
Total			19	0	9	22			

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Category	Code	Title of Course	Hours/Week			Credits	Maximum Marks		
			Lecture	Tutorial	Practical		CA	SSE	Total
SEMESTER 7									
PCC	18ETN042	Dynamics of Offshore Structures	3	0	0	3	40	60	100
PCC	18ETN043	Construction of Offshore Structures	3	0	0	3	40	60	100
PEC	18ETN___	Professional Elective III	3	0	0	3	40	60	100
OEC	18ETN___	Open Elective II	3	0	0	3	40	60	100
PCC	18ETN044	Offshore Design Software - MOSES	0	0	3	1	40	60	100
HSC	18ETN105	NSS I	3	0	0	3	40	60	100
EEC	18ETN049	Major Design Project Phase I	0	0	10	5	40	60	100
Total			15	0	13	21			

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SCHOOL OF OCEAN ENGINEERING

B. TECH - NAVAL ARCHITECTURE & OFFSHORE ENGINEERING

Category	Code	Title of Course	Hours/Week			Credits	Maximum Marks		
			Lecture	Tutorial	Practical		CA	SSE	Total
SEMESTER 8									
PCC	18ETN045	Port Design and Infrastructure	3	0	0	3	40	60	100
PEC	18ETN___	Professional Elective IV	3	0	0	3	40	60	100
OEC	18ETN___	Open Elective III	3	0	0	3	40	60	100
EEC	18ETN050	Major Design Project-Phase-II	0	0	*16	8	40	60	100
Total			9	0	16	17			
*Students will be working on the project during non-class hours.									

LIST OF BASIC SCIENCE COURSE

Category	Code	Title of Course	Hours/Week			Credits
			Lecture	Tutorial	Practical	
BSC	18ETN002	Physics (Oscillation, Waves and Optics)	3	1	0	4
BSC	18ETN003	Mathematics – I (Calculus and Linear Algebra)	3	1	0	4
BSC	18ETN006	Physics Lab	1	0	3	2
BSC	18ETN009	Chemistry	3	1	0	4
BSC	18ETN010	Mathematics – II (Probability and Statistics)	3	1	0	4
BSC	18ETN012	Chemistry Lab	0	0	4	2
BSC	18ETN015	Mathematics – III (Fourier Series and Transformation)	3	0	0	3
BSC	18ETN023	Mathematics - IV (Numerical Methods)	3	1	0	4

LIST OF ENGINEERING COURSE

Category	Code	Title of Course	Hours/Week			Credits
			Lecture	Tutorial	Practical	
ESC	18ETN004	Basic Electrical Engineering	3	1	0	4
ESC	18ETN005	Engineering Graphics & Design	1	0	4	3
ESC	18ETN007	Electrical Engineering Lab	0	0	2	1
ESC	18ETN011	Programming for Problem Solving	3	0	0	3
ESC	18ETN013	Programming for Problem Solving Lab	0	0	4	2
ESC	18ETN014	Workshop/Manufacturing Practices	1	0	4	3
ESC	18ETN016	Fluid Mechanics	3	0	0	3
ESC	18ETN017	Engineering Mechanics	3	0	0	3
ESC	18ETN022	Strength of Materials and Fluid Mechanics Lab	0	0	3	1
ESC	18ETN024	Theory of Structures	3	0	0	3

LIST OF PROFESSIONAL CORE COURSES

Category	Code	Title of Course	Hours/Week			Credits
			Lecture	Tutorial	Practical	
PCC	18ETN018	Basic Ship Theory	3	0	0	3
PCC	18ETN019	Fundamentals of Offshore Structures	3	0	0	3
PCC	18ETN020	Marine Engineering	3	0	0	3
PCC	18ETN021	Basics of CADD Software	0	0	3	1
PCC	18ETN025	Hydrodynamic, Resistance & Propulsion of Ships	3	0	0	3
PCC	18ETN026	Strength of Ships	3	0	0	3
PCC	18ETN027	Marine Electrical Technology	3	0	0	3
PCC	18ETN028	Ship Design Calculation Drawing & Drafting – I (SDCADD-I)	0	0	3	1
PCC	18ETN029	Ship Design Software - Maxsurf	0	0	3	1
PCC	18ETN030	Finite Element Analysis	3	1	0	4
PCC	18ETN031	Ship Production I	3	0	0	3
PCC	18ETN032	Advanced Offshore Engineering	3	0	0	3
PCC	18ETN033	Ship Design	3	0	0	3

PCC	18ETN034	Marine Materials and Metal Joining Techniques	3	0	0	3
PCC	18ETN035	Ship Design Calculation Drawing & Drafting – II (SDCADD-II)	0	0	3	1
PCC	18ETN036	Offshore Design Software - SACS	0	0	3	1
PCC	18ETN037	Sea Keeping and Maneuvering	3	0	0	3
PCC	18ETN038	Structural Design of Ships	3	0	0	3
PCC	18ETN039	Structural Design of offshore Structures	3	0	0	3
PCC	18ETN040	Ship Production II	3	0	0	3
PCC	18ETN041	Ship Design Calculation Drawing & Drafting – III (SDCADD-III)	0	0	3	1
PCC	18ETN042	Dynamics of Offshore Structures	3	0	0	3
PCC	18ETN043	Construction of Offshore Structures	3	0	0	3
PCC	18ETN044	Offshore Design Software - MOSES	0	0	3	1
PCC	18ETN045	Port Design and Infrastructure	3	0	0	3

LIST OF PROFESSIONAL ELECTIVE COURSES						
Category	Code	Title of Course	Hours/Week			Credits
			Lecture	Tutorial	Practical	
PEC	18ETN051	Subsea Engineering	3	0	0	3
PEC	18ETN052	Ship Conversion Technology	3	0	0	3
PEC	18ETN053	Ship Trials	2	0	0	2
PEC	18ETN054	High Performance Marine Vehicles	3	0	0	3
PEC	18ETN055	Design of floating offshore structures	3		0	3
PEC	18ETN056	Marine Refrigeration and Air-conditioning	2	0	0	2
PEC	18ETN057	Standards and Recommended Practices	2	0	0	2
PEC	18ETN058	Marine Corrosion and Coating Engineering	2	0	0	2

LIST OF OPEN ELECTIVE COURSES						
Category	Code	Title of Course	Hours/Week			Credits
			Lecture	Tutorial	Practical	
OEC	18ETN059	Production and Project Management	3	0	0	3
OEC	18ETN060	Quality Control and Quality Assurance	3	0	0	3
OEC	18ETN061	Health Safety and Environment Management	3	0	0	3
OEC	18ETN062	Engineering Economics and Management	3	0	0	3

LIST OF EMPLOYABILITY ENHANCEMENT COURSES (EEC)						
Category	Code	Title of Course	Hours/Week			Credits
			Lecture	Tutorial	Practical	
EEC	18ETN101	Personality Development - I	2	0	0	2
EEC	18ETN151	Industrial Safety	2	0	0	2
EEC	18ETN102	Personality Development - II	2	0	0	2
EEC	18ETN103	Personality Development - III	2	0	0	2
EEC	18ETN104	Personality Development - IV	2	0	0	2
EEC	18ETN047	Shipyard Training	0	0	3	1
EEC	18ETN048	Minor Project	0	0	3	1
EEC	18ETN049	Major Design Project Phase I	0	0	10	5
EEC	18ETN050	Major Design Project-Phase-II	0	0	*16	8

LIST OF HUMANITIES AND SOCIAL SCIENCES ELECTIVE COURSES						
HSC	18ETN001	English	2	0	0	2
HSC	18ETN008	English Lab	0	0	2	1
HSC	18ETN152	Environmental Science and Engineering	3	0	0	3
HSC	18ETN152	Yoga	0	0	2	1
HSC	18ETN105	NSS I	3	0	0	3

SYLLABUS

18ETN001	English	L- 2	T - 0	P- 0	C- 2

COURSE OBJECTIVES:

- The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.
- To acquire ability to speak effectively in real life situations.
- To write letters and reports effectively in formal and business situations.
- To develop listening skills for academic and professional purposes.
- To gain effective speaking and listening skills in communication.
- To develop the soft skills and interpersonal skills to excel in their career.
- To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment procedures.

UNIT I: VOCABULARY BUILDING **6**

General Vocabulary – Nouns - Compound nouns, Word borrowing & Word making, Foreign machinery in English, Dictionary and Thesaurus usages, Synonyms, Antonyms, Prefixes and Suffixes, Homonyms, Homographs and Homophones, Changing words from one form to another, Acronyms and Abbreviations.

UNIT II BASIC WRITING 6

Sentences structures – Kinds of sentences, Types of sentences, Clauses and Phrases, Punctuations, Word Links and Connectives, Summarizing, Precise writing, Paragraph Writing.

UNIT III IDENTIFYING COMMON ERRORS IN ENGLISH 6

Articles, Prepositions, Subject-verb Agreement, Pronouns - Relative pronouns, Demonstrative pronouns, Misplaced Modifiers, Redundancies, Clichés, Infinitives& Gerund

UNIT IV NATURE AND STYLE OF SENSIBLE WRITING 6

Describing people, place and situations, Process description, Definitions, Numerical Expressions, Information Transfer- Flow chart Bar chart and Pie chart, Checklists, Writing introduction and conclusion.

UNIT V WRITING PRACTICES 6

Letter Writing- Formal & Informal Letters, Report Writing- Letter Report, Accident Report, Investigation Report and Survey, Essay writing, Comprehension Passages.

Total Hours: 30

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	List out a wide range of technical vocabulary to interpret the professional texts with attention to ambiguity, complexity, and aesthetic value	K4
CO2	Infer implied meanings of different genres of texts and critically analyze and evaluate them for ideas as well as for method of presentation.	K3
CO3	Assess and write cohesively, coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.	K5
CO4	Infer meanings of different flow charts and bar charts and develop constructive paragraphs deriving possible information to be obtained from them.	K3
CO5	Prepare letters to officials and to the Editor in formal and officials' contexts	K5

TEXTBOOKS:

1. ’English for Scientists, Prof.K.R. Lakshminarayanan, Former Head, Department of Humanities and Social sciences, Sri Venkateshwara College of Engineering, Pennalur, Sriperumbudur, Tamilnadu SCITECH PUBLICATIONS (INDIA PVT.LTD)2014
2. Department of English, Anna University, Mindscapes, ‘English for Technologists and Engineers’, Orient Longman Pvt. Ltd, Chennai: 2012.
3. Department of Humanities and Social Sciences, Anna University, ‘English for Engineers and Technologists’ Combined Edition (Volumes 1 and 2), Chennai: Orient Longman Pvt. Ltd., 2006.
4. Department of English, Anna University, Mindscapes, ‘English for Technologists and Engineers’, Orient Longman Pvt. Ltd, Chennai: 2012.
5. Department of Humanities and Social Sciences, Anna University, ‘‘English for Engineers and Technologists’’ Combined Edition (Volumes 1 and 2), Chennai: Orient Longman Pvt. Ltd., 2006.
6. M.AshrafRizvi, “Effective Technical Communication”, Tata McGraw-Hill Publishing Company Limited, New Delhi.2009.

Suggested Readings:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

18ETN002	Physics (Oscillation, Waves and Optics)	L- 3	T - 1	P - 0	C - 4

Course Objectives:
The objective of this course is to familiarize the prospective engineers with techniques in calculus and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

UNIT I: Simple harmonic motion, damped and forced simple harmonic oscillator 9
Harmonic oscillator – Differential equation and solution of simple harmonic oscillator – simple pendulum – damped harmonic oscillator: Equation of motion and its solution, qualitative description of heavy, critical and light damping – energy decay in a damped harmonic oscillator – Q factor – forced mechanical and electrical oscillators – power absorbed by oscillator.

UNIT II: Non-dispersive transverse and longitudinal waves in one dimension and introduction to dispersion 9
Waves, travailing waves example of waves, characteristics of a waves - longitudinal and transverse waves–Examples - Transverse wave on a string, the wave equation on a string-longitudinal waves and the wave equation- acoustics waves and speed of sound-characteristics of musical sound, quality of tone, decibel- noise pollution- acoustics- of buildings - Reverberation - Reverberation time.

UNIT III: The propagation of light and geometric optics 9
Fermat's principle of stationary time- laws of reflection and refraction- Fresnel equations, reflectance and transmittance, Brewster's angle, total internal reflection - Dispersion, Dispersive power of prism- Defect of lenses- spherical aberration- coma-achromatic lenses.

UNIT IV: Wave optics 9
Huygens' Principle, superposition of waves - Young's double slit experiment- Newton's rings-Michelson interferometer, Mach Zehnder interferometer - Fraunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision - Dispersion of a diffraction of grating and their resolving power.

UNIT V: Lasers 9
Einstein's theory of matter radiation interaction and A and B coefficients- population inversion, different types of lasers: gas lasers (He-Ne, CO_2), solid-state lasers (ruby, Neodymium), dye lasers; Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in science, engineering and medicine

Course Outcome:
After successful completion of the course, the student will be able to

CO	Course outcomes	Knowledge Level
CO1:	Understand the basic concepts of simple harmonic oscillator.	K2
CO2:	Identify the remedies for acoustic of building.	K3
CO3:	Illustrate the different types of aberration in lens.	K2
CO4:	Distinguish between Fresnel and Fraunhofer diffraction	K4
CO5:	Classify the different types of lasers and their applications.	K2

Suggested Reference Books

1. Ian G. Main, Oscillations and waves in physics
2. H.J. Pain, The physics of vibrations and waves
3. E. Hecht, Optics
4. A. Ghatak, Optics
5. O. Svelto, Principles of Lasers

18ETN003	Mathematics – I (Calculus and Linear Algebra)	L - 3	T- 1	P - 0	C- 4

Course Objectives:

The objective of this course is to familiarize the prospective engineers with techniques in calculus and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

UNIT I: Calculus: (12 hours)
Evolutes and involutes- Evaluation of definite and improper integrals- Beta and Gamma functions and their properties

UNIT II: Calculus: (12 hours)
Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders- indeterminate forms and L'Hospital's rule.

UNIT III: Sequences and series: (12 hours)
Convergence of sequence and series, tests for convergence- Power series, Taylor's series, series for exponential, trigonometric and logarithm functions.

UNIT IV: Multivariable Calculus (Differentiation): (12 hours)
Limit, continuity and partial derivatives, directional derivatives, total derivative- Tangent plane and normal line- Maxima, minima and saddle points- Method of Lagrange multipliers.

UNIT V: Matrices ((12 hours)
Introduction to matrix and rank of a matrix-System of linear equations- Symmetric, skew-symmetric and orthogonal matrices-Eigenvalues and eigenvectors- Diagonalization of matrices-Cayley-Hamilton Theorem and Orthogonal transformation.

Total Hours: 60

Course Outcome:
After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Introduce the idea of applying differential and integral calculus to notions of curvature and to improper integrals. Apart from some applications it gives a basic introduction on Beta and Gamma functions.	K1
CO2	Introduce the fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.	K1
CO3	Develop the tool of power series for learning advanced Engineering Mathematics.	K3
CO4	Familiarize the student with functions of several variables that is essential in most branches of engineering.	K1
CO5	Develop the essential tool of matrices in engineering.	K3

Textbooks:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002

2. Ramana B . V ., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,11, Reprint, 2010

Reference Books:

1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008..
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

18ETN004	Basic Electrical Engineering	L - 3	T - 1	P - 0	C - 4

COURSE OBJECTIVE:

1. To obtain basic knowledge on electrical quantities such as current, voltage, power and energy.
2. To provide adequate working knowledge on basic DC and AC circuits used in electrical and electronic devices.
3. To understand the working principle, construction, applications of DC machines, AC machines & measuring instruments.
4. To emphasize the importance of transformers in transmission and distribution of electric power.

UNIT I DC Circuits **12**

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, Mesh and Nodal analysis, Analysis of simple circuits with dc excitation, Wye↔Delta Transformation, Superposition, Thevenin and Norton Theorems. Time-domain analysis of first order RL and RC circuits.

UNIT II AC Circuits **12**

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT III Transformers **12**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Autotransformer and three-phase transformer connections.

UNIT IV Electrical Machines & Power Converters **12**

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Single phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. DC-DC buck and boost converters, duty ratio control. Single phase Bridge Rectifier, Single Phase voltage source inverters.

UNIT IV Electrical Installations **12**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

TOTAL: 60 hours

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Predict the behavior of any electrical and magnetic circuits. Formulate and solve complex AC, Dc circuits.	K6
CO2	Identify the type of electrical machine used for that particular application.	K3
CO3	Realize the requirement of transformers in transmission and distribution of electric power and other applications.	K3
CO4	Understand the construction, principle of operation, speed control of three phase induction motor	K3
CO5	Demonstrate wiring, earthing and to do power factor calculations.	K2

Text / References:

1. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
3. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
4. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
5. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

18ETN005	Engineering Graphics	L - 1	T - 0	P - 4	C - 3

COURSE OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products
- To expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination)
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I INTRODUCTION TO ENGINEERING DRAWING AND PLANE CURVES 12
Curves used in engineering practices: Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid, Epicycloid, Hypocycloid – construction of involutes of squad and circle – Drawing of tangents and normal to the above curves. Scales – Plain, Diagonal and Vernier Scales.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 12
Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to both reference planes - Auxiliary Planes

UNIT III PROJECTION OF SOLIDS 12
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method - Auxiliary Views

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES 12
Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – Obtaining true shape of section - Auxiliary Views. Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

UNIT V ORTHOGRAPHIC PROJECTION AND ISOMETRIC PROJECTION 12
Free hand sketching: Representation of Three-Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement - layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.
Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones

TOTAL: 60 Hours

COURSE OUTCOMES

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Develop special curves and sketch by free hand orthographic views	K6
CO2	Understand and draw the projections of points, straight lines and planes	K2
CO3	Sketch the projections of simple solids like prisms, pyramids, cylinder and cone	K2
CO4	Develop lateral surfaces of the uncut and cut solids	K3
CO5	Develop the perspective projection of simple solids, truncated prisms, pyramids, cone and cylinders and sketch the isometric projection	K3

TEXTBOOKS:

1. N.D. Bhatt, “Engineering Drawing” Charotar Publishing House, 46 th Edition, (2003).

REFERENCES:

2. K. V. Natrajan, “A textbook of Engineering Graphics”, Dhanalakshmi Publishers, Chennai (2006).
3. M.S. Kumar, “Engineering Graphics”, D.D. Publications, (2007).
4. K. Venugopal & V. Prabhu Raja, “Engineering Graphics”, New Age International (P) Limited (2008).
5. M.B. Shah and B.C. Rana, “Engineering Drawing”, Pearson Education (2005).
6. K. R. Gopalakrishnana, “Engineering Drawing” (Vol.I&II), Subhas Publications (1998). 6. Dhananjay A.Jolhe, “Engineering Drawing with an introduction to AutoCAD” Tata McGraw Hill Publishing Company Limited (2008).
7. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, (2008).

18ETN006	Physics Lab	L- 1	T- 0	P - 3	C- 2

List of Experiments

1. Spectrometer –Dispersive Power of prism
2. Spectrometer – Grating
3. Semiconductor Laser – To find Wavelength and particle size.
4. Ultrasonic Interferometer
5. Torsional Pendulum
6. Hooke's Law
7. Compound pendulum- To determine 'g'
8. Newtons' Ring
9. Air wedge
10. Bifilar Pendulum

Total Hours: 30 hrs

COURSE OUTCOMES

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Examine the dispersive power of the prism using spectrometer.	K3
CO2	Estimate the formation of Newton's rings in the air-film in between a plano-convex lens.	K4
CO3	Calculate the wavelength and particle size of semiconductor diode laser.	K3
CO4	Measure the velocity of ultrasonic waves and compressibility of the liquid using ultrasonic interferometer.	K5
CO5	Calculate the gravity g at that place and the radius of gyration.	K3

18ETN007	Electrical Engineering Lab	L:0	T:0	P:2	C:1

COURSEOBJECTIVE:

To provide comprehensive idea about AC and D C circuit analysis, working principles and applications of basic machines in electrical engineering.

List of Laboratory Experiments/Demonstrations:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi- meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification.
3. Resonance in R-L-C circuits.
4. Loading of a transformer: measurement of primary and secondary voltages and currents, and power
5. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line -line voltage, phase-to-neutral voltage, line and phase currents).
6. Load Characteristics of a DC Motor
7. Torque - Slip Characteristic of an Induction motor
8. Three phase induction motors - Direction reversal by change of phase-sequence of connections.
9. Demonstration of dc-dc converter.
10. Demonstration of dc-ac converter.
11. Demonstration of ac-dc converter.

Total hours: 30

COURSE OUTCOME:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Study different meters and instruments for measurement of electrical quantities	K2
CO2	Measure power and power factor in ac circuits	K2
CO3	Understand 3 phase balanced and unbalanced, star and delta connected supply with load and to	K1
CO4	Measure power in 3 phase circuits	K2
CO5	Understand the Characteristics of DC motor and Induction motor	K2
CO6	Demonstrate various converter circuits and to implement for the particular application.	K2

18ETN008	English Lab	L- 0	T - 0	P - 2	C - 1

LIST OF EXERCISE

1. Listening comprehensions
2. Pronunciation,
3. Phonology, Intonation,
4. Stress and Rhythm,
5. Situational Dialogues,
6. Communication in workplace,
7. Interviews,
8. Seminar,
9. Formal Presentations,
10. Group Discussions,
11. Debates,
12. JAM sessions

Total hours: 30

COURSE OUTCOME:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Use appropriate communication strategies for enhancing interpersonal relationship.	k4 - k5
CO2	Apply soft skills in personal, social and corporate life	k5
CO3	Articulate knowledge of chosen profession and corporate skills effectively in interviews with appropriate body language	k6
CO4	Demonstrate active group discussion and presentation skills such as initiating a conversation, exchanging ideas, expressing dissent or agreement and giving persuasive presentation.	k3
CO5	Prepare job applications, various letters, abstract and summary for technical articles.	k4

18ETN009	Chemistry	L - 3	T - 1	P - 0	C - 4

Course Objective

- To learn about the molecular orbitals, ionic interactions and periodic properties.
- Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electro negativity.
- List major chemical reactions that are used in the synthesis of molecules.

UNIT I Atomic and molecular structure, Intermolecular forces and potential energy surfaces 14

Molecular orbitals of diatomic molecules and plots of the multicenter orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties.

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H_3, H_2F and HCN.

UNIT II Spectroscopic techniques and applications 12

Principles of spectroscopy and selection rules. Electronic spectroscopy. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Diffraction and scattering

UNIT III Use of free energy in chemical equilibria 12

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion.

UNIT IV Periodic properties 12

Variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries.

UNIT V Organic reactions and synthesis of a drug molecule 10

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

Total:60 hrs

Course Outcomes

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Explain the relation between the intermolecular forces, present within a substance and the temperatures associated with changes in its physical state.	K2
CO2	Apply formalisms based on molecular symmetry to predict spectroscopic properties.	K3
CO3	Determine and understand the operation of electrochemical systems for the production of electric energy, i.e. batteries and fuel cells.	K4
CO4	Explain general corrosion in terms of electrochemistry	K2
CO5	Explain the arrangement of elements in the periodic table and relate the arrangement to electronic configuration, bonding and properties.	K2
CO6	Prove various types of reaction and its mechanism in drug development	K4

Text Books

1. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane.
2. Fundamentals of Molecular Spectroscopy, by C. N. Banwell.
3. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan.

Reference Books

1. Physical Chemistry, by P. W. Atkins.
2. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp.
3. University chemistry, by B. H. Mahan.

18ETN010	Mathematics – II (Probability and Statistics)	L - 3	T - 1	P - 0	C - 4

Course Objectives:
The objective of this course is to familiarize the students with statistical techniques. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline.

UNIT 1: Basic Probability: (12)
Probability spaces- conditional probability- Independence- Bayes'rule- Discrete random variables- Continuous random variables- Expectation of Discrete Random Variables- Continuous Random variables.

UNIT 2: Continuous Probability Distributions: (12)
Discrete Distributions-Binomial, Poisson, Geometric-Continuous Distribution-Normal, Uniform, Exponential and gamma densities.

UNIT 3: Bivariate Distributions: (12)
Bivariate distributions and their properties-Covariance- Correlation and Regression Analysis

UNIT 4: Basic Statistics: (12)
Measures of Central tendency: Mean, Median and Mode- Measure of Dispersion- Range, Standard Deviation and coefficient of variation- Moments Skewness and Kurtosis (Simple Problems)

UNIT 5: Applied Statistics: (12)
Introduction to Large and small sample – t-test-Single mean, difference of means, and Paired t-test. Small samples: Test for single mean, difference of means-F-test- Chi-square test for goodness of fit and independence of attributes.

Total Hours: 60

COURSE OUTCOME
After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	The students will have a fundamental knowledge of the concepts of probability.	K1
CO2	Knowledge of standard distributions which can describe real life phenomenon.	K2
CO3	The notion of sampling distributions and statistical techniques used in engineering	K4
CO4	Use appropriate statistical methods in the analysis of simple datasets	K5
CO5	Develop skills in presenting quantitative data using appropriate diagrams, tabulations and summaries	K6

Text/Reference Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
3. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
5. N.P. Bali and Manish
6. Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
8. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.

18ETN011	Programming for Problem Solving	L - 3	T - 0	P - 0	C - 3

COURSE OBJECTIVE:

- To understand the basic concepts of programming – Flow chart, Pseudo code.
- To learn the fundamentals of C programming - declarations, operators, expressions and control statements.
- To learn the manipulation of strings, functions, pointers and file operations.
- To understand the concepts of arrays, basic sorting and searching algorithms**.**
- To find the order of time complexity of basic algorithms

Unit 1: Introduction to Programming **9**

Introduction to Programming (Flow chart / pseudo code, compilation etc.), Variables (including data types) -Arithmetic expressions and precedence, Conditional Branching and Loops - Writing and evaluation of conditionals and consequent branching Iteration and loops

Unit 2: Arrays and Basic Algorithms **9**

Arrays (1-D, 2-D), Character arrays and Strings, Searching, Basic Sorting Algorithms, Finding roots of equations, Notion of order of time complexity through example programs

Unit 3: Function and Pointers **9**

Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference, Recursion with example programs such as Finding Factorial, Fibonacci series, etc. Pointers - Defining pointers, Use of Pointers in self-referential structures

Unit 4: Structures and Unions **9**

Structures - Defining structures and Array of Structures, Structures containing Pointers, Unions - Storage classes: auto, static, extern, register – Dynamic memory allocation

Unit 5: String Functions and Files **9**

Strings - library string functions, pointers in strings, pointers and function arguments, Files - file Operations, processing a file, Preprocessor directives, use of typedef, Command line arguments, Enumerated data types.

Total: 45 hrs

COURSE OUTCOME:

After successful completion of the Programming for Problem Solving course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Understand the principles of algorithm, flowchart and pseudo code	K2
CO2	Find the order of time complexity of algorithms	K1
CO3	Understand programs involving control instructions, arrays, structures and unions.	K2
CO4	Utilize the string manipulations, and to write functions for various applications using C programming constructs.	K3
CO5	Apply the file operations in ‘C’ programming	K2

Textbooks:

1. Byron Gottfried, “Schaum's Outline of Programming with C”, McGraw-Hill
2. E. Balaguruswamy, “Programming in ANSI C”, Tata McGraw-Hill

References:

1. Brian W. Kernighan and Dennis M. Ritchie, “The C Programming Language”, Prentice Hall of India
2. Yashavant Kanetkar, “Let Us C”, BPB Publications
3. Ashok.N.Kamthane, “Computer Programming”, Pearson Education (India)

18ETN012	Chemistry Lab	L - 0	T - 0	P - 4	C -2

Laboratory Outcomes

The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering.

Choice of 10-12 experiments from the following

1. Determination of surface tension and viscosity
2. Thin layer chromatography
3. Ion exchange column for removal of hardness of water
4. Determination of chloride content of water
5. Colligative properties using freezing point depression
6. Determination of the rate constant of a reaction
7. Determination of cell constant and conductance of solutions
8. Potentiometry - determination of redox potentials and emfs
9. Synthesis of a polymer/drug
10. Saponification/acid value of an oil
11. Chemical analysis of a salt
12. Lattice structures and packing of spheres
13. Models of potential energy surfaces
14. Chemical oscillations- Iodine clock reaction
15. Determination of the partition coefficient of a substance between two immiscible liquids
16. Adsorption of acetic acid by charcoal
17. Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of Minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

COURSE OUTCOME

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Estimate the rate constants of reactions, freezing point depression and partial coefficient of immiscible liquids.	K4
CO2	Develop a small drug molecule and analyze a salt sample.	K3
CO3	Find the viscosity and partition coefficient of a substance.	K4
CO4	Determine the saponification value of an oil	K5
CO5	Determine the cell constant and conductance of solutions	K5

Textbooks

1. S. Sundaram and K. Raghavan “Practical Chemistry”, S. Viswanathan. Co. 3rd edition 2011.
2. Gnanaprakasam, Ramamurthy, “Organic Chemistry Lab Manual” S. Viswanathan Pvt. Ltd. 3rd edition 2011

Reference Books

1. Vogel’s – “Textbook of qualitative organic Analysis”, Longmann, 12th edition, 2011
2. J. N. Gurtu and R. Kapoor “Advanced experimental Chemistry”, S. Chand and Co. 6th edition, 2010

18ETN013	Programming for Problem Solving Lab	L - 0	T - 0	P - 4	C - 2

COURSE OBJECTIVE:
To design and develop C Programs for various applications

LIST OF EXPERIMENTS:

1. Familiarization with programming environment
2. Simple computational problems using arithmetic expressions
3. Problems involving if-then-else structures
4. Iterative problems
5. 1D Array manipulation
6. Matrix problems
7. String operations
8. Simple functions
9. Solving Numerical methods problems
10. Recursive functions
11. Pointers and structures
12. File operations

COURSE OUTCOME
After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Understand the Programming Environment	K2
CO2	Develop programs using various control instructions and operator precedence in C Programming.	K3
CO3	Apply the string manipulations, arrays and functions for various applications in C.	K3
CO4	Analyze the use of structures, unions and pointers in C	K4
CO5	Utilize the various file operations in C	K3

18ETN014	Workshop/Manufacturing Practices	L - 1	T - 0	P - 4	C - 3

COURSE OBJECTIVE:

- To study bench fitting drawings for making male and female fittings as per the given dimensions and Tolerances.
- To study Arc welding drawings for making common weld joints as per the given dimensions.
- To study sheet metal development drawings for making common metal parts/components as per the given dimensions.

Detailed contents:

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods (3 lectures)
2. CNC machining, Additive manufacturing (1 lecture)
3. Fitting operations & power tools (1 lecture)
4. Electrical & Electronics (1 lecture)
5. Carpentry (1 lecture)
6. Plastic moulding, glass cutting (1 lecture)
7. Metal casting (1 lecture)
8. Welding (arc welding & gas welding), brazing (1 lecture)

Workshop Practice: (60 hours)

Machine shop (10 hours): To make Facing and plain turning, step turning, drilling in the lathe
Fitting shop (8 hours): To make square, V joint in bench fitting as per the given dimension and Tolerances
Carpentry (8 hours): To make half lap joint, dovetail, TEE Lap joint. To make single, butt, lap and T fillet joint by arc welding with the back hand and fore hand welding techniques as per the given dimensions.
Welding shop (8 hours) (Arc welding 4 hrs + gas welding 4 hrs)

Electrical & Electronics (13 hours)

1. To make fluorescent lamp wiring.
2. To make staircase wiring.
3. To make residential wiring.
4. To measure Peak-peak, rms, period, frequency using CRO.
5. To solder components devices and circuits by using general purpose PCB.

Plumbing Works (10)

1. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
2. Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

Sheet Metal Work: (3hours): To make simple Dustpan, Rectangular trays in sheet metal with the jigs as per the given Dimensions.

COURSE OUTCOMES: After successful completion of the Engineering Practices Laboratory course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Understand the different types of woods used and tools used in wood Working technology.	K2
CO2	Developments of sheet metal jobs from GI sheets, knowledge of basic concepts of soldering.	K3
CO3	Experiment with different types of tools used in fitting technology.	K3
CO4	Utilize the hands-on experience in various fields.	K3
CO5	Demonstrate with the various plumbing tools and various joints.	K3

18ETN015	Engineering Mathematics – III	L - 3	T - 0	P - 0	C - 3

Course Objective: To develop students' ability to solve problems using fourier series, laplace transform, partial differential equations, numeric methods, numerical differentiation and integration, Trapezoidal and Simpsons rule and their engineering applications in ship design calculations.

UNIT I Fourier Series **12**

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Parseval's identity – Harmonic Analysis.

UNIT II Fourier Transform **12**

Fourier integral theorem (without proof) – Fourier transform pair – Fourier Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT III Partial Differential Equations **12**

Formation of partial differential equations - singular integrals- Solutions of standard types of first order partial differential equations – Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of homogeneous functions.

UNIT IV Application of Partial Differential Equations **12**

Classification PDE-Method of separation of variables – One dimensional wave and heat equation – Steady state solution of two-dimensional heat equation (square plate only)

UNIT V Z -TRANSFORM AND DIFFERENCE Equations **12**

Z-transform –Introduction- properties – Inverse Z-transform (using partial fraction and residues) – Convolution theorem - Formation of difference equations – Solution of difference equations using Z- transform.

Total Hours: 60

Course Outcomes:
After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Develop Fourier series for different types of functions.	K3
CO2	Define and determine Fourier Transform.	K3
CO3	Derive and obtain the solution of wave, heat equation	K4
CO4	Solve problems of Fourier series and Fourier transforms used in engineering applications.	K5
CO5	Know the z-transforms and its properties	K2

TextBooks:

1. Grewal. B.S, "Higher Engineering Mathematics", Khanna Publications, Delhi,43rd Edition, 2013.
2. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 6th reprint,2008.
3. Sivaramakrishna Das.P & Vijayakumari.C , A Text book of Engineering Mathematics-III

Reference Books:

1. Bali.N.P. and Manish Goyal 'A Textbook of Engineering Mathematics', Laxmi Publications, 9th edition,2011.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India, 9th Edition, 2011.
3. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education ,3rd Edition, 2012.
4. Transforms and partial differential equations- A.Singravelu

18ETN016	Fluid Mechanics	L - 3	T - 0	P - 0	C - 3

Course Objective: To develop student's ability to understand fundamentals of fluid mechanics, fluid motion, equation of motion, Newton's law of fluid friction, laminar and turbulent flow, various types of pump, friction coefficient, continuity equation etc.

UNIT I Properties of Fluids **9**

Properties of fluids – ideal fluid – actual fluid – fluid pressure, **s**tates of fluids – Euler's equilibrium conditions – constant velocity rotation around a fixed axis – forces on walls of container – surface tension – atmospheric equilibrium

UNIT II Fluid motion **9**

Fluid in motion – one dimensional flow – continuity equation – Euler's equation – Bernoulli's equation – energy equation for unsteady flow, Generalized Bernoulli's equation – Newton's law of fluid friction – laminar flow – Poiseuille's flow – turbulent flow – Reynold's number – Prandtl's mixing length – friction coefficient

UNIT III Types of Pumps and Turbines **9**

Pumps & Turbines – Positive Displacement Pump - centrifugal pump – rotary pump - reciprocating pump – air vessels – roto dynamic pumps – velocity diagram - Impulse turbine – Pelton wheel – reaction turbine – Francis turbine – Kaplan turbine

UNIT IV Two- and Three-dimensional flow **9**

General theory of two- and three-dimensional flow – continuity equation – circulation – Stoke's integral theorem – sources – sinks – dipole – flow with circulation – potential flow – hydro dynamical lift – Kutta – Joukowski theorem

UNIT V Viscous Flow **9**

Pattaks motion - Balance of Momentum - Navier-Stokes Equation – Biot - Savart's law - cortex sheets - viscous flow - boundary theory - criterion for separation - turbulent boundary layer - airofoils - lift - drag - circulation - pressure distribution - cavitation.

Total hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Understand and analyze the properties of fluids for various equilibrium conditions	K2
CO2	Applying the concepts and solving Bernoulli's equation for various flow	K3
CO3	Examine the functioning of pumps and turbines	K4
CO4	Understand the dimension flow fluids	K2
CO5	Formulate various stock equation for viscous flow	K6

Textbooks

1. K.L Kumar: Engineering Fluid Mechanics, Eurasia Publishing house, New Delhi
2. Dr. Jagdishlal: Hydraulic machines, Metropolitan book Co, Delhi.
3. Vallentine: Applied hydrodynamics, Butterworths, London.

Reference Books

1. Walther Kaufmanns: Fluid Mechanics, Tata McGraw – Hill publishing company Ltd.
2. Daugherty & Franzini – Fluid Mechanics with Engg. Application, International Student's edition McGraw Hill.

18ETN017	Engineering Mechanics	L - 3	T - 0	P - 0	C - 3

Course Objective: To develop the students' ability in understanding engineering mechanics in areas such as concurrent forces, properties of areas, forces in planes etc., so that the same can be applied to the engineering problems in the ship building industry.

Unit I Concurrent forces in a plane **9**

Concurrent forces in a plane - Review of vectors, statics, types of forces, Moments, Parallel forces in a plane.

Unit II Properties of areas **9**

Properties of areas- moment of inertia of plane figure about an axis, principal axes of three-dimensional bodies, calculation of mass moment of inertia of plates, cylinders and spheres, S.F and B.M Diagrams, Stress and Strain.

Unit III General cases of forces in a plane **9**

General cases of forces in a plane - Equilibrium of forces in a plane, plane trusses, method of joint and sections, method of substitution funicular polygon, Maxwell diagrams, flexible suspension cables. Cantilever and simply supported beams with concentrated and distributed and moment loads.

Unit IV Force system in space **9**

Force system in space, principle of virtual work, efficiency of simple machines stable and unstable Equilibrium, Interfacial friction - static, kinetic and rolling friction, Application to inclined planes, wedges, Screw jacks and belts.

Unit V Kinematics and Kinetics of particles **9**

Kinematics and Kinetics of particles - Rectilinear motion of particles relative motion, D' Alembert's principle, inertia couple, constrained motion, non-centroidal motion, translation and rotation of rigid bodies, virtual work energy arid work. Curvilinear translation, rotation of rigid body, plane motion of a rigid body, impulse and momentum, conversion and momentum, momentum and momentum equation, rotational motion.

Total hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Define concurrent forces and their types, forces in plane	K1
CO2	Explain moment of Inertia, SF and BM diagrams	K2
CO3	Explain about beams, functions of beams and their types	K2
CO4	Classify the forces acting in spaces and their types	K4
CO5	Explain kinematics and kinetics principles	K2

Textbooks

1. Dr. K.L. Kumar, “Engineering Mechanics”, Tata Mc-graw Hill
2. R. S. Khurmi , Engineering Mechanics, S. Chand and company Ltd. 2008

Reference Books

1. Timoshenko & Young, “Engineering Mechanics”, CBS Publishers and distributors private limited, new Delhi, 2004.
2. Beer & Johnson, “Engineering Mechanics”, Tata Mc - Graw Hill, New Delhi, 2009
3. S. Rajasekara, “Engineering Mechanics-Statics and dynamics”,

18ETN018	Basic Ship Theory	L- 3	T - 0	P - 0	C - 3

COURSE OBJECTIVE

To perceive knowledge about the basic ship structures, fundamental principle of the ship's theories and calculations about the hydrostatics, floating curves, static stability of ships and dynamic stability of ships.

UNIT -1: Introduction **9**

Historical review - ancient types of vessels (rafts, boats, and ships), the role of the ship in the ages of the great discoveries. Types of ships-terms and definitions, cargo ships (general cargo ships, bulk carriers, container ships, Ro-Ro ships, barge carriers, tankers), fishing vessels, factory ships, supply ships, Cable ships, ice breakers, research vessels, warships, hydrofoils, air cushion vehicles, small pleasure crafts (yachts, ketches, etc) , Some physical fundamentals-Archimedes principle, laws of floatation stability and trim, forces acting on a ship (static condition in waves and during launching) The ship's form-main dimensions.

UNIT – 2: Lines Plan and Hydrostatics **9**

Lines Plan – fairing process – table of offsets, Integration rules – Trapezoidal rule; Simpson's rules (1-4-1, 1-3-3-1 and 5-8-1 rule); 6 ordinate rules; Tchebycheff's rule; Areas, volumes and moments, Bonjean calculations and curves, sectional area curves, Hydrostatic calculations and curves. Buoyancy and weight of the ship

UNIT – 3: Basics of Ship Stability **9**

Introduction :- Potential energy and equilibrium; Stability of ships - stable and unstable conditions (including submerged vessels); Stability terms; Equivolume inclinations - shift of C.O.B. due to inclinations, C.O.B curve in lateral plane, metacentre, pro-meta center and metacentric radius, metacentric height, metacentric curve, surface of flotation, curve of flotation, righting moment and lever; Moments due to wind, shift of cargo, passengers, turning and non-symmetrical accumulation of ice; Effect of superstructure on stability.

UNIT – 4: Transverse Stability **9**

Transverse stability: - Form and weight stability – stability functions

Initial stability – GM0, GZ at small angles of inclinations, wall sided ships; Stability due to addition, removal and transference (horizontal, lateral and vertical) of weight, suspended weight and free surface of liquids; Stability while docking and grounding; Inclining experiment.

Large angle stability -Diagram of statical stability (GZ-curve), characteristic of GZ-curve, static equilibrium criteria; Methods for calculating the GZ-curve (Krylov, Prohaska, etc.); Cross curves of stability; Dynamical stability – diagram of dynamical stability, dynamical stability criteria.

UNIT – 5: Longitudinal and Damage Stability **9**

Longitudinal stability – trim, longitudinal metacentre, longitudinal centre of flotation, moment to change trim, trimming moment; trim calculations – addition, removal and transference of weight, change of density of water

Damage stability – deterministic and probabilistic approach. Stability in waves. Recommendations of classification societies and governmental authorities – Intact and damage stability rules.

Total Hours 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Define about various types of ships, fundamentals of principles and ship's form	K1
CO2	Demonstrate the fairing processes of lines plan, Simpson's rule and hydrostatic calculations	K2
CO3	Evaluate the various conditions of ship stability, equilibrium, curves of floatation	K5
CO4	Explain the statical and dynamic stability of the vessel	K5
CO5	Develop the data of the longitudinal stability and damage stability	K6

Textbooks:

1. Capt. H.Subramaniam, Ship Stability Vol- I, II and III, Vijaya Publications
2. Tupper, E.C.;Introduction to Naval Architecture, Butterworth-Heinemann, UK, 1998.

Reference Books:

1. Lewis,E.U.; "Principles of Naval Architecture", (2nd Rev.), SNAME, New Jersey, U.S.A.
2. Rawson & Tupper; Basic Ship Theory

18ETN019	Fundamentals of Offshore Structures	L- 3	T - 0	P - 0	C - 3

Course Objective: To develop student's ability to understand various loads to which the offshore structure is subjected to, types of offshore structures and various equipment's on the offshore structure loading mechanisms, mooring hardware components etc.

UNIT I Historical Development of Offshore Structures **9**

Introduction – Definition of Offshore Structures – Historical Developments - Deepwater challenges, Functions of Offshore Structures, selection of Offshore Structure and its Configurations, Bottom Supported Fixed Structures, Complaint Structures, Floating Structures – Novel offshore design – Field development concepts

UNIT II Load and Responses **9**

Introduction, Gravity Load, Hydrostatic Loads, Resistance Loads, Current loads on Structures, Current Drag and Lift Force, Steady and Dynamic Wind Loads on Structures, Wave Loads on Structures, Varying Wind Load, Impulse loads and Introduction to design

UNIT III Topside Facilities and Layout **9**

Introduction - General layout Considerations - Areas and Equipment - Deck Impact Loads - Deck Placement and Configuration - Float over Deck Installation - Helipad - Platform Crane - Living quarters - Oil and gas treatment - Oil and gas storage, offloading and export - Utility and process support systems - Drilling facilities

UNIT IV Offshore Installation **9**

Introduction – Installation of Fixed Platform Substructures - Floating Structures – Foundations - Subsea Templates – loadouts - transportation - Platform Installation Methods and installation criteria – Installation of Pipelines and Risers

UNIT V: Materials for Offshore Applications **9**

Material for Construction-Structural Steel, Topside Materials, Advanced Composite materials, Corrosion Control, Material Reliability and Monitoring and Fracture Control

Total hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Summarize and classify the concepts types and knowledge in basics of offshore structures	K2
CO2	Interpret the loading conditions and apply the formula to analyze the loads acting on offshore structures	K3
CO3	List the types of equipment and its machinery which are functioning in offshore structures	K1
CO4	Summarize the various offshore installation methods	K2
CO5	Explain the various materials used on the constriction of offshore structures	K2

Textbooks

1. Dawson, T.H., "Offshore Structural Engineering", Prentice Hall, 1983
2. B.C Gerwick, Jr. "Construction of Marine and Offshore Structures", CRC Press, Florida, 2000.
3. Subrata K Ckakrabarti, "Handbook of Offshore Engineering", Vol 1, Vol 2, Elsevier Publishers, 1st edition, 2005.

Reference Books

4. API RP 2A., "Planning Designing and Constructing Fixed Offshore Platforms", API
5. McClelland, B & Reifel, M.D., "Planning & Design of fixed Offshore Platforms", VanNostrand, 1986
6. Graff, W.J., "Introduction to Offshore Structures", Gulf Publ. Co. 1981.
7. Reddy, D.V & Arockiasamy, M., "Offshore Structure" Vol.1 & 2, Kreiger Publ. Co 1991
8. Morgan, N., "Marine Technology Reference Book", Butterworths, 1990.

18ETN020	Marine Engineering	L- 3	T - 0	P - 0	C - 3

Course Objectives:

- To classify the machineries in a ship
- To compare the various starting techniques of machineries
- To illustrate the cross-sectional views of the machineries and machineries room arrangement

Unit – I: Main Propulsion Machinery – 1 **9**

Marine diesel engines -general engine principles, Low speed and medium speed diesel engines, Fuels, fuel oil system, Scavenging and turbo charging. Starting and revising systems, controls and safety devices, Lubrication, Lubricants and lub oil systems, cooling systems torque and power measurement. Marine boilers types, fire tube and water, tube boilers, boiler arrangements, steam to steam boilers, double evaporation boilers, exhaust gas heat exchangers, auxiliary steam plant systems, exhaust gas boilers, composite boilers

Unit – 2: Main Propulsion Machinery – 2 **9**

Marine Steam turbines -Types of turbines, compounding - reheat turbines, turbine construction, rotors, blades, casing, gland scaling, diagrams, nozzles, bearings etc. Lubrication systems, expansion arrangements, control, gearing operating procedure. Marine gas turbines - fundamentals of G.T, Structure of gas turbines, gearing, operational features, controls, gearing, combined cycles.

Unit – 3: Special Types **9**

Nuclear propulsion -physical principles of the operation of nuclear reactors - use of nuclear propulsion on sea going vessels. Electric Propulsion, Dynamic Positioning, Automation of ship propulsion plants, Maintenance requirements and reliability of propulsion plants, Engine dynamics, torsional vibration of engine and shafting, axial shaft vibration, critical speeds engine rating, rating corrections, trial tests etc. Relationship of engine to the propeller, classification society rules on engine construction.

Unit – 4: Auxiliary Machineries **9**

Air compressors, boilers, heat exchangers, cooling, evaporators, distillers, waste heat recovery systems, hot water, drinking water, cooling water and sea water systems. Fuel systems, lubricating oil system filters, coolers, centrifuges, purifiers and clarifiers. Bilge and Ballast systems - Sewage disposal, Oily water separator, incinerator, galley equipment, RO plant. Introduction to Marine pumps and piping - types, materials, colour coding etc. Rudder and steering gear, anti-roll devices.

Unit – 5: Design Considerations **9**

Considerations in Engine room arrangement, marine engineering considerations in ship design, and design and selection considerations of marine machinery. Safety systems firefighting equipment Instrumentation & control, watch keeping system UMS classes. Air compressors, heat exchangers and engine mounting, study of different types of marine engines available in the world market.

Total hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Categorize the machineries and their functions	K4
CO2	Compile the records of the machineries commissioning data and performance	K6
CO3	Develop the machineries room arrangement	K6
CO4	Explain the Lube Oil, Fuel Oil systems	K2
CO5	Design the layout of an engine room	K6

Textbook

1. Harrington; Marine Engineering, SNAME Publications
2. Pounder,C.C.; Marine Diesel Engines, Newnen-Butterworths, London.
3. Khetagurov, M.; Marine Auxiliary Machinery and Systems, Peace Publishers, Moscow.

Reference Books:

1. Taylor, D.A.; Introduction to Marine Engineering
2. Reed's Marine Engineering for Naval Architect
3. Marine Pumps and Piping Systems

18ETN021	Basics of CADD Software	L - 0	T - 0	P - 3	C - 1

List of Experiments

1. Introduction to CAD Software's
2. Basic AutoCAD Commands
3. Creating Sheet Size, Title Block and Scaling of drawing.
4. Working with different types of layers, line types.
5. Dimensioning, Text
6. Creating simple 2D objects
7. Creating simple Isometric drawings
8. 2D drawings Universal Coupling
9. 2D drawings Plumber block
10. Assembly of Universal Coupling

Course Outcomes:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Define basic concepts of CADD software and their applications in naval industries	K1
CO2	Explain about the drawing procedures, presentation and creation	K2
CO3	Develop a sheet, block and scaling of 2D drawings	K3
CO4	Create simple 2D objects and simple Isometric drawings	K6
CO5	Design Assembly drawing of any shapes with 2D drawings images	K6

Total Hours: 40

18ETN022	Strength of Materials and Fluid Mechanics Lab	L- 0	T - 0	P - 3	C - 1

List of Experiments

1. Bending Moments - To determine experimentally the bending moment in (a) A cantilever and (b) A simply supported beam and to compare experimental values with the theoretical values.
2. Standard tension test on UTM (Al or MS Rod)
3. Shear strength of MS rod on UTM
4. Deflection characteristic of open and closed springs.
5. Hardness measurement - Brinell, Rockwell
6. Charpy and Izod impact tests
7. Maxwell's theorem and estimation of Young's modulus
8. To determine the coefficient of contraction, discharge and velocity for flow through an orifice (circular) (Orifice).
9. To Calibrate a given notch on triangular in cross-section (triangular notch).
10. To draw the characteristic curves of the Reciprocating Pump. (reciprocating pump).
11. To draw the characteristic Curves for a Pelton wheel at a constant speed (peltron turbine).
12. Comparative study and performance behavior of different types of Mouth pieces
    Cylindrical
    Converging
    Diverging

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Make use of UTM for analyzing bending moment	K4
CO2	Estimate the impact load using Charpy test	K4
CO3	Evaluate the hardness number value of a material using Rockwell hardness test	K5
CO4	Evaluate the friction factor for the pipe	K5
CO5	Explain the coefficient of discharge contraction and velocity of an orifice	K2

Total hours: 40

18ETN023	Engineering Mathematics - IV	L - 3	T - 1	P - 0	C - 4

Course Objective:

Using appropriate numerical methods, determine approximate solutions to ordinary differential equations. Analyze the errors obtained in the numerical solution of problems.

UNIT I: Solution of Equations and Eigenvalue Problems 12

Solution of algebraic and transcendental equations –iteration method – Newton Raphson method – Solution of linear system of equations- Gauss elimination method –- Gauss-Jordon method–Matrix Inversion by Gauss Jordon method – Eigen value of a matrix by power method.

UNIT II: Interpolation and Approximation 12

Interpolation with unequal intervals- Lagrange's interpolation – Newton's Divided difference interpolation– Interpolation with equal intervals- Newton's forward and backward difference formulae.

UNIT III: Numerical Differentiation and Integration 12

Approximation of derivatives using interpolation polynomials- Numerical integration using trapezoidal and Simpson's 1/3 and 3/8 rule – Romberg's method

UNIT IV: Initial Value Problems for Ordinary Differential Equations 12

Single step methods: Taylor series method – Euler's method-Modified Euler's method– Fourth order Runge – Kutta method for solving first order equations

UNIT V: Boundary Value Problems in Ordinary and Partial Differential Equations 12

Finite difference methods for solving two-point linear boundary value problems – Finite difference techniques for the solution of two-dimensional Laplace's and Poisson's equations on rectangular domain

Total hours: 60

Course Objective:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Apply appropriate algorithms to solve selected problems, both manually and by writing computer programs.	K3
CO2	Compare different algorithms with respect to accuracy and efficiency of solution.	K4
CO3	Appropriate numerical methods, determine the solutions to given non-linear equations.	K3
CO4	Using appropriate numerical methods, determine approximate solutions to systems of linear equations.	K3
CO5	Demonstrate the use of interpolation methods to find intermediate values in given graphical and/or tabulated data	K2

TEXT BOOKS:

1. Grewal, B.S. and Grewal,J.S., " Numerical methods in Engineering and Science ",9th Edition, Khanna Publishers, New Delhi, 2012.
2. Gerald, C. F. and Wheatley, P.O., "Applied Numerical Analysis", 6th Edition, Pearson Education, Asia, New Delhi, 2006.
3. Sivaramakrishna Das.P and Vijayakumari.C, Numerical Analysis, 2014, Pearson Education, Limited in south Asia.

REFERENCE BOOKS:

1. Chapra, S. C and Canale, R. P., "Numerical Methods for Engineers",Tata McGraw-Hill, New Delhi, 5th Edition, 2007
2. Sankara Rao K, "Numerical Methods for Scientisits and Engineers",Printice Hall of India,New Delhi, 3rd Edition,2007 .

18ETN024	Theory of Structures	L - 3	T - 0	P - 0	C - 3

Course Objective: To develop student's ability to understand structural calculation theories, analysis of stiffened plates, Pure bending plates, flexibility and stiffness matrices, ultimate strength concepts, design of Tubular members, design for dynamic loads, vibration of beams and shafts etc.

UNIT I Continuous beams and strain energy method **9**

Continuous beams - Chaperon's three-moment equation, Moment distribution method, Torsion of non-circular sections, shear center of simple cross sections. Strain energy method-principle of virtual work, flexibility method, stiffness method, strain energy and complementary energy, Castiglione's theorems. Introduction of theory of plasticity.

UNIT II Matrix methods **9**

The Matrix displacement approach, Introduction, Stiffness matrix of a bar, element subjected to Axial Force, Co-ordinate transformations, Global stiffness matrix, application to Pin-jointed frames, stiffness matrix of a beam element, application to continuous beams.

UNIT III Theory of thin plates **9**

Introduction to theory of thin plates, Pure bending of plates, Small deflection analysis of laterally loaded plates, Boundary conditions, Naview solution, Lavy's` solution. Analysis of stiffened plates - orthotropic plate model and other methods. Design of plates for large deflections and permanent set - design of lifting structures such as cranes.

UNIT IV Design of tubular members **9**

Design of tubular members for pure and combined stress resultants - brief introduction to optimal member design. Design principles of tubular joints - punching shear and ultimate strength concepts fracture mechanics and fatigue.

UNIT V Design for dynamic loads **9**

Design for dynamic loads Vibrations of continuous systems - vibration of strings and rods - vibration of beams - vibration of shafts.

Total hours: 45

Course Outcomes:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Define the shear force and bending moment diagram for Indeterminate structures	K1
CO2	Explain stiffness matrix for various problems	K2
CO3	Evaluate dynamic response for various systems	K5
CO4	Design the bending stress of the structures	K6
CO5	Develop the loads calculation and plot in the graph using software	K6

TEXT BOOKS

1. Timoshenko & Young; Theory of structures, McGraw Hill Publications.
2. Ramamirutham, "Strength of materials", Dhanpat Rai publishing company (p) limited, new delhi, 17th edition, 2008.
3. Krishna Raju & Gururaja; Advanced Mechanics of solids and structures, Narosa Publications.

REFERENCE BOOKS

1. Reddy, C.S; Basic Structural Analysis, Tata-McGraw Hill Publications. Timoshenko & Young; Theory of plates, McGraw Hill Publications.
2. RD Blevins; Flow induced Vibrations, Van Nostrand Reinhold, 1990.
3. BC Gerwick, Jr. Construction of marine and offshore structures, CRC Press, 2000.
4. N Barltrop, Floating Structures, A Guide for Design and Analysis, OPL , 1998

18ETN025	Hydrodynamic, Resistance & Propulsion of Ships	L - 3	T - 0	P - 0	C - 3

Course Objectives:

- To classify the functions of wave characteristics and kinematics
- To determine the value of resistance and types of resistance acting on ship
- To Interpret and assess the BSRA series and proving various types of resistance for ships
- To understand and design the propellers and its qualities

Unit-1 Marine Hydrodynamics 9

Classification of water waves, Wave Characteristics, Wave theories, Water particle kinematics, Wave deformation, Wave analysis, Wave forecasting methods, Wave forces – Morison equation, Wave currents and its classification, Scour and other effects of currents.

Unit-2 Components of ship resistance **9**

Dimensional analysis. Laws of comparison - geometrical, dynamical and kinematical similarity, Newton's, Froude's and Reynold's law, model-ship correlation. Viscous resistance – turbulent plate friction and plate resistance, viscous pressure resistance, separation and resistance due to separation, influence of curvature of the ship's hull, form factor, hull roughness and its influence on frictional resistance Wave making resistance – pressure resistance, ship wave system, interference effects, theoretical calculation of wave making resistance, wave breaking resistance, bulbous bows and their effects

Unit-3 Determination of resistance **9**

Model testing and exploration, Series test results – residuary resistance, effect of hull form on resistance, Taylor series, Series 60, B S R A series, S S P A series, etc.; statistical analysis of resistance data, Guldhammer Harvald's and Danckwardt's method. Resistance of planing crafts multihull vessels, hovercrafts, hydrofoils, barges and convoy of barges. Air and wind resistance, Resistance of appendages, Added resistance in waves; Resistance in restricted waterways – resistance in shallow water, resistance in canals

Unit-4 Propeller as a thrust producing mechanism **9**

Historical development; Screw propeller – screw propeller geometry, sections, propeller drawing, construction details. Types of propellers and other propulsion devices, Propeller theories – Momentum theory, Blade element theory, Circulation theory. Interaction between Hull and propeller Wake and wake fraction, Resistance augment and thrust deduction factor, propulsive efficiency in open water and behind conditions, hull efficiency, quasi propulsive coefficient, transmission efficiency; Powering. Cavitation and its effects and prevention.

Unit-5 Design of propellers **9**

Propeller families and series; Open water tests, Presentation of data, Kt-Kq diagrams, Design charts -Bp-δ, TJ PJ charts, Use of charts in propeller design and performance study; Selection of engines, diesel engine characteristics. Propeller strength Materials and their qualities, strength calculation. Model testing for resistance and propulsion – tank testing facilities, testing, prediction of resistance from model tests, extrapolation, Froude's concept, laminar influence and tank wall effect, comparison of resistance prediction with results of full-scale trials Laws of comparison, open water diagram, self-propulsion tests.

Total Hours 45

Course Outcomes:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Classify the functions of wave characteristics and kinematics	K4
CO2	Make use of model of ship determine the value of resistance and types of resistance acting on ship	K5
CO3	Interpret and assess the BSRA series and proving various types of resistance for ships	K5
CO4	Develop the design of propellers and its qualities	K6
CO5	Develop the efficient design of ships by predicting the resistance and propulsion	K5

Textbooks

1. Lewis,E.U.; “Principles of Naval Architecture”, (2nd Rev.), SNAME, New Jersey, U.S.A.
2. Barnaby K.; Basic Naval Architecture, Marine Propellers and Propulsion 2007, Second Edition, J S Carlton, Butterworth-Heinemann, ISBN: 978-07506-8150-6
3. Marine Powering Prediction and Propulsors by Neil Bose (2008), The Society of Naval Architects and Marine Engineers, ISBN: 0-939773-65-1.

Reference Books

1. Basic Ship Theory Vol II, Rawson and Tupper, Butterworth-Heinemann, 2001, ISBN 0 7506 5396 5
2. Principles of Naval Architecture: Ship Resistance & Flow by Lars Larsson & Hoyte C. Raven (2010), The Society of Naval Architects and Marine Engineers ISBN 978-0-939773-76-3
3. Practical Ship Design, DGM Watson, Elsevier Ocean Engineering Book Series 2002, ISBN: 0-08-042999-8
4. Practical Ship Hydrodynamics 2000, Volker Bertram, Butterworth-Heinemann, ISBN 0 7506 4851 1
5. Hydrodynamics in Ship Design 1957 Vol I, II, III, H E Saunders, The Society of Naval Architects and Marine Engineers
6. Hydrodynamics of High-Speed Vehicles 2005, OM Faltinsen, Cambridge University Press, ISBN-13 978-0-521-84568-7
7. Marine Hydrodynamics, Office of Naval Research Fluid Mechanics Program, MIT

18ETN026	Strength of Ships	L - 3	T - 0	P - 0	C - 3

Course Objectives:

- To determine the various loads and framing arrangement of ship
- To determine the section modulus and scantling calculations
- To illustrate the basics of ship vibration and methods to determine the dynamic response
- To illustrate the basic understanding of transfer function and frequency domain analysis
- To evaluate the structural analysis and stiffening of plates

Unit-1 Introduction to functions and analysis of ship structures: 9

Functions of ship structure, the forces acting up on a ship at sea, static forces, dynamic forces. The distortion of ship's structure. Application of theory and experience. Limitations of the theory. Distinction between strength and stiffness of hull girder. Forces and moments acting on ship's structures in regular waves in head seas, and oblique seas. Nature of stresses in ship's hull when ship is floating in still water and on a wave. Modelling of ship's' structures including general remarks on structural strength. Three-dimensional analysis of a ship structures (elementary treatment only). Assumptions and simplification of longitudinal strength calculations. Introduction to the use of probability theory in the assessment of longitudinal strength.

Unit – 2: Longitudinal strength of hull girder and ultimate strength 9

Modelling of ship hull Girder as a beam. Assumed form of wave systems. Conditions of Hogging and Sagging. The buoyancy curves. The weight curves. Distributions of dead weight items. The Load, shearing force and bending moment curves. Characteristics of shear force and bending moment curves. Still water bending moment, wave bending moment and total bending moment. Bending theory applied to ship structures and its limitations. Calculations of hull girder section modulus and hull deflection. Dynamic effects on loads acting on the hull due to ship motions and wave action such as slamming. Thermal effects on hull girder. Stresses in the inclined condition. Application of plastic theory to ship structures, stress-strain diagram, calculation of plastic neutral axis and plastic moment. Ultimate strength of a simply supported beam and a fixed ended beam. Ultimate longitudinal strength of a ship.

Unit – 3: Transverse strength of hull girder and ship hull material 9

Transverse loads on ship's hull such as hydrostatic loads, weights, wave loads, racking, and torsion. Effect of hatches and other openings. Strain energy method, moment distribution method and comparison of the two methods, Influence of bracketed connections. Manufacture of steel. Requirement of ship building quality steels, high strength steels, Aluminum alloys and glass reinforced plastics, Mechanical properties and chemical composition of structural materials, Testing of steels such as tensile test bend test and impact test. Brittle fracture. Steels for very low temperature applications

Unit – 4: Strength of bulk heads, decks and tank tops, foundations, super structure, deck houses and structural discontinuities and local strength problem 9

Types of bulkheads and loads on bulkheads, Strength analysis of bulkheads. Types of foundations- loads on foundations and Strength analysis. Generation of loads on superstructure. Factors affecting superstructure efficiency. Effective superstructure. Strength of Aluminum alloy superstructure. Strength analysis of decks and tank tops. Determination of

scantlings of superstructure decks based on simple bending theory. Strength of deckhouses, structural discontinuities such as holes in plates, notches in beams and girders, deck openings, ends of superstructure, ends of girders and other structural members. Stress concentration due to various structural discontinuities mentioned above. Applications of three-moment theorem to Ship structures. Use of strain energy method for solution of bending moment problems and redundant structural problems.

Unit – 5: Theory of thin plates, buckling of structures, composite construction, grillage analysis, calculation of scantlings as per rules 9

Thin plate theory and solution for different boundary conditions. Application of plain stress theory to ship structural problems. Case of a plate acted upon by a concentrated load; Buckling of plates. Influence of stiffeners (longitudinal and \ or transverse) on the buckling stress of ship's plating. Bending and membrane stresses in plates (application to bulkheads, shell plates etc.) Composite construction- Two materials with same elastic modulus. Two materials of different elastic Modulii. Bending of composite beam. Introduction to Grillage. Analysis of simple Grillage., Scantling calculations according to the rules of classification societies.

Total hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Define various loads acting on ship under various conditions	K1
CO2	Illustrate shear force and bending Moment diagram for ship in still water and wave loading conditions	K2
CO3	Evaluate the section modulus and scantling calculations for ship.	K5
CO4	Evaluate the basic calculations for Transfer function and Frequency domain and basic Statistical analysis	K5
CO5	Determine natural frequencies of SDOF and MDOF system and methods to obtain response analytically.	K5

Textbooks

1. Lewis,E.U.; Principles of Naval Architecture, (2nd Rev.), SNAME, New Jersey, U.S.A.
2. Owen Hughes; Ship Structural Design
3. Muckle,W.; Strength of Ships.

Reference Books

1. Ship Structural Design - A Rationally Based, Computer-Aided, Optimisation Approach, 1995, Hughes OF John Wiley and Sons
2. Ship Structural Analysis and Design 2010, OF Hughes and JK Paik, The Society of Naval Architects and Marine Engineers, ISBN 978-0-939773-78-3
3. Structural Design of Seagoing Ships, Barabanov, MIR Publishers
4. Basic Ship Theory Vol II, Rawson and Tupper, Butterworth-Heinemann, 2001, ISBN 0 7506 5396 5
5. Principles of Naval Architecture Series: Strength of Ships and Ocean Structures by Alaa Mansour and Don Liu, Edited by J. Randolph Paulling (2008), The Society of Naval Architects and Marine Engineers ISBN 0-939773-66-x
6. Principles of Naval Architecture Series: Vibration by William S. Vorus Edited by J. Randolph Paulling (2010), The Society of Naval Architects and Marine Engineers,

The Society of Naval Architects and Marine Engineers, ISBN: ISBN 978-0-939773-75-6
7. Practical Ship Design, DGM Watson, Elsevier Ocean Engineering Book Series 2002, ISBN: 0-08-042999-8
8. Marine Structural Design, 2003, Y Bai, Elsevier, ISBN: 0-08-043921-7
9. Design of Ship Hull Structures - A Practical Guide for Engineers, Yasuhisa Okumoto et al, Springer, ISBN: 978-3-540-88444-6
10. Sea loads on ships and offshore structures 1998, OM Faltinsen, Cambridge Univeristy Press, ISBN 0521458706
11. Design of Ship's Structures 1993, DW Chalmers, UK MoD Publications, ISBN 0 11 772717 2
12. Elementary Beam Theory and the Ship Girder, 1979, Stanford Maritime London, ISBN 0 540 07352 0
13. Ship-shaped Offshore Installations Design Building and Operation, 2007, Jeom Kee Paik and Anil Kumar Thayamballi, Cambridge University Press, ISBN-13 978-0-521-85921-9
14. Torsion and Shear Stresses in Ships, Mohamed Shama, 2011, Springer, ISBN-13: 978-3642146329

18ETN027	Marine Electrical Technology	L - 3	T - 0	P - 0	C- 3

Course Objective: To develop student's ability to understand electrical motors, starters, switch boards, electrical installations and safety devices, ac generator active and reactive load sharing, generator synchronizing procedure, understand principle of 3 phase alternating voltage generation on board the ship.

UNIT I AC Motors and Starters **9**

Understand the Principle of operation of a direct on-line starter (DOL) starter, Star delta starter, autotransformer starter, Understand the need and means for motor protection. AC Motors Understand the construction and characteristics of a squirrel cage induction motor Understand the principle of operation of a single-phase motor.

UNIT II AC Generator **9**

Understand the construction and principle of operation of a three-phase ac generator, ac regulation on ac generator, ac generator active and reactive load sharing, generator synchronizing procedure (SIMULATOR).

UNIT III Switch Board **9**

Understand the function of the main switchboard, need and methods ac system protection. Neutral System Understand the types of neutral systems and earth fault. Emergency Supplies-The operation and maintenance of commonly used batteries on board ship. The operation of the emergency generator. Insulation Resistance-Understand insulation resistance measurement.

UNIT IV DC Generator **9**

Understand the construction and principle of operation of a dc generator. Dc Motor-Understand the construction and operation of dc motor. Ship Lightning-Understand different types of lightings installed onboard ships. 3 Phase Ac System-Understand principle of 3 phase alternating voltage generation.

UNIT V Electrical Installations and Safety **9**

Understand hazards of live electrical systems and safe electrical practice. Fuse protection, general maintenance. Instrumentation -Temperature, Pressure, Torque, Rpm measuring devices – methods working Principles.

Total hours: 45

Course Outcomes:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Demonstrate the principles and operations of AC motors and starters	K2
CO2	Demonstrate the construction of DC generator & 3 Phase Alternate Voltage	K2
CO3	List out the functions of AC generator operators & procedure	K4
CO4	Explain the concept of switch boards operation and maintenance principle	K2
CO5	Classify the different types of lightings installed onboard	K4

Textbooks

1. Elstan A. Fernandez, Marine Electrical Technology, SPD Publishers, 4th Edition, 2008.
2. John C. Payne, "The Marine Electrical and Electronics Bible" Sheridon House Inc. 2001

Reference Books

1. Dennis t. Hall, "Practical Marine Electrical Engineering", Witherby Publishers, 2nd edition, 1999.
2. H. D. McGeorge, "Marine Electrical Equipment and Practice", Newnes, 1993

18ETN028	Ship Design Calculation Drawing & Drafting – I (SDCADD-I)	L - 0	T - 0	P - 3	C -1

Course Objectives:

- To develop offset table from BSRA series
- To design lines plan and hydrostatic curves
- To make use of the offset table to find the hydrostatic properties

List of Exercises:

1. Ship Lines plan (Manual & Autocad)
2. Fairing of Lines
3. Generating Offset table
4. Bonjean Calculation
5. Calculation of Hydrostatic Parameters (Excel)
6. Hydrostatic Curves (Excel & Autocad)

Total Hours 40

Course Outcomes:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Define the significance of BSRA series, Offset tables and Lines plan	K1
CO2	Interpret the BSRA series into an Offset table	K2
CO3	Construct the Lines plan, hydrostatic curves by Manually and also using Software	K3
CO4	Evaluate the hydrostatic parameters and Bonjean values	K5
CO5	Compare the values of all the hydrostatic properties like volume, displacement etc.	K5

18ETN029	Ship Design Software - Maxsurf	L - 0	T - 0	P - 3	C - 1

Course Objective: To develop students' ability to understand and carry out practice in Maxsurf software, so that the student is capable of using the software in ship/offshore engineering. This module will include the offshore vessel modeling, surface preparation, Vessel hydrostatic calculation, tanks calibration, large angle stability, waveform, probabilistic damage, longitudinal strength calculation.

Introduction Basic Principles, creating your first Design, adding a Surface, setting up Units, Modeling Edges, setting your Frame of Reference, Showing the Net, Inserting Control Points, Setting Surface Stiffness Removing Control Points

Using Maxsurf Working with Surfaces, Surface Properties, Surface Materials and Skin Thickness, Modeling Developable Surfaces, Developable Surfaces Example.

Maxsurf Calculations, Hydrostatics, Calculate Girth, Calculate Areas, Using Parametric Transformation, Scaling factors, Hull Shape Comparison, Parametric Transformation Restrictions, Input of Data, Importing DXF background, Importing Rhino .3dm files, Output of Data, Exporting a Maxsurf Design

Stability Analysis Input Model, Analysis Settings, Environment Options, Stability Criteria, Output, Upright Hydrostatics, Large Angle Stability, Equilibrium Condition, Specified Condition KN Values, Limiting KG, Floodable Length, Longitudinal Strength, Tank Calibrations, Probabilistic Damage, Setting Initial Conditions, Working with Load cases, Compartment Types, Heel, Trim, Draft, Displacement, Specified Conditions, Hog and Sag, Waveform, Grounding, Criteria Results, Criteria Results Table

Total Hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Define basics of Maxsurf Software and their significance	K1
CO2	Classify the surface properties, Materials and skin thickness	K2
CO3	Apply Simpson's rules for finding areas of the curves	K3
CO4	Compare the Hull shape, input data and stability criteria	K4
CO5	Analyze stability, floodable length and longitudinal strength	K4

18ETN030	Finite Element Analysis	L – 3	T – 1	P – 0	C – 4

Course Objective: To impart the student with the basic knowledge about finite element analysis of structural elements which will be useful for the design of ships and offshore structures. This subject cover one dimension and two-dimension FEM, isometric elements, analysis of plates and application of FEM.

Unit I Introduction **9**

Concepts of FEM – steps involved – merits and demerits – energy principles Discrimination – Raleigh – Ritz method of functional approximation. Principles of Elasticity: Stress equations – strain displacement relationships in matrix form plane stress – plane strain and axi-symmetric bodies of revolution with axi-symmetric loading.

Unit II One dimensional and Two-Dimensional FEM **9**

One dimensional FEM: Stiffness matrix for beam and bar elements – shape functions foe ID elements. Two-dimensional FEM: Different types of elements for plane stress and plane strain analysis displacement models – generalized coordinates – shape functions – convergent and compatibility requirements – geometric invariance – natural coordinate system – area and volume coordinates – generation of element stiffness and nodal load matrices

Unit III Isometric elements **9**

Concept – different Isoparametric elements for 2D analysis -formulation of 4-noded and 8-noded Isoparametric quadrilateral elements – Lagrange elements – serendipity elements. Axi Symmetric Analysis: bodies of revolution – axi symmetric modeling – strain displacement relationship – formulation of axi symmetric elements.

Unit IV Analysis of Plates **9**

Introduction to Finite Element Analysis of Plates: basic theory of plate bending – thin plate theory –stress resultants – Mindlin's approximations – formulation of 4-noded isoperimetric quadrilateral plate element – Shell Element.

Unit V Applications of FEM **9**

Introduction to non – linear analysis – basic methods – application to Special structures- Three-dimensional FEM: Different 3-D elements-strain-displacement relationship –formulation of hexahedral and Isoparametric solid element.

Total hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Formulate the finite element mathematical modeling concepts for boundary value engineering Problems.	K6
CO2	Analyze the problems in one dimensional structure including trusses, beams and frames	K4
CO3	Analyze the problems in Isometric Elements	K4
CO4	Analyze the problems in Plate Elements	K4
CO5	Apply the finite element method to solve two- and three-dimensional problems	K6

Textbook:

1. Robert D.Cook, David S, Malkus and Michael E. Plesha, "Concepts and Applications of Finite Element Analysis" Wiley, 1989.
2. OC Zienkiewicz, "Finite element Methods" Butterworth Heinemann, 5th edition, 2002
3. GS Krishna Murthy, "Finite element analysis, theory and programming" 2nd edition, Mc-graw Hill publishing.

Reference Books:

1. Tirupathi Chandra Patila and Belugunudu, "Introduction to Finite elements in engineering" Pearson Education Limited, 2014
2. JN Reddy, "Introduction to Finite element Method", McGraw-Hill, 2006.

18ETN031	Ship Production I	L – 3	T – 0	P – 0	C- 3

Course Objective

- To define the construction of a mid-ship section and other parts
- To demonstrate about shipyard facilities and machines
- To explain the various production stages and techniques

Unit-1 History of Indian Ship building **9**

Characteristics of ship building process as heavy and one-off kind maritime industry, general principles on layout of shipyards, Relation with supply industry, subcontractors. Storage and preparation of material – Introduction, material handling and storage, transport system in steel stockyard, material preparation (straightening of plates and rolled sections, shot blasting, pre-painting), material preparation flow line devices and their control systems.

Unit-2 Fabrication of component parts **9**

The cutting process – tools, physical chemical background of the cutting process, mechanical cutting, devices for thermal cutting, general description of the various machines, photoelectric and NC- control devices, edge preparation, problems of accuracy; Bending of rolled and built up sections - general description of bending, control of the bending process, automation of bending; Plate bending, uniaxial bending, biaxial bending (devices, cold bending, heat-line bending), possibilities of automated plate bending.

Unit-3 Assembly of Ship's Structures **9**

Prefabrication – general remarks, basic problems of prefabrication, pattern of prefabrication, welding in prefabrication, Data generation for ship building process. Basic welding in shipbuilding, welding methods, standards, symbols
Sub-assemblies: built up T-bars, web frames, machine foundations etc.; welding deformation and straightening; Prefabrication of flat sections – panels, panel production line, preassembly of biaxial stiffened panels – welding procedures. Assembly of flat and corrugated sections, flat sections with curvature – assembly jigs, welding process, its nature, theoretical background, strengthening of flat sections. Preassembly of volume units – Preassembly of double bottom sections – different structural arrangements, variants of the assembly process, welding problems; Preassembly of side tank units – structural arrangement; Special assembly systems, Preassembly of the fore and aft end structure; Preassembly and outfit of superstructures. Outfitting shops- Mechanical, Piping and Insulation.

Unit-4 Erection of ship's hull **9**

General assembly methods, handling of preassembled units in the erection area – cranes, heavy-duty truck; Preassembly of blocks – special types, advantages and disadvantages; Hull assembly – different methods of hull assembly, auxiliary devices; Welding in ship's hull assembly – welding methods applied, welding defects, welding deformation of the ship's hull; Quality control (X-ray tests etc.),; Scaffolds. Activities in shipyard pipe, machine and shipwrights' shops

Unit-5 Launching **9**

General methods, launching by floating off (building dock, launching dock, floating dock), Mechanical launching methods (slip, lift), Launching from inclined building berths – stern launching, side launching; Tipping, Pivoting.

Total Hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Define the labor, material, machine and space resource requirements	K1
CO2	Explain the productivity term	K2
CO3	Estimate ship efficiency and machine utilization figures	K5
CO4	Adapt the activity networks for planning purposes	K6
CO5	Perceive the knowledge about the fabrication processes	K5

Textbooks

1) Taggart; Ship Design and Construction, SNAME
2) Storch R. Lee, Hammon C.P. & Bunch H.M.; Ship Production, Cornell Maritime Press, Maryland, USA, 1988
3) Dormidontov V.K. & et.al.; Shipbuilding Technology, Mir Publishers, Moscow.
4) Eyres D.J.; Ship Construction William Heinemann Ltd, London, 1982

Reference

1) Ship Construction, 2007, Sixth edition, D. J. Eyres, Butterworth-Heinemann, ISBN 13: 9-78-0-75-06-8070-7
2) Merchant Ship Construction, H. J. Pursey, Brown, Son & Ferguson, Ltd., Nautical Publishers
3) Ship Production, 2nd edition, 1995, Richard Lee, The Society of Naval Architects and Marine Engineers, ISBN 0-939773-57-0
4) Practical Construction of Ship, RM Newton,
5) Shipbuilding Technology, V. K Dormidontov, MIR Publishers
6) Ship Construction – Sketches and Notes 2003, Kemp and Young, Elsevier, ISBN 0-7506-3756-0

18ETN032	Advanced Offshore Engineering	L - 3	T - 0	P - 0	C - 3

Course Objective: The student will get understanding of oil and gas field development, deep water challenges, riser systems, platform types, remote operated vessels, Mooring lines - Typical mooring configuration, material and construction, anchors and ancillary equipment, static mooring analysis, etc.

Unit I Introduction of Oil and gas field **9**

Oil and gas field development Options: Platform types, marine riser systems, current design trends and deep-water challenges, Upstream, Midstream, Downstream, Exploration, Appraisal, Development, Production, Economics

Unit II Riser systems: **9**

Flexible pipe structure and material, typical configurations, top tensioned vertical risers, hybrid risers. Flow assurance: multi-phase flow, deposition of solids, thermal management, corrosion. Riser analysis: governing equations, boundary conditions, natural frequency.

Unit III Mooring system **9**

Mooring lines -Typical mooring configuration, material and construction, anchors and ancillary equipment, static mooring analysis - mooring and anchoring system for different offshore structure TLP, spar, semisubmersibles, drill ships.

Unit IV Vortex induced vibration **9**

Vortex induced vibration: VIV Parameters, drag, lift, vortex shedding, surface roughness, Strouhal number, VIV assessment, fatigue life calculation, Simplified VIV Analysis Examples of VIV Analysis

Unit V Remotely operated vehicles **9**

Remotely operated vehicles: ROV categories- Micro, mini, general, Light work class, Heavy work class, Trenching & Burial, AVUs ROV-handling systems, construction and materials, navigation and control, Remote Piloting, Manipulator arms, HD and 4k Video Cameras, Tooling Solutions.

Total Hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Summarize the types of riser systems and illustrate the current economical situations	K2
CO2	Categorize the types configurations and analyze risers for various boundary conditions	K4
CO3	Demonstrate types of mooring anchors and its configuration methods	K2
CO4	Evaluate and find the solution for VIV problems in Offshore Structures	K2
CO5	Illustrate about the various underwater vehicles Elaborately	K2

Textbooks

1. Handbook of Offshore Engineering, Subrata K. Chakrabarthi, Vol I, Vol II, USA, 2005
2. BC Grewick, Jr. Construction of marine and offshore structure, CRC Press, 2000.
3. RD Blevins, Flow induced vibrations, Van Nostrand Reinhold, 1990.
4. N Barltrop, Floating structures: A Guide for design and analysis, OPL, 1998.

Reference Books

1. EE Allimendinger, Submersible vehicle systems design. SNAME, 1990.
2. HO Bordeaux, Buoy engineering, John Wiley, 1975.

18ETN033	Ship Design	L - 3	T - 0	P - 0	C - 3

COURSE OBJETIVES

- To Evaluate the ship parameters like coefficient of forms, displacement, etc,.
- To analyze the ship stability
- To define the marine auxiliary systems like ballast, bilge systems

Unit-1 Introduction **9**

General aspects of Marine Activities, Transportation of cargoes, Marine services & Operations, Marine Industries; Engineering Economics in Ship Design - Economic criteria, Initial cost, Operating cost, RFR; Owners requirements

Unit-2 Methods of ship design **9**

Design using basic type ships, Design using coefficients, Design using iteration methods; design spiral; design categories (dead-weight carrier, capacity carrier, linear dimension ship). Ship parameters - displacement, displacement coefficient, displacement equation, volume equation, solution of the cubic equation

Unit-3 Ship dimension **9**

Length, breadth, depth, draught, form coefficients; Shape of the hull. Mass estimation - lightship mass – steel mass, outfit mass, engine plant mass; dead weight. Design of hull form – conventional method of lines, distortion of existing forms; stem and stern contours, Bulbous Bow.

Unit-4 General arrangement and Stability Booklet **9**

Subdivision of the ship's hull and erections, arrangement of spaces, arrangement of tanks, superstructure and deckhouses, arrangement of engine plants, Cargo handling capacity, hold capacity and stowage factor, Stability – stability booklet, IMO Regulations, Checks on stability, trim. Tonnage measurement – international, Suez, Panama. Influence of stability, resistance and propulsion and ship hydrodynamics factors on ship design

Unit-5 Auxiliary systems **9**

Marine system and Offshore Platform Equipment design: Bilge and Ballast system, Ventilation system, Air Conditioning and Refrigeration system, Berth and Mooring systems, Anchor handling system for ships and shore structures, Storage and Offloading, Firefighting systems, Stern gear, Steering gear, Lifesaving equipment.

Total Hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Design ship using basic type ships, coefficient, iteration methods	K6
CO2	Estimate the mass, material requirements, deadweight, etc	K5
CO3	Design of hull form, stem and stern and bulbous bow	K6
CO4	Solve the tonnages, stability, resistance and propulsion	K6
CO5	Select the mooring systems, anchors, firefighting systems	K5

Textbooks

1. Lewis, E.U; 'Principles of Naval Architecture' (2nd Rev.) Vol. III, 1989, SNAME New York
2. Schneekluth, H; Ship Design for Efficiency and Economy, Butterworths, 1987
3. Taggart; Ship Design and Construction, SNAME

Reference Books

1. Practical Ship Design, DGM Watson, Elsevier Ocean Engineering Book Series 2002, ISBN: 0-08-042999-8

2. Risk-Based Ship Design - Methods, Tools and Applications, Apostolos Papanikolaou et al, Springer-Verlag Berlin Heidelberg 2009, ISBN: 978-3-540-89041-6,
3. Ship Design for Efficiency and Economy 2nd Ed, H. Schneekluth and V. Bertram, Butterworth-Heinemann, ISBN 0 7506 4133 9
4. Ship Design & Construction, Vol I and II (2003, 2004), The Society of Naval Architects and Marine Engineers, ISBN 0-939773-40-6, ISBN 0-939773-41 -4
5. Basic Ship Theory Vol I and II, Rawson and Tupper, Butterworth-Heinemann, 2001, ISBN 0 7506 5396 5
6. Engineering for Ship Production, Thomas Lamb,1986, The University of Michigan
7. PNA Series, SNAME 2010.
8. Management of Marine Design, Stian Erichsen, Butterworths, ISBN 0-408-03237-5
9. Marine Vehicle Weight Engineering, Society of Allied Weight Engineers 2005, ISBN 9-9999-9999-9
10. Maritime Economics, 2nd ed, Martin Stopford, 2003, Routledge, ISBN 0-415-15309-3
11. MARPOL Consolidated edition 2006, IMO Sales number: IC520E
12. Rickmers standard for stowage and securing of project cargo, 2003, Rickmers Linie GmBH and Cie, Hamburg

18ETN034	Marine Materials and Metal Joining Techniques	L - 3	T - 0	P - 0	C - 3

Course Objectives:

- To define the fundamental science and engineering principles relevant to materials used in marine field.
- To illustrate the basic principles of various mechanical testing methods and NDT methods
- To interpret the practical knowledge about the structure and properties of metals. The problems encountered in welding various metals and metal alloys are reviewed in detail.

Unit-1 Introduction **9**

Definition, Historical Background, Development in Welding, Science of Welding, Welding Metallurgy: Introduction, Structure of metals, Crystallization of a pure metal, Phase transformation in Iron - Carbon diagram, Weldability of steel, Presence of alloy elements, Effect of welding process & nature of base metal, Preheating, HAZ.

Unit-2 Types of Welding **9**

Gas metal arc welding – Process, different metal transfers, power source, electrodes, shielding gas, uses of Gas in metal arc welding, mechanized system in shipbuilding - Introduction, philosophy of automation in welding, different welding systems in shipyards, Welding in production shop – SMAW, GTAW, EBW, LBW, SAW, Gravity welding, Auto contact welding, CO2 Welding, Friction Welding. Principle, process & applications

Unit-3 Panel line production **9**

One-sided welding – SAW, MIG welding, welding of stiffeners, Welding in building berth - External welding on the berth, Electro-slag welding, Electro gas welding, One-sided welding (Flux Asbestos backing, Ceramic backing etc.); Internal welding on the berth, Comparison of European, Japanese & Indian Welding Process

Unit-4 Welding Problems & Defects **9**

Welding problems - Weld defects, Distortion, Accuracy control; Non-destructive tests.
Welding quality control - Welding standards, Welding procedure qualification, Effect of variables on qualification of Welders & operators, Test reports, Acceptance standards, Quality assurance and audit, Consumable classification & coding. Introduction to Robotic Welding.

Unit-5 Adhesive Bonding as a joining technique **9**

Structural Adhesive Bonding as a joining technique – Adhesives and adherents, bonding methods and joint design, analysis of joints for strength, surface preparation for steel, aluminum and other materials used for marine structures.

Total Hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Apply the core concepts in Materials Science to solve marine engineering problems.	K3
CO2	Select materials for design and construction of marine structures	K1
CO3	Evaluate NDT method and able to interprets the results obtained from NDT methods	K5
CO4	Perceive knowledge about the Welding Procedure Specification, Procedure Qualification Record	K5
CO5	Explain about advanced welding technique like laser beam, robotic and Friction stir welding	K5

Textbooks

1. Davies, A.C.; Welding, Cambridge University Press, Low Price Edition, 1996.
2. Richard, Little; Welding Technology, McGraw Hill Publications, New Delhi.
3. Joe Lawrance; Welding Principles for Engineers, Prentice Hall Inc. Englewood Cliffs, N.J.
4. Welding Handbook – Vol.:1,2,3; American Welding Society
5. O.P. Khanna; A Textbook of Welding Technology, Dhanat Rai & Sons.

Reference Books

1. Rossi, Welding Technology, McGraw Hill.
2. Koenigsberger and Adaer, Welding Technology, Macmillan.
3. Howard B Cary., Modern Welding Technology, 4th edition, Prentice Hall, New Jersey, USA, 1997.
4. AWS Welding Handbooks, AWS, New York, 1995.

18ETN035	Ship Design Calculation Drawing & Drafting – II (SDCADD-II)	L - 0	T - 0	P - 3	C - 1

Course Objectives:

- To illustrate the resistance and tank capacities of the ship
- To evaluate the scantling, tank capacities and resistance of ship
- To design shell expansion and midship section by using softwares

List of Exercises:

1. Shell Expansion drawing (Manual & Autocad)
2. Midship section Calculation (Excel)
3. Midship section drawing (Manual & Autocad)
4. Scantling Calculation
5. Resistance calculation (Excel)
6. Tank Capacities calculation and Tank Plan (Excel & Autocad)

Total Hours: 40

Course Outcomes:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Define the significance of shell expansion drawing and midship section drawing	K1
CO2	Develop shell expansion and midship section drawing by using manually and software	K2
CO3	Make use of the values of particulars to do the scantling calculation and material requirement of the ship	K3
CO4	Define the resistance and tank capacity of the ship	K2
CO5	Evaluate the total resistance and tank capacities of the ship	K5

18ETN036	Offshore Design Software - SACS	L - 0	T - 0	P - 3	C - 1

Course Objective: To develop students' ability to understand and carry out practice in SACS software, so that the student is capable of using the software in ship/offshore engineering. This module will include the Nonlinear structural analysis, Dynamic response analysis due to environmental loads, Impact effects analysis, Severe accidental loadings analysis

List of Exercises:

Offshore Structural Design & Load out Analysis Offshore Structural Engineering, Design Criteria, Operation Design, Environment Criteria, Standards & Specification, Jacket Fixed Platform Structure Design, Jacket Main Structure Component, Deck and Deck Leg Dimensioning, Equipment Layout, Deck Elevation, Deck Framing, Jacket Design, Jacket's Leg Dimensioning, Bracing Structure, Bracing Dimensioning

Offshore Structural Engineering Design & Analysis with SACS, Basic Function, Joint Creation, Member Creation, Member's Property, Load joint, Structural Model Checking, Structural Analysis, Case Study: Jacket Fixed Platform Structure Design, Making Jacket, Legs & Brace, Making Main Deck, Making Deck Leg, Filling Properties for members, Member Offset

Offshore Structure Fatigue Analysis Fatigue stress range generation, Fatigue load, Hot spot stress & SCF, Fatigue damage and fatigue life calculation

Offshore Structure Loading Analysis Dead Load / Self Weight, Live Load, Equipment Load, Crane Load, Wave & Current Load, Wind Load, Combined Load

Offshore Structure Engineering Further Analysis & Reporting Further Offshore Structure Analysis, Reporting Offshore Structural Design & Analysis

Total Hours: 45

Course Outcomes:
After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Develop the Offshore structures, platforms, deck frames and jacket legs	K3
CO2	Analyze the loads applied, basic functions and loads of the offshore structures	K4
CO3	Analyze fatigue stress, load, damages and fatigue life	K4
CO4	Inspect stress for various environment loading conditions	K4
CO5	Survey and assess further design of offshore platform	K4

18ETN037	Sea Keeping and Maneuvering	L - 3	T - 0	P - 0	C - 3

Course Objective: To develop the student's capability to understand the sea keeping aspects of the ships and offshore structures, ships motion control in the sea way, use of stabilizers, and dynamics of the floating offshore systems, dynamic effects of ship in seaway, etc.

UNIT I Coordinate system **9**

Ship in Regular Waves - Coordinate Systems, Equations and Motion - uncoupled Heave, Pitch and Roll; Coupled Heave and Pitch - Hydrodynamic Forces - Radiation Forces - Strip Theory. Probabilistic Approach - Introduction to Random Response Theory Random Response of linear, Systems under wave Loading, Directional Spectra for Waves - Probabilistic Design Criteria - General Motion Analysis of Floating Bodies, Time and Frequency Domain Approach.

UNIT II Dynamic effects of ship in seaway **9**

Ship in Seaway and Dynamic effects - Linear Superposition, Response Amplitudes Operator, Pitch and Roll in irregular Waves, Local and Relative Motions shipping of green water, Slamming, Yawing and Broading, Added Resistance, Powering in Waves, Wave Loads.

UNIT III Ship motion control **9**

Ship Motion Control - Control of Roll - Passive Stabilizers (Bilge keel, Sails, Free Surface Tanks, U-tanks, moving weight) Controlled - Passive Stabilizers, Active Stabilizers (fin, gyro, active-tank) Rudder stabilization, Control of Pitch.

UNIT IV Sea keeping performance criteria **9**

Sea keeping Performance and Design Aspects - Sea - keeping performance criteria and ship seaways responses, factors affecting pitching, heaving and rolling, guidelines for design.

UNIT V Dynamics of floating system **9**

Dynamics of floating systems: Equations of motion for SDOF Systems, Time and Frequency domain solutions - Oscillators of Floating Bodies, Added Mass and Moment of Inertia, and Hydrodynamic damping - Exciting Forces and moments due to Waves. Strip theory for Slender Bodies - Symmetric and Unsymmetric Coupled Motions Effect of Forward Speed - 3D Effects - Dynamic Effects - Roll and Pitch Damping Devices.

Total hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Solve the hydrodynamic and loading conditions acting on ships	K3
CO2	Explain the dynamic effects of ships in seaway conditions	K2
CO3	Outline the idea of ship motion control	K2
CO4	Rule on seakeeping performances for hydrodynamic conditions	K5
CO5	Formulate the equations for dynamics of floating systems	K6

Text Books

1. Lewis E.U; "Principles of Naval Architecture" (2nd Rev) Vol. III**,** 1989,
2. Bhattacharya.R; "Dynamics of Marine Vehicles" 1978, Wiley Inter Science, Newyork.

Reference Books

1. Lamb.H; "Hydrodynamics", 1945 Cambridge University Press, UK.
2. Newmann.J.N; "Marine Hydrodynamics".MIT Press, USA ,1977
3. Newmann J.N; "Theory of Ship Motions Advanced Applied Mechanics", 1980
4. Price W.G & Bishop R.E, "Probability Theory of Ship Dynamics", Chapman & Hall, London1982.

18ETN038	Structural Design of Ships	L - 3	T - 0	P - 0	C - 3

Course Objective: This subject will give the student the knowledge about ship building materials, ship structural design concepts, structural components of the ship and the design aspects, general considerations, external loads, framing systems, structural design procedure, etc.

Unit-1 Introduction **9**

Historical review, the structure of wooden ships. Transition from wood to steel. The structure of riveted ships and welded ships. Riveting and welding in ship building. Structural changes from riveted to welded ships. General mid-ship section structural arrangements for different types of ships- general cargo ship, oil tanker-single and double hull, bulk carrier, container ship, tug, trawler, passenger ship, cross channel ferry.

Unit-2 Structural parts, functions and classification rules **9**

Different structural elements- keel, transverse frames, longitudinal frames, web frames, vertical keelson, beams, girders, floors, brackets, pillars, stem bars, stern frames, bulkhead stiffeners, platings etc.-their structural configuration, design features and functional aspects. Assembly of various structural elements into the structural parts of the ship such as double bottom structure, side shell, single bottom structure, bulkhead structure, deck structure, aft-end structure, fore-end structure, super structure etc. Structural design as per classification society rules. Use of relevant standards in structural design.

Unit-3 Structural Design of Bottom, Side Shell, Bulkhead, deck, fore-end, aft-end structures **9**

Bottom structures, structural design of single bottom and double bottom structures, their structural configuration and determination of dimensions and scantlings of stiffeners, frames, longitudinal, inner and outer bottom plating, Shell plating and framing-layout of strakes, spacing of framing, shell expansion plan, longitudinal and transverse frames, ordinary and web frames, end connections of frames, Bulk heads-structural arrangement of bulk heads, longitudinal and transverse bulk heads, determination of scantlings and sizes of structural parts of bulkheads, plating and stiffening of bulk heads, in flat, corrugated, Swaged and non-water tight bulk heads, connection of bulkheads with side shell, decks etc., partial bulk heads. Decks - deck plating, subdivision of strakes and structural arrangements of longitudinal and transverse stiffeners. Determination of scantling, end-connections of deck stiffeners. Fore-end structure-stem profiles, plating and stiffening of the fore end structures, panting arrangement, stem design-built up or cast, bulbous bow construction, details of arrangements, chain locker, hawse pipes, paint stores, forward collision bulkheads, determination of scantlings. Aft-End structure-stern profiles, plating and stiffening of aft-end structure, stern frame – built up or cast, details of stern tube, bossings, shaft struts etc. Different types of rudder configurations and stern fittings for these rudder types. Nozzles and propeller arrangements. Determination of structural scantlings.

Unit-4. Structural Design of Engine Room, Superstructure, Cargo Handling Arrangements, Hatches, Special Ships, Welded Structures and Computer Applications **9**

Engine Room – Horizontal subdivision of engine room, platforms, decks, shaft tunnel and recesses, Engine casting, foundations of Diesel engines, turbines, boilers, auxiliary machinery. Static and dynamic loads in engine room. Structural design of engine room and determination of scantlings. Superstructure – Structural design and details of openings, expansion joints etc.

Determination of scantlings, Construction and design of cargo handling systems and equipment – loads on derricks, masts and rigging. Determination of scantlings. Deck cranes –details of installation and structural arrangements necessary. Hatch covers – loads acting on hatch covers, various types of hatch cover and their structural design. Structural design of special types of ships – fishing vessels, tugs, tankers, dredgers, icebreakers, and submarines. Stress Concentration and fatigue in ship structures. Computer applications in structural design. Various methods of joining structural parts and elements. Design of welded structures. Problem of fracture in welded structures. Design and strength of butt – welds, fillet welds, Tee and corner joints, bracketed connections. Structural fire protection.

Unit-5 Hull Vibration of Ships **9**

Flexural vibrations of a beam. Free and forced vibrations, vibration of undamped spring-mass system, damped vibrations. The exciting forces on hull of ships, modes of hull vibration. Calculation of hull frequencies – factors influencing frequency, empirical formulae for hull frequency estimation. Analytical methods for calculation of hull modes (elementary treatment only). The Stodala's interpolation method. Propeller exciting forces. Damping – Types of damping. Special local vibration problems – Rudder vibration, cavitation, stress and vibration levels, human reaction to vibration. General methods of reducing vibrations. Devices for reducing main hull vibration. Synchronising devices for twin – screw ships, rotating weight neutralisers, Kurt nozzles.

Total hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Classify the types of ships in marine sector from past to present	K2
CO2	Make use of rule book to design structural components of ships	K3
CO3	Value the role of classification societies in structural design of ships	K5
CO4	Compile and give solution to structural design based on engine room superstructure, and cargo handling equipment's	K5
CO5	Estimate scantlings for midship, fore and aft of a ship	K5

Textbooks:

1. Ship Construction by D.J. Eyers

Reference Books:

1. Strength of Ship Structures by W. Muckle
2. Principles of Naval Architecture by Ed.V. Lewis
3. Ship Design and Construction by R.Taggart

18ETN039	Structural Design of offshore Structures	L - 3	T - 0	P - 0	C - 3

Course Objective: To develop the student's ability to carry out offshore structure design calculations, and understand the various aspects of the design covering design loads, tension and compression members, plates and beams, design of cylindrical members, design of tubular joints, etc.

UNIT I Planning of Offshore Structure design **9**

Planning of Offshore Structures - Design criteria and procedures – WSD and Load Resistance Factor Design - Design loads – dead loads and live loads - load combinations - Determination of wave, wind and current loads.

UNIT II Design of plates and beams **9**

Design criteria of plates and beams – considerations - Design of tension members and compression members - Materials used for plates and beams- Analysis of loading on beams and plates, End fitting effects in column testing, cripping strength test.

UNIT III Design of cylindrical members **9**

Design of cylindrical members – axial compression, biaxial bending and combined loads; Hydrostatic implosion, effects of external hydrostatic pressure, local buckling, the residual stresses, Ultimate strength, monotonic loading behavior and strength.

UNIT IV Design of Tubular joints **9**

Design of Tubular joints – Ultimate static strength formulas for welded tubular joints, Punching shear method and calculation of allowable joint capacity; stress concentration factor, Fatigue analysis and Design – SN curve method.

UNIT V Pile Design **9**

Pile Design – International standard and recommendations, Pile driveablility, Pile driving monitoring, Pile Capacity for axial bearing loads and axial pull out loads; Soil reaction for axially loaded piles and laterally loaded piles; Structural Design of piles.

Total Hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Understand the various loading acting on the structural members of an offshore platform	K2
CO2	Illustrate the design considerations for the plates and beams	K2
CO3	Evaluate the strength of the cylindrical structural member	K4
CO4	Evaluate and design of tubular joints for various design factors	K4
CO5	Interpret the design stages and rules and regulations involved in the pile design under various loading conditions	K2

Textbooks

1. S.K. Chakrabarti, "Handbook of Offshore Engineering", Elsevier Publications 2005.
2. Dawson T.H., "Offshore Structural Engineering" Prentice Hall, 1983.

Reference Books

1. API RP 2A WSD 1993
2. API RP 2A LRFD 2000

18ETN040	Ship Production II	L - 3	T - 0	P - 0	C - 3

Course Objective: The student will get an insight into the various type of launching methods, launching calculations, outfitting activities onboard the vessel, including installation of machinery, shafting, propeller, cabling, basin trials, sea trials, contractual obligation etc.

Unit-1 Outfitting of ships **9**

Workshops –piping shop, fitters shop, Carpenters shop (wood, plastics), Mechanical workshop, Machine shop (preassembly of blocks), Other workshops (electrical installation, painting, insulation, etc.); Technological process in the hull installation work –Technological process in installing the main machinery, installation of shafting and propeller, installation of the main machinery, installing of auxiliary machinery and boilers, installation of piping systems, electrical installation, hull installation work; Pre and advanced outfitting.

Unit-2 Production design **9**

Application of the principles of design for production in shipbuilding – joining of parts, relations between structural design and prefabrication, simplifications in structural design (design for welding), quality control. Problems of accuracy – tolerances, standards, measuring techniques (theodolite, laser, etc.); quality control

Unit-3 Process planning in shipbuilding **9**

Planning for operations – interconnection between production design and process planning, production and process analysis, assembly charts, operation process charts, flow process charts; Process selection. Application of models for process planning, scheduling and control – Gantt charts, CPM & PERT, transportation models etc.; Special aspects of application of these in shipbuilding process.

Unit-4 Capacity planning **9**

Estimation of future capacity of a shipyard method, strategies for modifying capacity, models for capacity planning under the special conditions of shipbuilding.

Unit-5 Production Standards **9**

Production standards in several parts of the ship production process, work measurement systems, methods of man-hour determination, use of computers, correlation between size of series and needed man-hours. Systems of maintenance and quality control.

Total Hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Explain the functions of hull outfit items in ship	K2
CO2	Solve the productivity of the worker and efficiency shipyards	K3
CO3	Develop the planning schedule using software	K3
CO4	Explain the problem occurs during the construction and inspection	K5
CO5	Adapt the international standards in the shipbuilding processes	K6

Textbooks

1. Ship Production, 2nd edition, 1995, Richard Lee, The Society of Naval Architects and Marine Engineers, ISBN 0-939773-57-0
2. Shipbuilding Technology, V. K Dormidontov, MIR PublishersElwood S.Buffa; Modern Production/Operations Management, Wiley Eastern Ltd.
3. Richard J. Hopeman; Production - Concepts, Analysis, Control, 3`d Edition, Charles E. Merril Publishing Co.
4. Arthur C.Laufer; Operations Management, South-Western Publishing Co.
5. Khanna, O.P.; Industrial Engineering and Management, Dhanpat Rai Publication.
6. Richard` I. Levin, et.al.; Production/Operations Management: Contemporary Policy for Managing Operating Systems, Tata-McGraw Hill Publishing Co. Ltd.
7. Taggart; Ship Design and Construction, SNAME

Reference Books

1. Ship Construction, 2007, Sixth edition, D. J. Eyres, Butterworth-Heinemann, ISBN 13: 9-78-0-75-06-8070-7
2. Merchant Ship Construction, H. J. Pursey, Brown, Son & Ferguson, Ltd., Nautical Publishers
3. Practical Construction of Ship, RM Newton,
4. Ship Construction – Sketches and Notes 2003, Kemp and Young, Elsevier, ISBN 0-7506-3756-0

18ETN041	Ship Design Calculation Drawing & Drafting – III (SDCADD-III)	L - 0	T - 0	P - 3	C - 1

Course Objectives:

- To illustrate the Light weight, wetted surface calculation and painting area calculation
- To evaluate the trim, stability calculation, load line calculation and freeboard
- To draw the accommodation layout
- To evaluate rudder and propeller dimensions using manual calculations

List of Exercises:

1. Lightship weight calculation (Excel)
2. Trim and Stability Calculation (Excel)
3. Accommodation Layout (Autocad)
4. Wetted surface area and Painting area estimation (Excel)
5. Tonnage and Equipment number calculation (Excel)
6. Freeboard and Load line Calculation (Excel & Autocad)
7. Propeller calculation
8. Rudder Calculation

Total Hours: 40

Course Outcomes:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Define the ship properties like wetted surface area, free board load line calculations, etc.	K1
CO2	Make the use of the software to draw the accommodation layout of the ship	K2
CO3	Explain about the tonnages, equipment number, free board and load line	K2
CO4	Define the appendages like propeller and rudder and their types, uses and their significance	K1
CO5	Evaluate the particulars of rudder and propeller using their detailed sketch done by the software	K5

18ETN047	Shipyard Training	L - 0	T - 0	P - 2	C - 1

Course objective: The students will be attached to various shop floors in the shipyard to observe and study the shipyard practices during the summer vacation. The student will be able to see for himself production of ship and offshore structure at various stages. They are to submit their workbook on completion of shipyard attachment.

They will study and familiarize themselves with the following,

1. Shipyard Layout
2. Shipyard Organization Chart
3. Dry-dock Layout
4. Services in dry dock
5. Types of dock blocks
6. Dry dock gate arrangements
7. Various stages of hull erection
8. Plate preparation arrangement
9. Types of plate surface preparation
10. Mechanical engineering workshops
11. Electrical workshop
12. Out fitting arrangement in the out-fitting wharf

Total Hours: 40

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Know the outline of shipyard practices and various departments	K2
CO2	Classify and understand the different types of drydocks	K2
CO3	Explain and Summarize about the shipyard layout and organization chart	K2
CO4	Take part in the hands-on training on various sections in shipyards	K4
CO5	Combine the overall knowledge gained from shipyard and create a training report	K6

18ETN048	Minor Project	L - 0	T - 0	P - 3	C - 1

Course Objective: To develop student's ability to understand and carry out project work on a chosen topic independently and submit for evaluation. This will enhance the student's independent thinking and ability to work independently on selected topic and carry out research work later.

The students will be allotted minor project from the department and they will have to complete the project and submit the report for evaluation.

Total Hours: 40

18ETN042	Dynamics of Offshore Structures	L - 3	T - 0	P - 0	C - 3

Course Objective: To develop student's ability to understand the basic feature of dynamic loading and structural response, Formulation of equation of motion, principle of virtual displacement and Hamilton's principle degrees of freedom, mass moment of inertia, responses to impulse loading, Fourier series loading and response, etc.

Unit I Overview **9**

Basic features of dynamic loading and response – models for dynamic analysis – lumped mass, generalized displacements and finite element models. Formulation of equation of motion, principle of virtual displacement and Hamilton's principle - Degrees of freedom – Translational and rotational systems - mass moment of inertia

Unit II Solution to equation of motion **9**

Free vibration of single degree of freedom system: - Solution of equation of motion, undraped free vibration - Damped free vibration, critically damped, under damped and over damped systems, Negative damping. Single degree of freedom system – Response: - Response to harmonic loading, Undamped system- damped system, Response to periodic loading -Fourier series expansion of the loading- response to Fourier series loading Exponential form of Fourier series loading and response- Complex frequency transfer functions

Unit III Response to dynamic loading **9**

Response to impulsive loads: - Suddenly applied load, sine wave impulse, rectangular impulse, triangular impulse, spike loading, approximate analysis Response to general dynamic loading: - Duhamel integral for undamped system – unit impulse response function numerical evaluation, response of damped system- numerical evaluation, Numerical analysis in the frequency domain, fast Fourier transform analysis.

Unit IV Multi degree of freedom system **9**

Multi degree of freedom system: - Two degree of freedom system – equation of motion, characteristic equation, frequencies and mode shapes, coordinate coupling and choice of degree of freedom, orthogonality of modes, natural coordinates, superposition of natural modes, response of two degree of freedom system to initial excitation, beat phenomenon, response to harmonic excitation.

Unit V Matrix methods for dynamic analysis **9**

Analysis of multi- degree of freedom system- Rayleigh - Ritz, Stodola and Holzer methods, Matrix methods for dynamic analysis, mode superposition analysis. Practical Vibration Analysis: - Determination of frequency by Rayliegh's method. Beam flexure – selection of shape- improved Rayleigh's method - solid interaction - dynamic behaviour of offshore towers - stochastic dynamics of offshore structures - frequency domain response - Narrow band systems, fatigue predictions - Response to wave, and earthquake loadings.

Total Hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Outline of dynamic loading condition for offshore structures	K1
CO2	Predict and solve the six degrees of freedom of ships for various motions in the seaway	K3
CO3	Interpret harmonic loading response for damped and undamped conditions	K5
CO4	Evaluate numerical, Fourier transform analysis for various frequencies of offshore structures	K5
CO5	Solve dynamic behavior of Offshore structure using matrix method	K6

Text Books

1. Clough,R.W. and Penzien, J., “Dynamics of structures”, McGraw Hill, 1993.
2. Chopra, A.K., “Dynamics of structures – Theory and Application to Earthquake Engineering”, Prentice Hall of India, 1996.
3. James F. Willson, “Dynamic of offshore structure”, John Wiley & Sons Inc.

Reference Books

1. Meirovitch L., “Elements of Vibration Analysis”, Mc.Graw Hill, 1986.
2. Thomson W.T., “Theory of Vibration with Applications”, Pearson Education Inc., 1998.
3. Craig, Jr. R.R., “Structural Dynamics”, John Wiley, 1981.
4. Hurty, W.C. and Rubinstein M.F., “Dynamics of Structures”, Prentice Hall, 1964.

18ETN043	Construction of Offshore Structures	L - 3	T - 0	P - 0	C - 3

Course Objective: To develop student's ability to understand practical aspects of fabrication and construction of offshore structures, Deep sea operations, Phenomena for Deep-Sea Operations, Properties of Materials for the Deep Sea, Platforms in the Deep Sea, launching, Removal of Offshore Platforms, Removal of Piled Structures, etc.

Unit I Introduction **9**

Introduction to constructability, Construction stages for offshore structure. Principle of constructability, Facilities and methods for fabrication, Launching, Assembly and Jointing Afloat, Material Selection and procedures, Access, Tolerances, Survey control, Quality control and assurance, safety, Control of construction: Feedback and Modification, Contingency Planning, Manuals, On-site Instruction Sheets, Risk and reliability Evaluation.

Unit II Construction in deep sea **9**

Construction in deep sea, Considerations and Phenomena for Deep-Sea Operations, Properties of Materials for the Deep Sea, Platforms in the Deep Sea: Compliant Structures: Guyed Towers, Compliant (Flexible) Tower, Articulated Towers, Tension-Leg Platforms (TLP's), SPARS, Ship-Shaped FPSOs, Deep-Water Moorings, Construction Operations on the Deep Seafloor, Deep-Water Pipe Laying, Seafloor Well Completions, Deep-Water Bridge Piers.

Unit III Decommissioning of offshore platform **9**

Removal of Offshore Platforms, Removal of Piled Structures (Terminals, Trestles, Shallow-Water Platforms), Removal of Pile-Supported Steel Platforms, Removal of Concrete Gravity: Base Offshore Platforms, New Developments in Salvage Techniques, Removal of Harbor Structures.

Unit IV Marine structures in arctic sea floor **9**

Arctic Marine Structures, Sea Ice and Icebergs, Atmospheric Conditions, Arctic Seafloor and Geotechnics, Oceanographic: Ecological Considerations, Logistics and Operations, Earthwork in the Arctic Offshore, Ice Structures.

Unit V Pipeline installation **9**

Steel and Concrete Structures for the Arctic: Steel Tower Platforms, Caisson-Retained Islands, Shallow-Water Gravity-Base Caissons, Jack-Up Structures, Bottom-Founded Deep-Water Structures, Floating Structures, Well Protectors and Seafloor Templates, Deployment of Structures in the Arctic, Installation at Site, Ice Condition Surveys and Ice Management, Durability, Constructability, Pipeline Installation, Current Arctic Developments

Total Hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Outline the construction stages and principles of fabrication survey, QCQA, safety standards, and Identify the K factors	K2-K3
CO2	Make use of recommended practices and rule book to construct the types of offshore structures	K4
CO3	Examining the structures and concluding for decommissioning of offshore structures and its methods based on various sea conditions	K4
CO4	Analyze various sea conditions and its criteria for arctic sea conditions	K4
CO5	Explain the methods of pipeline installations	K2

Textbooks

1. API recommended practice 2A-WSD, “Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms” - Working Stress Design
2. B.C Gerwick, “Construction of Marine and Offshore Structures”, CRC Press, Florida, 2000.
3. Subrata K Ckakrabarti, “Handbook of Offshore Engineering”, Vol 1, Vol 2, Elsevier Publishers, 1st edition, 2005.

Reference Books

1. Libros y Manuales de Ingenieria, “Construction of Marine and Offshore Structures”, 3rd Edition, CRC Press.
2. McClelland, B & Reifel, M.D., “Planning & Design of fixed Offshore Platforms”, Van Nostrand, 1986
3. Graff, W.J., “Introduction to Offshore Structures”, Gulf Publ. Co. 1981.

18ETN044	Offshore Design Software - MOSES	L - 0	T - 0	P - 3	C - 1

Course Objective: To develop students' ability to understand and carry out practice in MOSES software, so that the student is capable of using the software in ship/offshore engineering. This module will include the offshore vessel modeling, load application, load analysis, modes of vibration, frequency domain transportation, RAO data extraction

List of Exercises:

MOSES fundamentals: Moses Overview, Moses Basics & Function, Moses Commands & Macro, String Functions

Modeling with Moses Barge & Vessel Modeling with Moses, Moses Model Parameter, defining defaults & Model Defining Options, Defining Parameters & Parameter Options, Defining Points, Classes, Beams, Element Attributes, Load Group & Compartments in Moses, Generate Isometric View from Moses Model, Moses Model & Analysis plotting

Analysis with Moses Extracting Modes of Vibration, Frequency Domain Transportation Solution, Defining Load Cases, Obtaining Applied Loads, performing a Structural Analysis, structural post processing, Bending Moments and Shears, Force Response Operators, Post–Processing Beams, Post–Processing Generalized Plates, Post–Processing Joints

Transportation Analysis with MOSES Structure Weight calculation, Hydrodynamics, Response Amplitude Operator (RAO), RAO Data Extraction for Marine Operation

Course Outcomes:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Define basics of MOSES software, commands and functions	K1
CO2	Utilize designing tool to know the importance of design for various conditions	K3
CO3	Analyze shear force, bending moment responses and factors affecting the forces	K4
CO4	Analyze weights estimations, Hydrodynamics and Response Amplitude Operator	K4
CO5	Compile the hydrodynamics, RAO and SF and BM responses	K6

Total Hours: 45

18ETN049	Major Design Project Phase I	L - 0	T - 0	P - 10	C - 5

Course objective: The student will be able to carry out data collection, collation, and design calculations independently with the help of the guide. The student will have to choose any ship or offshore engineering project for design work. They have to complete the preliminary calculation up to fixing of main dimensions and preliminary checks. Detailed design will be carried out in phase II of project

Course Outcomes:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Develop the data for the finalizing the main dimensions of the Ship/Offshore structures	K3
CO2	Make use of BSRA series to optimize the Offset table	K3
CO3	Illustrate the lines plan, hydrostatic curves and Bonjean curves	K2
CO4	Evaluate the hydrostatic properties, total resistance and tank capacities of the Ship/Offshore structures	K5
CO5	Construct the model midship section and general arrangement plan	K6
CO6	Create Stability booklet	K6

Total Hours: 40

18ETN045	Ports Design and Infrastructure	L - 3	T - 0	P - 0	C - 3

COURSE OBJECTIVE:

Unit I: Introduction **9**
Ports and harbor as the interface between the water and land infrastructure an infrastructure layer between two transport media. The fundamentals: Wave conditions inside harbor – wave disturbance & seiching Water circulation

UNIT II: Breakwater 9
Break water, jetties & quay walls; Mooring, berthing and ship motion inside the port Cargo handling

UNIT III: Design issue **9**
Port layout in regards to (1) wave action (2) situation (3) navigability (AKO) Berthing Facilities
Design of port infrastructure in regards to (1) cargo handling (2) cargo storage (3) integrated transport of goods
Planning multipurpose port terminals

UNIT IV Port operations **9**
Physical aspects: Allowable wave conditions for cargo handling. Wave conditions for human safety on quays and breakwater. Forecasting /nowcasting of wave & current conditions for port operations. Dredging and navigability. Hazard scenarios
Management aspects: VTMS & Management of computerized container terminal. Safety & environment (handling of fire, oil spill, rescue….) Total Quality Management in ports.

UNIT V: Sustainability **9**
Global trades & port restricting / reforms. Impacts of possible climate change scenarios. Sustainable development strategies for cities and Ports

Case Studies:
Layout operations and future issues of one or two existing ports to be analyzed.

COURSE OUTCOMES:
After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Define Port infrastructure, wave conditions in harbor	K1
CO2	Explain berth, moorings and cargo handling	K2
CO3	Design of port infrastructure in regards to cargo handling cargo storage	K6
CO4	Illustrate port operations like dredging and navigability	K2
CO5	Explain port restrictions and impacts of climate changes	K2

Total Hours: 45

18ETN050	Major Design Project-Phase-II	L - 0	T - 0	P - *16	C - 8

Course objective: The student will be able to carry out detailed design of the project in this phase and he will have to complete the project work by the end of the semester. He will give a seminar presentation on the calculations and drawings carried out to the guide so that he gains more confidence in the design aspects.

Total Hours: 40

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Evaluate the scantlings of the ship/offshore like thickness of the shell plates	K5
CO2	Design Shell expansion and Superstructure plans	K6
CO3	Construct Accommodation and Engine room layouts	K6
CO4	Design the GA, propeller and rudder	K6
CO5	Estimate the power required like horse power, engine power, shaft power and delivered power	K6

SYLLABUS

PROFESSIONAL ELECTIVE COURSES

18ETN051	Subsea Engineering	L - 3	T - 0	P - 0	C - 3

Course Objective: The student will get knowledge about offshore production, gas reserves and fields, subsea production systems, risers FPSOs and FPVs, Pipelines and flowlines - Design and functions – Route survey, Autonomous Underwater Vehicles (AUVs) etc

Unit I Introduction to Subsea Production **9**

Introduction to offshore production, Background to offshore production systems, Global oil and gas reserves and fields, Introduction to offshore exploration and drilling, Introduction to subsea engineering -Building blocks, Subsea Production Systems (SPS) and Umbilicals, Risers and Flowlines (URF)Other elements, Systems design. Types of subsea completions, Extensions to existing platforms, Tiebacks to existing production hosts.

Unit II Production systems **9**

Production systems for floating hosts: Floating Production, Storage and Offloading systems (FPSOs) and Floating Production Vessels (FPVs), Well to beach developments (gas fields)**,** Flow assurance for subsea production systems – Hydraulics, Wax, Hydrates. Wellheads, Xmas Trees and Manifolds**-**Wellheads, Drilling subsea wells, Wellheads as part of drilling and production operations, Blowout preventers, Design and functions, Installation, Examples, Xmas trees, Types of trees, Dual bore vertical trees and spool/horizontal trees, Design and function, Suppliers, Installation, New developments (drill through and all electric trees) – Examples- Manifolds - Templates - Types of manifolds (wells clustered around manifold or template manifold) - Design and functions - Installation – Examples

Unit III Pipelines, Flowlines and Risers **9**

Pipelines and flowlines - Design and functions - Route survey - Pipe selection of materials and coatings - Installation methods - Operations – Examples. Risers - Requirements and functions - Flexible dynamic risers - Design - Operation and use - Manufacture - Current developments - Hybrid riser towers - Steel catenary risers – Examples

UNIT IV Control Systems, Umbilical's and Equipment Costs **9**

Subsea production control systems - Types - Electro-hydraulic multiplex control systems - Equipment and suppliers - Operations - Installations – Examples. Drilling control systems, Umbilical's - Functions - Design and manufacture - Installation – Examples. Costs of subsea equipment. Underwater Operations, Subsea Maintenance and New Technologies**.** Underwater engineering operations. Subsea Deepwater installation activities. Inspection, maintenance and repair - Shallow water – diver operations - Deepwater diverless interventions - Remote Operated Vehicles (ROVs) - Autonomous Underwater Vehicles (AUVs) Decommissioning activities - Production hosts - Subsea equipment**.** New technologies - Subsea pumping - Subsea processing - Requirements - Systems and examples

UNIT V Subsea Reliability, Subsea Field Development Examples and Case Studies and Decommissioning Activities **9**

Subsea completions - interfaces with other functions, Drilling and well completions, Production hosts - Government authorities. Examples of fields developed with subsea completions. Increased production to existing production host - North Sea fields. Tie back to production host - Gulf of Mexico fields - Norwegian fields. Subsea production to floating host - North Sea fields - Angolan fields - Australian fields - Brazilian fields. Gas fields – deepwater production to shallow water host - MCE (Gulf of Mexico) - Malampaya field (Philippines). Gas fields – well to beach - Orman Lange field (Norway) - West Delta Deep (Egypt)

Total Hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Explain subsea production system. and its components and illustrate extension of existing Platforms through subsea developments**.**	K2
CO2	Demonstrate the floating production host with respect to FPSO's and FPV's and explain the concept of Flow Assurance for subsea production including Hydraulics, Wax, hydrates	K2
CO3	Compare the pipeline installation methods and classify the different types of risers used in the subsea technology	K2
CO4	Categorize the subsea control systems including Umbilical and explain its functions	K4
CO5	Explain subsea deep-water installation, inspection, maintenance and repairs.	K2

Text Books:

1. Yong Bai, Qiang Bai, "Subsea engineering handbook", 1st edition, gulf professional publishing, 2012
1. Andrew C Palmer and Roger A King, "Subsea pipeline engineering", 2nd edition,Pennwell corporation, 2008

Reference Books:

1. Yong BaI, Qiang Bai, "Subsea pipelines and risers", Elsevier,2005.

18ETN052	Ship Conversion Technology	L - 3	T - 0	P - 0	C - 3

Course Objective: The student will get in depth knowledge about conversion of one type of ship to another type including fixing of revised length, beam and depth, the cargo carrying capacity and redesignated functions. Checks on sea keeping qualities, selection of main engine, etc.,

UNIT I Introduction **9**

Basic ship parameters, existing ship stability condition, cross curves of stability, statical stability, and damage stability for the existing ships, principal particulars of the ship, general arrangement drawing of the ship including deck layout, engine room layout, accommodation layout, deck machinery for the existing ship.

UNIT II Fixation of revised length, beam and depth **9**

Fixation of the revised length, beam and depth based on the cargo capacity and redesignated functions, layout general arrangement, including engine room lay out, deck plans, water tight bulk head arrangements, fore peak and aft peak arrangements, anchor and anchor handling arrangements, computation of steel weight, equipment and outfit mass, engine plant mass, weight margin etc.

UNIT III Stability calculations **9**

For the revised requirement of length, breadth, and depth workout block coefficient and prismatic coefficient, mid ship section design, water plane area coefficient, revised functions of stability criteria, cross curves stability, statical stability curves, damaged stability, sea keeping maneuvering, rudder design, steering gear arrangement etc.

UNIT IV Hull design **9**

Shape of sectional area curve bow and forward section forms, bulbous bow design, stern forms, conventional method of lines design, propeller clearances, propeller design, model testing, Ship yard operations, hull production, hull structural design, outfitting production (hull), outfitting production (machinery).

UNIT V Powering **9**

Selection of main engine based on the revised powering calculations, revised shaft length, shaft bearings, propeller calculations, interaction between ship and propeller, ship resistance under trial conditions, additional resistance under service condition, rudder design.

Total Hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Define the basic concepts about Conversion Tech	K1
CO2	Illustrate the engine room layout, outfit and other parts	K2
CO3	Distinguish between revised length and original length	K4
CO4	Design the repaired propeller and outfit items	K6
CO5	Select the main engine based on the revised powering calculations and revised shaft length	K3

Text Books

1. K J Rawson and E C Tupper “Basic Ship Theory”, Longman, 1976.
2. E.C. Tupper “Introduction to Naval Architecture” by, Butter worth Heinemann
3. H. Schneekluth and V. Bertram, “Ship Design for Efficiency and Economy”,2nd edition, Butterworth-Heinemann, 1998

Reference Books

1. Yasuhisa Okumoto, Yu Takeda, Masaki Mano, “Design of ship hull structures” Springer Publications, 2009
2. Robert Taggart, “Ship design and construction”, SNAME Publications

18ETN053	Ship Trials	L - 3	T - 0	P - 0	C - 3

Course Objective: The student will learn the various harbor and sea trials to be carried out for a vessel prior to commissioning and handing over to the owner. The trials will include harbor trials, sea trials, maneuvering trials and speed trials which is a contractual obligation.

UNIT I Installation Inspection **9**

Ships Machinery Installation including main engines – generators - pumps - compressors and air reservoirs – eductors - steering gear and steering gear system - fire main pumps and systems, deck machineries, boat davits, anchor and anchor chain cable system etc., Inspection by Surveyors - Complete Shaft alignment checks.

UNIT II Basin Trials (Harbor Trials **9**

Start main engine in alongside condition, precautions to be taken, check marine engineering parameters start generators, monitoring performance, paralleling of generators, synchronizing of generators, load sharing, throw output. Start compressors and monitor performance. Fill up the Air reservoirs and note down the timing. Start sea water pumps, bilge educators and other auxiliary machinery. Conduct steering / Rudder trials, Anchor trials in harbor.

UNIT III Sea Trials **9**

Observe the performance of all auxiliary machineries at sea and record the performance, Anchor Trials at sea by lowering and hoisting of anchor, Record the readings, run main engine at various regimes and observe the performance.

UNIT IV Maneuvering trials **9**

Evaluating maneuverability by Maneuvering trials, turning circle trials, various terms involved in turning circle, ships heeling while turning – zig zag maneuvering, Spiral maneuvering, Pull Out Maneuvering, Crash Stopping, Contractual Obligation, contractual clause - penalty clause - Speed trials - measured mile run.

UNIT V Maneuvering devices **9**

Maneuvering devices such as rudders, special rudders, active rudders, kitchen rudders- Other devices such as vertical axis propeller, cycloidal rudder, flap rudder, lateral thrust units, rotating propulsion pods, rudder forces and torque, ships handling at slow speed, broaching, ships handling at shallow and confined waters, interaction between ships, dynamic stability and control of submarines, underwater vehicles.

Total Hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Define the ship machineries and their functions	K1
CO2	Explain the functions of main engine, generator and other machineries	K2
CO3	Illustrate the performance of all auxiliary machineries at sea and record the performance	K2
CO4	Evaluate the maneuverability by Maneuvering trials, turning circle trials, various terms involved in turning circle, ships heeling while turning	K5
CO5	List the devices such as rudders, special rudders, active rudders and propeller	K4

Text Books:

1. K J Rawson and E C Tupper, “Basic Ship Theory”, Longman, 1976
2. Lewis, E.U.; “Principles of Naval Architecture”, (2nd Rev.), SNAME, New Jersey, U.S.A.

Reference Books:

1. Robert Taggart, “Ship design and construction”, SNAME Publications

18ETN054	High Performance Marine Vehicles	L - 3	T - 0	P - 0	C - 3

Course Objective: The student will get knowledge about the design aspects of non-conventional vessels, high speed crafts and special type of vessels. This will include mono hull, multi hulls, catamaran, trimaran, SWATH vessels, and other unconventional hulls, etc.

UNIT I Introduction **9**

Introduction: Basic differences between conventional and high-performance crafts - Special features - Types – Monohull - planning craft - hydrofoil craft - air cushion vehicles – Multihulls – Catamaran – trimaran - SWATH vessels - Unconventional hulls

UNIT II Hull forms **9**

Hull forms - aero and hydrodynamic force - stability criteria, resistance of very slender hulls, in particular importance of form factors, transom stern effects prediction of form factors for transom stern vessels, effect of water depth on HSE resistance.

UNIT III Resistance Prediction methods **9**

Resistance prediction methods for HSE, regression, methods, potential flow methods, assumption and boundary conditions, This Ship theory, assumptions, approximation, key results, transom flow modeling, application to optimization, Introduction to Kelvin-Neumann approach, full non-linear potential flow methods, CFD, hybrid methods, Wave wake, background to problem, aspirations, for wave wake criteria, maximal way height criteria, wave energy and energy flux criteria, designing for minimal wave wake.

UNIT IV Powering and Propulsion **9**

powering and propulsion - seaworthiness - maneuvering and control - structures and materials. Comparative performance and applications - maritime operational requirements. General features of marine water jets, water jet theory, mass flow rate, Gross thrust, net thrust, momentum drag.

UNIT V Water Jet and SWATH **9**

Water jet propulsion, efficiency of water jet systems and losses, cavitation consideration, preliminary design of water jets, general design characteristics of SWATH and comparison to catamaran, Sea keeping design consideration. Dynamic stability of SWATH, control design, motion sickness and comfort factors, damage stability standards

Total Hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Demonstrate the concept behind the designing of various high-speed crafts	K2
CO2	Illustrate the various hull forms used in designing od small craft vessels	K2
CO3	Interpret the various methods in predicting the resistance of various high-speed crafts	K2
CO4	Explain the concept behind the powering of high-speed crafts	K2
CO5	Adapt the new technologies in designing of novel small crafts	K6

Text Books

1. Lewis, Edward V. “Principles of Naval Architecture: Resistance, Propulsion and Vibration”, Vol 2, Society of Naval architects and Marine Engineers. 1990
2. Rawson, KJ and Tupper EC “Basic Ship Theory”, Longman. 1976

Reference Books

1. Muralidhar, K and Biswas, G “Advanced Engineering Fluid Mechanics”, Cambridge University Press, John Wiley, 1996.
2. Rama Durghaiah, D, “Fluid Mechanics and Machinery”, New Age International Publishers, 2002.

18ETN055	Design of floating offshore structures	L - 3	T - 0	P - 0	C - 3

Course Objective: The student will get in depth knowledge about the floating offshore structures, semi-submersible, Heave RAO Calculation, functions and configurations of TLPs, design of Spar platform, Turret Design, design of drill ships, Design and conversion of FPSO, FPS, etc.

Unit I Semi-Submersible
Design of semi-submersible: Functions and Configurations of Semi-submersibles, Sizing of Semi-submersibles, Initial Design Process, Heave RAO Calculation, Weight and Buoyancy Estimates, Semi-submersible Hull Structure, Design Example

Unit II Functions and Configurations of TLPs
Design of TLP: Functions and Configurations of TLPs with applications, TLP Mechanics, Sizing of TLP, Weight Estimates of TLPs, Design Example, mooring line analysis, Weight and Buoyancy Estimates, pretension in tethers, response analysis of various degrees of freedom.

Unit III Design of Spar platform
Design of Spar platform: Spar Description, Spar Riser Systems, Spar Mooring, Spar Sizing, Drilling from a Spar, Spar Construction and Installation, Mathieu instability, Roll - pitch analysis - New configurations and applications in spar design - Design Example

Unit IV Design and conversion of FPSO, FPS
Design and conversion of FPSO, FPS: FPSO Hull Design, evaluation of different hull configurations, Hull Structure, Deck Structure, reserve of strength, corrosion margin and corrosion rates, field design life, environmental conditions, estimation of conversion work package, Turret Design and Selection, Stages of conversion such as tower-yoke, calm, calm-yoke, Design Example.

Unit V Design of Drillship
Design of Drillship: Design Considerations, Loads, Initial Scantling Evaluation, Total Strength Assessment, Topside and Hull Interface Structures, Fatigue Strength Assessment of Drill ships, Material Selection, Design Example

Total Hours: 45

Course Outcomes:
After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Demonstrate the concept behind the design process weight estimation buoyancy and RAO factors for Semisubmersibles	K2
CO2	Illustrate the design configuration and analysis weight estimation for Tension Leg Platform	K2
CO3	Interpret the design consideration for SPAR Platforms	K2
CO4	Explain the design concept of FPSO, FPS	K2
CO5	Summarize the various design concepts of drillsips	K2

Text Books

1. Subrata K Chakrabarti, “Handbook of Offshore Engineering”, Vol 1, Elsevier Publishers, 1st edition, 2005.
2. Subrata K Chakrabarti, “Handbook of Offshore Engineering”, Vol 2, Elsevier Publishers, 1st edition, 2005.
3. Jeom Kee Paik and Anil Kumar Thayamballi, “Ship-Shaped Offshore Installations Design, Building, And Operation”, Cambridge university press, 2007

Reference Books:

1 Hiroshi Iwasaki, “A preliminary design study of Tension Leg Platform”, Massachusetts Institute of Technology, Department of Ocean Engineering, 1981
2 API, ABS, DNV codes

18ETN056	Marine Refrigeration and Air-conditioning	L - 3	T - 0	P - 0	C - 3

Course Objective: The student will get knowledge about the refrigeration and air conditioning systems onboard the ship, compression and evaporator systems, Psychometric charts, Marine Refrigerating Plants**,** Refrigerated cargo vessel and refrigerated containers, etc.

UNIT I Basic Refrigeration and Air conditioning **9**

Reversed Carnot cycle- vapor compression cycle –Refrigerating effect-co-efficient of performance –cooling capacity-refrigerants and secondary refrigerant used in marine practice and their justification-rating of refrigeration plant –methods for improving C.O.P –use of vapor tables –applied problems

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UNIT II Marine Refrigerating Plants **9**

Refrigeration Cycle, Undercharging of Refrigeration System, Overcharge of Refrigeration System, Typical marine refrigerating plants with multiple compression and evaporator system –heat pump cycles –refrigeration in liquefied gas carriers.

UNIT III Air conditioning **9**

Psychrometric charts-various processes-comfort and industrial A/C –Effective temperature and comfort-chart-unitary and central A/C system Marine Air Conditioning, Principles of air conditioning – psychrometric properties of air – comfort condition – control of humidity – airflow and A.C.Capacity – Calculation for ships plants. Design and construction details of various equipment for air conditioning used in marine practice and their justification and humidity.

Unit IV Marine Refrigeration **9**

Design and constructional details of various equipment used for refrigeration in marine practice, operation and maintenance, Refrigeration and A/C components. Operation, maintenance and troubleshooting of compressors and its unloader lubrication system for different compressors – properties of lubrication for refer compressor. Evaporators- condensers –expansion devices-thermostatic switches- solenoid valves- low pressure and high pressure but Out switches. Gas leak detection- rectification and charging of gas.

Unit V Refrigerated Cargo Vessels and Refrigerated Containers **9**

Refrigerated cargo vessel- hold arrangements-air ventilation and circulation systems-insulation-precooling, classification society requirement, survey and certification guidelines, refrigerated containers- guide lines, duties responsibility of marine engineers- ventilation system- controlled atmosphere- carriage of fruit cargoes.

Total Hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Solve the problem in the thermodynamics cycles like reversed Carnot cycle and vapor compression cycle	K3
CO2	Describe the refrigeration cycle which is followed in marine vehicles and their systems	K2
CO3	Make use of Psychrometric charts to know the properties of the air like temperature and humidity	K3
CO4	Explain constructional details of various equipment in marine practice	K2
CO5	Illustrate the classification societies requirements, survey and certificate guidelines	K2

Textbooks:

1. Arora C.P. “Refrigeration & Air Conditioning”, 1st adition, Sri Eswar enterprises, Chennai, 1993.
2. Stoecker, Willbert.F Jones, Jerold.W., “Refrigeration and air conditioning”, 2nd edition, Tata McGraw-Hill, Delhi 1985

Reference Books:

1. D.A.taylor, " Introduction to marine Engineering", 2nd Edition, Butter Worth, London, 1993.
2. J.R.Stott, "Refrigerating Machinery and Air Conditioning Plant", 1st Edition, The Institute of marine engineers, London, 1974, Reprint 1998.

18ETN057	Standards and Recommended Practices	L - 3	T - 0	P - 0	C - 3

Course Objective: This course will enable the student to understand the various standards and rules available for the design of ships and offshore structures. The rule includes ILO and ILLO regulations, Standards of Training, Certification and Watch keeping, etc.

UNIT I IACS and IMO regulations **9**

Codes and regulations for International association of classification society (IACS AND MEMBERS IN IACS), International Martime Organization (IMO), Marine Pollution (MARPOL), Safety of life at sea(SOLAS).

UNIT II ILO and ILLO regulations **9**

Codes and regulations for International Labour organization (ILO) – International Regulations for Preventing Collisions at Sea (COLREG) –(ILLO) – (IMS) – The International Ship and Port Facility Security (ISPS)

UNIT III STCW regulations **9**

Standards of Training, Certification and Watch keeping for Seafarers (STCW) – SHIP RECYCLING – Emergency Position Indicating Radio Beacons (EPIRB) – Global Maritime Distress and Safety System (GMDSS)

UNIT IV Recommended practices **9**

Codes and regulations for Offshore Rules, MODU Rules, API CODE – DNV RP Codes and Recommended Practices, NORSKE Standards

UNIT V Offshore codes **9**

API 16Q for drilling riser - API 2RD for production Riser - API 17 A Design and operation of subsea production system - API 17 B for Flexible pipes, API 17 C to K - ISO 13628 Design and operation of subsea system – AWS – NACE - IMO

Total hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Compare the regulations of IMO and IACS standards	K2
CO2	Choose the best IACS standards for the constructions of the vessel	K1
CO3	Explain the regulations of the ILO and ILLO	K2
CO4	Improve the knowledge about the Classification societies and their functions	K6
CO5	Select the Offshore codes for the construction	K5

Text Books

1. IMO Publications and documents
2. Dawson, T.H., “Offshore Structural Engineering” Prentice Hall, 1983
3. API RP 2A., “Planning Designing and Constructing Fixed Offshore Platforms”, API
4. McClelland, B & Reifel, M.D., “Planning & Design of fixed Offshore Platforms”, VanNostrand, 1986

Reference Books

1. Graff, W.J., “Introduction to Offshore Structures”, Gulf Publ. Co. 1981.
2. Reddy, D.V & Arockiasamy, M., “Offshore Structure”, Vol.1 & 2, Kreiger Publ. Co 1991
3. Morgan, N., “Marine Technology Reference Book”, Butterworths, 1990.

18ETN058	Marine Corrosion and Coating Engineering	L - 3	T - 0	P - 0	C - 3

Course Objective: The student will get in depth knowledge about the chemistry of corrosion, galvanic action, type of paints, varnishes, enamels, metallic coatings and protection, surface preparation, coating applications, methods of applications, manufacturers specification, etc.

Unit I Corrosion **9**

Galvanic cell, Formation theory- Differential aeration theory. Factors influencing rate of corrosion. Chemical and electrochemical corrosion, types of corrosion, general methods of prevention and control of corrosion, sacrificial anode method, paints, varnishes and enamels, metallic coatings, hot dipping, galvanizing, electroplating.

Unit II Protective Coatings Application **9**

Paints-definition- components of paints and their functions- Special paints- Luminescent, heat resistant, fire retardant, Anti-fouling paints Health & Safety, Access Systems, Surface Preparation, Paint Types, Paint application and various methods, Paint Manufactures specification, Coating Inspection and Coating Inspection Equipment

Unit III Abrasive Blast Cleaning **9**

Abrasive Blast Cleaning Introduction, Health and Safety, Blast Media, Abrasive Blast Cleaning Standards & Quality Control, Abrasive Blast Cleaner Operational procedures, Process Control, Bead blasting, Hydro-blasting, Micro-abrasive blasting, Automated blasting.

Unit IV Paint Spraying& inspection **9**

Introduction, Health and Safety, Paint Materials, Airless Spray Equipment, Conventional Air Spray Equipment, coating failures, metallic coating, design and construction, concrete, coating surveys, paint manufacture specialist coating, ISO and other international standards, quality management, paint testing, paint thickness measurement (dry and wet) , soluble slats, fire protection

Unit V IMO& NACE Guidelines **9**

Marine PSPC, External corrosion and Coating Surveys, Cathodic Protection, Metallic Coatings, Specialist Coatings, Pipeline and facility external corrosion control, Facilities and pipelines cathodic protection design, Pipeline Coatings, and pipeline coating inspection, Pipeline HVAC induced interference, Coating Failures Degradation mechanisms and their control, Paint Repair Technologies, Estimation of paints qty.

Total Hours: 45

Course Outcomes:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Define corrosion life and select the methods of corrosion protection	K1
CO2	Explain the knowledge about the paint schemes and types	K2
CO3	Develop the requirement of the cathodic protection	K3
CO4	Perceive the knowledge about the galvanic process and other anti-corrosive processes	K5
CO5	Evaluate the paint schemes and their Dry film thickness range	K5

Text Books

1. EC Tupper, “Intoduction to Naval Architecture”, Betterworth- Heinemann, UK
2. Lloyds painting manuals
3. Paint manufactures recommendations

Reference Books

1. Painting Schemes of Indian coast guard, shipping corporation of India and Indian navy.
2. ISO and other international standards on painting.
3. Onboard maintenance painting guide, International paints

SYLLABUS

OPEN ELECTIVE COURSES

18ETN059	Production and Product Management	L - 3	T - 0	P - 0	C - 3

Course Objective: The student will learn production design, application of the principles of design for production in shipbuilding – joining of parts, ship building process planning, scheduling, process analysis and flow process charts, controlling the ship building process to meet the delivery date of the ship.

UNIT 1 Production design **9**

Production design – application of the principles of design for production in shipbuilding – joining of parts; relations between structural design and prefabrication, simplifications in structural design (design for welding), quality control.

UNIT II Problems of accuracy **9**

Problems of accuracy - tolerances, standards, measuring techniques (theodolite, laser, etc); quality control. Process planning in shipbuilding: -Planning for operations - interconnection between production design and process planning, production and process analysis, assembly charts, operation process charts, flow process charts; Process selection.

UNIT III Planning, scheduling and controlling 9

Application of models for process planning, scheduling and control - Gantt charts, CPM & PERT, transportation models etc.; Special aspects of application of these in shipbuilding process. Procedure control and systems control of production, time and motion study, material control and plant safety, industrial relations, personal management, training human relations, labour organization, dry docking and maintenance of ships.

UNIT IV Capacity planning **9**

Capacity planning - estimation of future capacity of shipyard methods, strategies for modifying capacity, models for capacity planning under the special conditions of shipbuilding - classes of capacity planning - lead strategy, lag strategy, match strategy, adjustment strategy.

UNIT V Production standards **9**

Production standards - production standards in several parts of the ship production. Process. Work measurement systems, methods of man - hour determination, use of computers, correlation between size of series and needed man – hours. Systems of maintenance and quality control. Shell plate development & Nesting, Application of Gantt-charts and network techniques. Design of a panel -line and capacity calculation, design of a special part of a shipyard layout (e.g. steel stockyard, dry-dock)

Total Hours: 45

Course Objectives:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Relate the structural design and prefabrication	K2
CO2	Define the process planning in shipbuilding and production and process analysis	K1
CO3	Apply the process planning, scheduling and control - Gantt charts, CPM & PERT	K3
CO4	Estimate of future capacity of shipyard methods, strategies for modifying capacity	K5
CO5	Apply the Gantt-charts and network techniques and capacity calculation	K3

Text Books

1. Taggart, “Ship design and construction”, SNAME chapter 15, 1980
2. Storch R. Lee, Hammon C.P. & Bunch H.M. “Ship Production”, Cornell Maritime Press, Maryland, USA, 1988
3. Eyre’s D.J. “Ship Construction” William Heinemann Ltd, London, 1982

Reference Books

1. Dormidontov V. K. “Shipbuilding Technology”, Mir publishers, Moscow.
2. Buffa, “Modern production operations management”, 6th edition, Wiley 1980

18ETN060	Quality Control and Quality Assurance	L - 3	T - 0	P - 0	C - 3

Course Objective: The student will understand basic definition of quality, Quality history, Major contributors to quality, quality control, quality assurance, quality management, Cost measurement, Utilizing Quality Costs for Decision-Making, quality planning and development, etc.

Unit I Introduction **9**

Definitions of quality: Quality basics and history, Major contributors to quality, approaches to managing quality, Quality control, quality assurance, quality management, difference between Quality assurance and quality control, quality control measures.

Unit II Total quality management **9**

Strategic Quality Management: STQM, Dimensions, measures, and metrics, Garvin's approach to operationalizing quality dimensions, quality planning, key elements of quality planning, quality costs analysis, Cost Measurement, Utilizing Quality Costs for Decision-Making

Unit III Designing quality **9**

Designing Quality Into Products and Services: Seven management tools Quality function deployment (QFD) Design for six sigma (DFSS) Robustness, Reliability, Risk assessment (FMEA and FTA), Design-quality, Conformance quality, quality costs.

Unit IV Customer requirement **9**

Identification of customer requirements, documentation requirements and control, quality planning, design and development, skilled labour, competence/ training and awareness, quality of purchased products, verification purchased products,

Unit V Quality inspection and testing **9**

Identification and traceability, Non-destructive testing, operation control, Dimensions of quality, inspection / testing, measurement and monitoring of products, dock trials, sea trials, standard Waterfall SDL, staged model, v model, evolutionary development.

Total Hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Define quality assurance and quality control basics	K1
CO2	Illustrate strategic quality management	K2
CO3	Design Quality into Products and Services	K4
CO4	Identify the customer requirements, documentation requirements and control	K3
CO5	Explain the Non-destructive testing, operation control, Dimensions of quality	K5

Text Books

1. Frank M Eyne “Quality planning and analysis”, McGraw-Hill, 2001
2. ISO 9001:2008, QMS manuals

Reference Books

1. Madhav N. Sinha, Walter W. O. Willborn, “The management of quality assurance”,Wiley, 1985
2. Storch, Rl, Hammon, Cp, Bunch, Hm & Moore, R; Ship Production, 2nd Cornell maritime Press, 1995, SNAME Publications

18ETN061	Health Safety and Environment Management	L - 3	T - 0	P - 0	C - 3

Course Objective: The student will learn about safety, health and environmental management, basic definitions, safety organizations, hazard and hazard control, safety in design and operation, Hazard assessment. Fatality risk assessment, fire prevention, etc.

Unit I Introduction **9**

Introduction to safety, health and environmental management. Basic terms and their definitions of safety in petroleum and offshore industry. Importance of safety in petroleum and offshore industry. Rules on safety regulations.

Unit II Safety **assurance and assessment** **9**

Safety assurance and assessment. Safety in design and operation. Organizing for safety. Hazard, classification and assessment. Hazard evaluation and hazard control

Unit III Environmental issues and Management **9**

Environmental issues and Management. Atmospheric pollution. Flaring and fugitive release. Water pollution- drilling waste, produced water, oil spills, cooling water, processed water- soil waste rock cutting, oil sludge, drilling solid waste, production waste. Environmental monitoring. Environmental
impact and decommissioning.

Unit IV Risk assessment **9**

Environmental management. Accidents modeling- release modeling. Fire and explosion modeling. Toxic release and dispersion modeling. Accident investigation and reporting. Concepts of HAZOP and PHA. Risk assessment and management. Risk picture- definition and characteristics. Risk acceptance criteria. Quantified risk assessment. Hazard assessment. Fatality risk assessment. Marine systems risk modeling. Risk management.

Unit V Safety measures **9**

Safety measures in design and process operations- inserting, explosion, fire prevention, sprinkler systems. Principles and methods and concept optimization for offshore petroleum industry. Analysis of case studies from offshore and petroleum industry

Total hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Define the Basic terms and their definitions of safety in petroleum and offshore industry	K1
CO2	Explain the Safety in design and operation. Organizing for safety. Hazard, classification and assessment	K2
CO3	Explain the Environmental monitoring, Environmental impact and decommissioning	K2
CO4	Identify the Risk assessment and management. Risk picture-definition and characteristics	K3
CO5	Analyze the case studies from offshore and petroleum industry	K4

Text Books

1. Skelton, B. "Process safety analysis", Gulf Publishing Company, Houston, 210pp, 1997.
2. Jan Erik Vinnem "Offshore Risk Assessment: Principles, Modelling and Applications of QRA studies". Springer, 577pp, 2007.
3. Terje Aven and Jan Erik Vinnem. "Risk Management with applications from Offshore Petroleum Industry". Springer, 200pp. 2007

Reference Books

1. Jorg Schneider. "Introduction to Safety and Reliability of Structures". Structural Engineering Documents Vol. 5, International Association for Bridge and Structural Engineering (IABSE), 138pp.1997
2. Lees, F.P. "Loss Prevention in Process Industries: Hazard identification, Assessment and Control", *Vol. 1-3*, Butterwort-Heinemann, Oxford, 1245pp. 1996
3. Patin, Stanislav. "Environmental Impact of the Offshore Oil and Gas Industry". Eco Monitor Publishing, USA, 425pp.1999

18ETN062	Engineering Economics and Management	L - 3	T - 0	P - 0	C - 3

Course Objective: The student will learn economic science, consumption, utility, business organization, partnership, laws of production, personnel management, competition advertisement and product differentiation, management control: power, authority responsibility and accountability etc.

UNIT I Introduction **9**

Definition – nature and scope of economics science – economics relation between economics decision and technical decision – economic efficiency and technical. Consumption – utility – diminishing marginal utility – indifferent map analysis.

UNIT II Four factors of production **9**

Production: Four factors of production and their peculiarities law of production – increasing – diminishing and constant return forms of business organization proprietorship – partnership joint stock company – division of labour- large scale production price mechanism. Demand and supply-elasticity of demand –different market structures- competition- monopoly- monopolist competition advertisement and product differentiation. Distribution: Marginal productivity theory of distribution – modem theory of distribution, gross and net profit-theories of profit rich theory-Ucerlamy theory – Innovative theory profit.

UNIT III Systems concept **9**

Systems concept, management control: power, authority responsibility and accountability; managerial functions conventional structures and relationships, hierarchy; the hierarchy of objectives; management by objectives; different schools of thought in management.

UNIT IV Personnel Management **9**

Personnel Management Recruitment, employment tests labour turnover, operator training; suggestion systems; Industry safety. Wages and Incentives; feature of wages; time and piece rate different incentive plans; profit sharing; job evaluation and ranking; factors of comparison and point rating.

UNIT V Behavioral science and psychology **9**

Scope and methods of behavioral science and psychology. Basic psychological processes perception, motivation, learning and retention. Psychology of individual differences – the concept of personality, measurement and assessment of personality. S-O-B model; A conceptual scheme for the understanding of work performance and behaviour of individuals and groups in the organization context. Marketing Management: Concept of marketing in sales approach product principles of accounting and finance statements. Long Term Financing: Equity, preference and debenture capitals term longs: dividends and share valuation: legal aspects of dividends; short term financing; working capital; management of receivable and inventories.

Total Hours: 45

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Define Scope of economic sciences relation between economics decision and technical decision	K1
CO2	Perceive the factors of production and their peculiarities law of production and division of labour- large scale production price mechanism	K4
CO3	Explain system concepts management control power and accountability	K2
CO4	Define personnel management, Industrial safety, wages, incentive profit sharing	K1
CO5	Explain basics of psychological process learning and retention and concept of marketing management	K2

Text Books

1. R.R. Borthwal “Industrial Economics-An introductory text”, New age, International publication, 2nd edition.
2. Paul A. Samuel, “Economics – An Introductory analysis” Mc graw hill, 1961.
3. Alfred W. Stonier and Double C Hagum, “A Text Book of Economics Theory”, 5th edition, Pearson publishing.

Reference Books

1. Stephen P. Robbins; “Organizational Behaviour – Concepts Controversies Application,” Prentice – Hall Pvt.’ New Delhi, 1996
2. Fred Luthans, “Organizational Behaviour”, Mcgraw – Hill Inc,1995

SYLLABUS

HUMANITIES AND SOCIAL SCIENCES
ELECTIVE COURSES

18ETN101	Personality Development I	L - 2	T - 0	P - 0	C - 2

COURSE OBJECTIVE

- To improve the interpersonal skills, soft skills, effective team player and analyze strength and weakness to meet their professional career.

UNIT I: SOFT SKILLS I **6**

Introduction to Personality Development – Meaning-Features of personality=Dimensions of Personality=Determinants of Personality-Features and Traits- Components of self-concept-Barriers-Self analysis

UNIT II: SOFT SKILLS II **6**

Importance of Soft Skills – First Impression-Work Place Requirements-Discipline-Cleanliness-Hygiene-general Appearance--Building Confidence—Concept of Thinking and Usage-Value of Time-Focus & Commitment.

UNIT III SOFT SKILLS IN ACTION **6**

Grooming – Attire – Understanding others- – Stability & Maturity Development – Strengths – Weakness –Opportunities-threats -Merits of SWOT Analysis-Components-how to convert weakness into strengths-Goal settings

UNIT IV SELF AWARENESS AND SELF ESTEEM **6**

Definitions-Components of self-awareness-Developing Self-Awareness-Self-esteem-meaning-Steps to improve self esteem

UNIT V SELF MOTIVATION **6**

Motivation –Meaning-Techniques of self-motivation-Motivation & goal setting – Motivation and emotion – Motivation at work.

Total: 30 Hours

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Develop the soft skills through personality features and get rid of barriers.	K3
CO2	Build the basic characters such as cleanliness, hygiene and appearance.	K3
CO3	Creating the soft skills in disciplinary actions.	K6
CO4	Understand the concept of self-awareness and self esteem	K2
CO5	Adapt Familiar with the self-motivation	K6

REFERENCES:

1. Personality Development and Soft Skills---Barun K Mitra, Oxford Publication
2. Seven habits of Higly Effective people – Stephen R. covey
3. Emotion, motivation and Self-regulation - Nathan C. Hall , McGill University, Canada, Thomas Goetz, University of Konstanz, Germany
4. http://www.emeraldgrouppublishing.com/
5. Psychology of Selfesteem – Nathaniel Branden, Nash (1st edition), Jossey-Bass (32nd anniversary edition

18ETN102	Personality Development II	L - 2	T - 0	P - 0	C - 2

COURSE OBJECTIVE:

To improve the leadership quality, team management, quantitative analyzing knowledge, ordering, sequencing and logical thinking knowledge to meet their professional career.

UNIT I SOFT SKILLS III **6**

Basic Etiquette – Email etiquette – Business etiquette – Telephone etiquette – Meeting etiquette – Adjustment of Role & Leadership – Team Management & Development

UNIT II QUANTITATIVE APTITUDE I **6**

Percentage – Profit Loss -Discount – Ratio Proportion – Time & Work – Time, Speed & Distancel. Problems relating to ages- Permutation &Combination-Probability

UNIT III QUANTITATIVE APTITUDE II **6**

Mensuration Clocks and Calendars- Boats-Simple Interest –Compound Interest- Fractions and Decimals – Square roots – Functions.

UNIT IV ANALYTICAL PROBLEMS **6**

Introduction – Linear Sequencing – Seating Arrangements – Distribution/Double Line Up – Selection – Ordering and Sequencing – Binary Logic – Venn Diagrams –Directions.

UNIT V LOGICAL PROBLEMS **6**

Introduction to Logical problems – Cause and Effect – Course of Action – Statement and Assumption – Letter and Symbol series – Analogies.

TOTAL: 30 Hours

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Develop the soft skills and basic etiquette	K6
CO2	Develop the quantitative aptitude skills	K6
CO3	Build the advanced aptitude skills	K6
CO4	Adapt Familiar with the analytical problem-solving skills	K6
CO5	Build the knowledge on logical problem-solving skills	K6

REFERENCES:

1. Personality Enrichment--K R DhanaLakshmi And N S Raghunathan, Margham Publications
2. Personality Development --Dr V M Selvaraj Bhavani Publications
3. Quantitative Aptitude – R. S Aggarwal
4. Logical and Analytical Reasoning (English) 30th Edition – A.K Gupta

18ETN103	Personality Development III	L - 2	T - 0	P - 0	C - 2

COURSE OBJECTIVE:

To improve the verbal aptitude, Speech Mechanism, Sentence Stress knowledge, Personality factors, time management and team building to meet their professional career.

UNIT I VERBAL APPTITUDE I **6**

Phonetics/Neutral Accent/Pronunciation – Speech Mechanism/Mouth & Face Exercise – Vowels & Consonants – Sounds – Syllable and Syllable Stress/ Word Stress – Sentence Stress & Intonation – Articulation Exercise – Rate of Speech / Flow of Speech / Idiomatic Phrases.

UNIT II VERBAL APTITUDE II **6**

Singular/plural-present tense/past tense—genders - Prepositions-conjunctions-Choice of words—simple sentences—compound sentences- summarizing phrases—Synonyms—Antonyms—Analogies—Similar Words

UNIT III SOFT SKILLS IV **6**

Attitude—Meaning- Features of attitude-Formation-Personality Factors-Types of attitude-change in attitude-Developing Positive attitude.

UNIT IV TIME MANAGEMENT **6**

Definition –Meaning-Importance, Value of time as an important resource- comparison of Time and Money-Circle of influence and circle of control—Definition of URGENT and IMPORTANT—Time Wasters and how to reduce—Procrastination—meaning and impact- 4 Quadrants.

UNIT V TEAM BUILDING **6**

Meaning—Aspects of team building—Process of team building—Types of Teams-Team ethics and Understanding-Team trust and commitment

TOTAL: 30 Hours

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Develop the personality skills	K3
CO2	Build the confidence level	K3
CO3	Evaluate the student's skulls through SWOT analysis	K5
CO4	Develop the self-awareness and self esteem	K6
CO5	Improve the motivation skills	K6

REFERENCES:

1. Managing Soft Skills and Personality - B N Ghosh, Mcgraw Hill Publications.
2. Principles and Practices of Management - Shejwalkar and Ghanekar McGraw Hill Latest.
3. Time management for Busy people – Roberta roesch, Tata Mcgraw-Hill Edition.
4. Personality Development -Dr V M Selvaraj, Bhavani Publications.

18ETN104	Personality Development IV	L - 2	T - 0	P - 0	C - 2

COURSE OBJECTIVE:

To improve the communication by understanding the elements of communication, presentation skills, understanding the audience, Personality factors, improve the skill in seminars and conferences presentation.

UNIT I SOFT SKILLS V **6**

Assertiveness—Meaning—Importance of assertiveness- Characteristics of assertive communication-Merits –forms of assertion—Causes of misunderstanding

UNIT II COMMUNICATION SKILLS **6**

Meaning—Elements of communication—Functions of communication—Principles of communication—Formal and Informal communication—Barriers in Communication—Characteristics of good communication—Feedback—communication systems.

UNIT III PRESENTATION SKILLS I **6**

Meaning—Importance of Presentation—Concept of 5 w's and one H —understanding the audience—Types of presentations—How to make effective presentation

UNIT IV PRESENTATION SKILLS II **6**

Use of slide, PPT's. and visuals—Rules for slide presentation—precautions-seminars and conferences-Steps to eliminate Stage fear.

UNIT V CHANGE MANAGEMENT **6**

Definition – Necessity - Resistance towards Change – 10 Principles of Change Management – Leaders approach – Effective Change management.

TOTAL: 30 Hours

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Define importance of assertiveness characteristic causes of misunderstanding	K2
CO2	Explain the elements of communication function and principles formal and informal communication	K2
CO3	Classify the importance of presentation and concept of 5w's and One H	K2
CO4	Explain the rules for slide presentation precaution of seminar and conferences	K2
CO5	Define necessity, principles of change management and leader approach	K1

REFERENCES

1. Helping employees embrace change - LaClair, J. and Rao, R. Helping Employees Embrace Change, McKinsey Quarterly, 2002, Number 4.
2. Who Moved My Cheese by Spencer Johnson published by Vermilion first edition
3. Effective Communication. Adair, John. London: Pan Macmillan Ltd., 2003.
4. Business Communication Today: Bovee, Courtland L, John V. Thill & Barbara E. Schatzman.Tenth Edition. New Jersey: Prentice Hall, 2010.

18ETN105	NSS I	L - 3	T - 0	P - 0	C - 3

COURSE OBJECTIVE:

- To develop character of volunteerism with understanding the youth issues, challenges and opportunities.
- To learn about the community mobilization.

UNIT I INTRODUCTION AND BASIC CONCEPTS OF NSS 6

NSS: History, philosophy, aims, objectives –Emblem: flag, motto, song, badge- NSS functionaries: Organizational structure, roles and responsibilities.

UNIT II NSS PROGRAMS AND ACTIVITIES 6

Concept of regular activities- special camping-day camps-Basis of adoption of village/slums, Methodology of conducting survey-Financial pattern of the scheme- other youth program/schemes of GOI- Coordination with different agencies- Maintenance of the dairy

UNIT III UNDERSTANDING YOUTH 6

Youth: Definition, profile of youth, categories – youth: Issues, challenges and opportunities - Youth as an agent of social change.

UNIT IV COMMUNITY MOBILIZATION 6

Mapping of community stakeholders-Designing the message in the context of the problem and the culture of the community-Identifying methods of mobilization-Youth adult partnership

UNIT V VOLUNTEERISM AND SHRAMDAN 6

Indian Tradition of volunteerism-Needs& Importance of volunteerism- Motivation and constraints of volunteerism-Shramdan as a part of volunteerism.

TOTAL: 30 Hours

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Understand themselves in relation to their community and develop among themselves since of social and civic and responsibility.	K2
CO2	Identify the needs and problem of the community an involve them in problem solving.	K3
CO3	Utilize their knowledge in finding practical solution to individual and community problem.	K3
CO4	Develop the confidence require for group living and sharing of responsibilities of acquire leader ship qualities and democratic attitudes.	K6
CO5	Develop the capacity to meet emergencies and natural disasters and practice national integration and social harmony	K6

SYLLABUS

HUMANITIES AND SOCIAL SCIENCES
ELECTIVE COURSES

18ETN151	INDUSTRIAL SAFETY	L - 2	T - 0	P - 0	C - 2

COURSE OBJECTIVE:

- Effectively communicate information on Health safety and environment facilitating collaboration with experts across various disciplines so as to create and execute safe methodology in complex engineering activities.
- Competent safety Engineer rendering expertise to the industrial and societal needs at national and global level.
- Provide knowledge on safety in various maintenance situations, personal protective equipment and fire safety.

UNIT-I: SAFETY IN METAL WORKING MACHINERY AND WOOD WORKING MACHINE 6
General safety rules, principles, maintenance, Inspections of turning machines, boring machines, milling machine, planning machine and grinding machines, CNC machines.

UNIT II PRINCIPLES OF MACHINE GUARDING 6
Guarding during maintenance, Zero Mechanical State (ZMS), Definition, Policy for ZMS – guarding of hazards - point of operation protective devices, machine guarding, types, fixed guard, interlock guard, automatic guard, trip guard, electron eye, positional control guard, fixed guard fencing- guard construction- guard opening., Selection and suitability: lathe-drilling-boring-milling -grinding-shaping

UNIT III SAFETY IN WELDING AND GAS CUTTING 6
Gas welding and oxygen cutting, resistances welding, arc welding and cutting, common hazards, personal protective equipment, training, safety precautions in brazing, soldering and metalizing – leak detection-pipe line safety-storage and handling of gas cylinders.

UNIT IV SAFETY IN COLD FARMING AND HOT WORKING OF METALS 6
Cold working, power presses, point of operation safe guarding, auxiliary mechanisms, feeding and cutting mechanism, hand or foot-operated presses, power press electric controls. Hot working safety in forging, hot rolling mill operation, safe guards in hot rolling mills Safety in gas furnace operation.

UNIT V SAFETY IN FINISHING, INSPECTION AND TESTING 6
Heat treatment operations, electro plating, sand and shot blasting, safety in inspection and testing, dynamic balancing, hydro testing. Health and welfare measures in engineering industry-pollution control in engineering industry-industrial waste disposal.

TOTAL: 30 Hours

COURSE OUTCOMES:
After successful completion of the Industrial Safety course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Discuss the safety rules, Maintenance, Inspection of various equipment's in machine shop.	K6
CO2	Discuss the importance of protective devices and various machine guarding components.	K6
CO3	Recommend the safety precautions of various welding processes such as arc, gas, resistance welding, brazing and soldering	K5
CO4	Elaborate the functions of the safety in cold forming and hot working of metals.	K6
CO5	Apply the safety measures during heat treatment operations. Learn the measures of pollution control and waste disposal.	K3

REFERENCES:

1. “Accident Prevention Manual” – NSC, Chicago, 1982.
2. “Occupational safety Manual” BHEL, Trichy, 1988.
3. “Safety Management by John V. Grimaldi and Rollin H. Simonds, All India Travelers Book seller, New Delhi, 1989.
4. “Safety in Industry” N.V. Krishnan Jaico Publishery House, 1996.
5. Indian Boiler acts and Regulations, Government of India.
6. Safety in the use of wood working machines, HMSO, UK 1992.
7. Health and Safety in welding and Allied processes, welding Institute, UK, High Tech. Publishing Ltd., London, 1989.

18ETN152	Environmental Science and Engineering	L - 3	T - 0	P - 0	C - 3

COURSE OBJECTIVES:

- To inculcate the importance of environmental pollution, preservation of nature and environmental management for human welfare.
- The student is expected to understand what constitutes the environment, what are precious resources in the environment, how to conserve these resources, what is the role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity.
- The role of government and non – governmental organization in environmental managements.

UNIT I ENVIRONMENT, ECOSYSTEM AND BIODIVERSITY 9

Definition – Scope and importance – Need for public awareness – Concepts of an Ecosystem – Structure and Function of an Ecosystem –Producers, Consumers and Decomposers – Energy Flow in the Ecosystem – Ecological Succession – Food Chains, Food Webs and Ecological Pyramids – Introduction, Types, Characteristic Features, Structure and Function of the (A) Forest Ecosystem (B) Grassland Ecosystem (C) Desert Ecosystem (D) Aquatic Ecosystems (Ponds, Streams, Lakes, Rivers, Oceans, Estuaries) – Introduction to Biodiversity – Definition: Genetic, Species and Ecosystem Diversity – Biogeographical Classification of India – Value of Biodiversity: Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Values – Biodiversity at Global, National and Local Levels – India as a Mega-Diversity Nation – Hot-Spots of Biodiversity – Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts – endangered and Endemic Species of India – Conservation of Biodiversity: In-Situ and Ex-Situ conservation of Biodiversity.
Field Study of Common Plants, Insects and Birds. Field study of simple ecosystems - pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 9

Definition – Causes, Effects and Control Measures of (A) Air Pollution (B) Water Pollution (C) Soil Pollution (D) Marine Pollution (E) Noise Pollution (F) Thermal Pollution (G) Nuclear Hazards – Solid Waste Management: - Causes, Effects and Control Measures of municipal solid Wastes – Role of an Individual in Prevention of Pollution – Pollution Case Studies – disaster Management - Floods, Earthquake, Cyclone and Landslides.
Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 9

Forest resources -Use and over – Exploitation – Deforestation – Case studies – Timber extraction –Mining – Dams and their ground water – Floods – Drought – Conflicts over water – Dams – Benefits and Problems – Mineral Resources- Use and Exploitation, Environmental Effects of Extracting and Using Mineral Resources, Case Studies – Food Resources: World Food Problems, Changes caused by Agriculture and Overgrazing, Effects of Modern Agriculture, Fertilizer- Pesticide Problems, Water Logging, salinity, Case Studies – Energy Resources:- Growing Energy Needs, Renewable and Non Renewable Energy Sources, Use of Alternate Energy Sources, Case Studies – Land Resources - Land as a Resource, Land Degradation, Man Induced Landslides, Soil Erosion and Desertification – Role of an Individual in Conservation of Natural Resources – Equitable use of Resources for Sustainable Lifestyles.

Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IVSOCIAL ISSUES AND THE ENVIRONMENT 9

From Unsustainable To Sustainable Development – Urban Problems Related to energy – Water conservation, Rain Water Harvesting, Watershed Management – Resettlement and Rehabilitation of People, its Problems and Concerns, Case Studies Role of non – governmental organization - Environmental Ethics- Issues and Possible Solutions – Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust, Case Studies –Wasteland Reclamation – Consumerism and Waste Products – Environment Production Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and Control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act –enforcement machinery involved in environmental Legislation – Central and state pollution control boards - Public Awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 9

Population Growth, Variation among Nations – Population Explosion Family Welfare Programme – environment and Human Health – Human Rights –Value Education – HIV /AIDS – Women and Child Welfare – Role of Information Technology in Environment and Human Health – Case Studies.

Total: 45 hrs

COURSE OUTCOMES:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Understand the concept of ecosystem, biodiversity, constitutes the environment and the precious resources available and how to conserve natural resources and the relationship between living and non-living things and ethics	K2
CO2	Analyze the different types of pollution and their causes, effect and control measures and the role of a human being in maintaining a clean environment exposure.	K4
CO3	Analyze the uses of available natural resources and the effect of over exploitation and deforestation, equitable use of resources for sustainable development and role of individual for conservation of resources.	K4
CO4	Create awareness; understand the role of non-governmental organization for sustainable development and their importance, effects and the different laws for environmental protection.	K6
CO5	Create awareness about human population in worldwide and their causes effect and role of information technology on control measures for sustainable lifestyle.	K6

Text Books

1. De AK, Environmental Chemistry, Wiley Eastern Ltd.
2. Bharucha Erach, 2003. The Biodiversity of India, Mapin Publishing Pvt. Ltd, India.
3. Brunner RC, 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480pgs.
4. Clark RS, Marine Pollution, Clanderson Press, Oxofrd (TB).

Reference Books

1. Agarwal KC, 2001. Environmental Biology, Nidi Publishers Ltd. Bikaner.
2. Gleick HP, 1993. Water in Crisis, Pacific Institute for Studies in Development, Environment and Security. Stockholm Environmental Institute, Oxford University Press, 473pgs.
3. Heywood VH, and Watson RT, 1995. global Biodiversity Assessment. Cambridge University Press 1140pgs.
4. Jadhav H and Bhosale VM, 1995. Environmental Protection and Laws. Himalaya Publishing House, Delhi 284pgs.

SYLLABUS

VALUE ADDED COURSES

18ETN201 SHIP HULL SURVEY AND REPAIR

Course Objectives:

- To define the responsibilities of the classification society people
- To explain the rules and regulations of the new ship building processes
- To adopt the knowledge about the statutory and periodical surveys

Unit-1 Repair of Ship Hull

Introduction; cause of wear and damage in ship's hull: Comparison between different types of repair activities (Afloat, berthed, etc.); Repair of hull and other parts while afloat; docking plan- replacement of hull plates and stiffeners, decks and bulkheads; repair of stem and stern frames and shaft bracket; NDT and X-ray tests; Testing for water tightness and hull continuity etc.;

Unit-2 Underwater welding & Ship Repair facility

Welding equipment; quality control and standards; degree of automation; Safety during repair – various operations involving risk; safety devices and plans; problems during docking; Ship repair facilities in a modern repair yard, repair docks, machine shop, scaffolding; Subcontracting policies by shipyard in repair project, layout of repair yard.

Unit-3 Marine surveys & Marine Surveying Agencies

Various types of marine surveys. Roles and responsibilities of marine surveying agencies; Historical development of ship classification societies; Major activities of classification societies; rules and class notation; IACS and joint projects; Comparison of ship class rules by LRS and ABS

Unit-4 Ship Classification Societies

International Ship classification societies and UN agencies involved in marine and offshore activities. Activities of classification societies and surveying agencies bodies; Classification society – Design approval; construction survey; survey on operation, repair conversion. Industrial surveys, third party accreditation.

Unit-5 Statutory Surveys & Other Bodies

Statutory surveys – role of MMD. Activities of statutory bodies – MMD, Inspectorate of boats – design approval; construction inclination experiment, keel sighting, registration, surveys during – repair conversion and operation.

Activities of other bodies – port authority; IWAI; Local bodies; canals etc.

Course Outcomes:

After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Compare different types of repair activities, Repair of hull	K2
CO2	Define the problems encountered in repair, facilities in shipyard,	K1
CO3	Explain about marine surveys, activities of classification societies	K2
CO4	Compare various classification societies and their standards	K4
CO5	Inspect the various parts of ship and guide the workers with regulations	K4

Textbook

1. Witherby (IACS) General Cargo Ships, Guidelines for surveys Assessment and Repair Hull Structures
2. Witherby (IACS) Surveyors Guidence

18ETN202 RISERS AND MOORING LINES

COURSE OBJECTIVE:
This program provides an intensive learning experience in the aspects of theory and practical areas of Offshore Engineering. This curriculum covers all the necessary inputs to provide expertise in Designing Risers and Mooring Lines

Unit I Introduction
Historical Background, Upstream, Downstream, Middle Stream, Oil & gas development options

Unit II Risers
Riser Background, Types, Application, Static & dynamic analysis

Unit III Mooring
Mooring Background, Types, Application, Static & dynamic analysis

Unit IV:
Flow around circular cylinders: VIV - Vortex-induced vibration, derivation and calculation

Unit V: Tutorials Coursework & Presentations
Riser Calculations, Mooring line calculation, Development in Riser and Mooring Line Technology

COURSE OUTCOMES:
After successful completion of the course, the student will be able to

Course Outcome	Description	Knowledge Level
CO1	Explain the basic concepts of Risers and Mooring lines behavior	K2
CO2	Examine the forces acting on the Risers and explain the different types of risers	K4
CO3	Evaluate the forces acting on the moorings and explain the types of mooring lines	K5
CO4	Understand the concepts of vortex induced vibration	K2
CO5	Evaluate the problems in designing of risers and mooring lines	K5

Text Books

1. Subrata K Chakrabarti, “Handbook of Offshore Engineering”, Vol 1, Elsevier Publishers, 1st edition, 2005.
2. Subrata K Chakrabarti, “Handbook of Offshore Engineering”, Vol 2, Elsevier Publishers, 1st edition, 2005.