B. Tech - III Year- I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	Ext Marks	Total Marks	Credits
			L	P				
NM 3101	PC	Fluid Mechanics	4	0	30	70	100	3
NM 3102	PC	Ship Design - I	4	0	30	70	100	3
NM 3103	PC	Ship Construction	4	0	30	70	100	3
NM 3105	PE	Professional Elective I	4	0	30	70	100	3
NM 3104	OE	Open Electives I	4	0	30	70	100	3
NM 3106	PC	Marine Thermal Lab	0	3	50	50	100	1.5
NM 3107	PC	NAPA Lab	0	3	50	50	100	1.5
NM 3108	SC	Welding Practice	1	2	50	50	100	2
NM 3109	INT	Internship-I			50	50	100	2
Total credits								**22**

NM 3101 FLUID MECHANICS

Periods/week : 4 Ses. : 30 Exam : 70

Examination Theory: 3hrs. Credits: 3

Course Objectives: This course offers basic knowledge on fluid statics, dynamics and hydraulic machines. The objective of this course is to enable the student to understand laws of fluid mechanics and evaluate pressure, velocity and acceleration fields for various fluid flows and performance parameters for hydraulic machinery.

Course Outcomes: The student will be able to:

- Identify importance of various fluid properties at rest and in transit.
- derive and apply general governing equations for various fluid flows
- Understand the concept of boundary layer theory and flow separation.
- Plot velocity and pressure profiles for any given fluid flow.
- evaluate the performance characteristics of hydraulic turbines and pumps

SYLLABUS

Properties of fluids- Viscosity- Pressure measurement and Manometers- Hydrostatic forces on surfaces.

Fluid Kinematics & Fluid Dynamics: Stream line- Stream tube- Stream function- Potential function- Classification of flows- Steady, Unsteady, Uniform, Non-uniform, Laminar, Turbulent, Rotational, Irrotational flows, Vorticity and circulation- Conservation of mass- Equation of continuity, Conservation of momentum- Euler's equation, Conservation of energy- Bernoulli's equation and its applications- Vortex motion- Free and forced vortices- Basic solutions of ideal fluid flows- Flow net analysis.

One dimensional Viscous Flow: Couette flow- Plane Couette flow, Favourable pressure gradient and adverse pressure gradient- Flow through pipes- Hagen Poiseulle flow- Fannigs friction factor- Darcy's Weisbach friction factor- Loss of head due to friction in pipes- Laminar and turbulent regimes- Flow potential and flow resistance- Flow through branched pipes, Momentum equation- Forces due to pipe bends, Curved tubes, Sudden enlargement, Sudden contraction, flow through porous media- Darcy's equation. Two dimensional viscous flow: Navier -Stokes equations and solutions- Order of magnitude analysis- Boundary layer equations. **Laminar Boundary Layer:** Momentum integral equation- Flow over a flat plate- Displacement thickness, Momentum thickness and energy thickness.

Turbulent Boundary Layer: Laminar- Turbulent transition- Momentum equations and Reynold's stresses- Fully developed turbulent flow through a pipe- Turbulent boundary layer on a flat plate- Laminar sub-layer- Boundary layer separation and control.

Dimensional Analysis and Modeling Similitude: Fundamental and derived dimensions- Dimensionless groups- Buckingham p-theorem- Rayleigh method- Model testing- Types of similarity- Geometric, Kinematic and Dynamic similarities- Hydraulic diameter.

Compressible Fluid Flow: Thermodynamic relations- Continuity, Momentum and Energy equations- Velocity of sound in a compressible fluid- Mach number and its significance- Limits of incompressibility- Pressure field due to a moving source of disturbance- Propagation of pressure waves in a compressible fluids- Stagnation properties- Stagnation pressure, Temperature and density- Area velocity relationship for compressible flow- Flow of compressible fluid through nozzles- Condition for maximum discharge through nozzles- Variation of mass flow with pressure ratio- Compressible flow through a venturimeter- Pitot static tube in a compressible flow.

Text Book:

Fluid Mechanics, by A.K.Mohanty, Prentice Hall of India Pvt.Ltd.

References:

1. Fluid Mechanics and Hydraulic Machines, by R.K.Bansal, Laxmi publications.
2. Foundations of Fluid Mechanics, by Yuan, Prentice Hall of India.
3. Fluid Mechanics and its Applications, by S.K.Gupta and A.K.Gupta, Tata McGraw Hill, New Delhi.
4. Fluid Mechanics and Hydraulic Machines by R.K.Rajput, S.Chand & Co.
5. Fluid Mechanics by Kothandaraman and Rudramoorthy.

NM 3102 SHIP DESIGN-I

Periods/week : 4 Ses. : 30 Exam : 70

Examination Theory: 3hrs. Credits: 3

Course objectives: introducing basic ship theory, the ship design process, and systems engineering concepts. Hands on development of a computer code for ship hydrostatics analysis. Hands on experiments on ship stability and resistance. Visits and exercises on board ships. Individual ship design project and related workshops.

Course outcome:

This course gives an introduction to naval architecture, i.e. the engineering design of ships and other marine technology systems, and basic ship theory such as hydrostatics, stability, resistance and propulsion. The objective is that students after finishing the course shall be able to:

- Demonstrate knowledge and understanding of the scientific basis and proven experience of ship design and insight into current research and development work;
- Demonstrate methodological knowledge and understanding in ship hydrostatics, stability, resistance and propulsion;
- Demonstrate ability to model, simulate, predict and evaluate ships' hydrostatics, stability, resistance, and energy and resource efficiency, even on the basis of limited information;
- Demonstrate ability to critically, independently and creatively make the initial design of a ship for a certain transport scenario, taking into account relevant scientific, social, ethical, economic and environmental aspects, and international regulatory frameworks;
- Give an account of the international shipping markets and the corresponding stakeholders, goods flow paths, and ship types;
- Discuss the opportunities for seaborne transportation in a sustainable society and describe the shipping-related environmental problems and measures for tackling them;
- Demonstrate ability to plan and carry out advanced engineering tasks within given frames using appropriate methods and to evaluate this work;
- Demonstrate ability to clearly present and discuss engineering conclusions and the knowledge and arguments behind them, in dialogue with different groups, orally and in writing, in national and international contexts.

SYLLABUS

General Considerations and Introduction to Ship Design Methods: Marketing, manufacturing and operational considerations in Ship design. Technological, economic and sociological factors and national priorities. Ship design as a science and as an art. Owner's requirements, shipyard production facilities and operational constraints to be considered in the design process. Introduction to ship design method using basic ship or parent ship types, ship design as an iterative process and stages of ship design. The design spiral, design ship categories such as dead weight carriers, capacity carriers, and linear dimension ships. Displacement and volume estimation. Dead weight-displacement ratio, components of dead weight and displacement, determination of main dimensions and form coefficients, use of computers in ship design process.

Estimation of Weight And Volume Components, Design Of Hull Form And Determination Of Stability And Other Criteria:

Weight and capacity equations and their use in ship design. Use of cubic equation. Calculation of weight and volume components using parent ship data or other compiled data. Calculation of steel, wood, outfit and machinery weights, using formulas. Estimation of dead weight components, design of hull form from first principles. Sectional area curve. Design of load water line, sections, stem and stern profiles, other water lines and development of the lines plan., determination of position of the LCB. Preliminary estimation of power and propeller diameter. Preliminary check for rudder area. Use of series data such as BSRA series and Taylor's series. Calculation of stability, free board, trims capacity and tonnage. Stowage factors. Volume required for cargo fuel fresh water and Ballast.

Determination of Engine Power and Selection of Main and Auxiliary Machinery:

Calculation of engine power. Relation between resistance and engine power. Criteria for selection of main propulsion plant. Types of main propulsion plants and fuels-their advantages and disadvantages. Different types of power transmission and shafting systems used in ships. Selection of propeller. Propeller types and number and estimation of main propeller parameters, such as diameter, rpm, number of blades, blade area ratio etc. Determination of location, area and volume of engine room. Estimation of size of engine casing. Estimation of electrical power requirement in the ship and deck area and volume required for installation of generators and main switchboard. Functions of various other auxiliary machinery such as boilers, cargo pumps, fuel and lube oil pumps, separators, cooling systems etc.

Cargo Systems and Cargo Handling Gear: Introduction to various types of cargo systems and cargo handling gear used on board ships such as cranes, derricks, Sampson posts, pumping systems etc. Properties and requirements for carriage of different types of cargo.

General cargo carriers, light and heavy bulk cargo carriers and ore carriers. Unitised cargo-pallets, containers, barges, etc. and specialised ships for their carriage. Wheeled cargoes. RO-RO ships and ferries. Liquid cargoes-oil tankers liquefied gas carriers and chemical tankers. Selection of cargo handling gear-arrangements for general, bulk, unitised and liquid cargoes. Piping arrangement for tankers.

Important Design Features of Various Types of Ships and other Considerations:

General cargo carriers, container ships, oil tankers, passenger vessels, bulk carriers, fishing trawlers, tugs, dredgers, barges, ferries. Different types of hull forms, propulsion systems, main and auxiliary machinery, cargo handling systems and operational requirements suitable of the above mentioned ships. Other consideration in ship design such as water tight integrity, damage stability, manoeuvring and sea keeping criteria, propulsive efficiency, minimisation of hull vibrations, compartments and super structure design in different types of ships. Trimming calculations in various operating considerations. Ballasting arrangements and estimation of total ballast.

Reference Books:

1. Ship Design and Construction by R.Taggart
2. Basic Ship Theory, Vol.1 & 2 by K.J.Rawson and E.C.Tupper
3. Principles of Naval Architecture, Vol. 1,2&3 by Ed.V. Lewis

NM 3103 SHIP CONSTRUCTION

Periods/week : 4 Ses. : 30 Exam : 70

Examination Theory: 3hrs. Credits: 3

Course Objective:

• To be well versed in how to apply various knowledge of architecture on ship operations.

• To Understand Ship Stability and Statically Stability

Course Outcome:

- CO 01: To understand the types of Ships
- CO 02: To understand the Stress and Strain in Ships in Still water and in Sea way
- CO 03: To understand the principle part of Ships
- CO 04: To understand the advantages of welding over riveting
- CO 05: To understand the concept of law of floatation
- CO 06: To understand the center of buoyancy and factors affecting the same
- CO 07: To understand the Transverse Statically stability
- CO 08: To understand the Equilibrium of Ship
- CO 09: To calculate of List while Loading, Discharging and/or shifting weights, Correction of List
- CO 10: To understand how to use of hydrostatic tables and curves as supplied to ships, Displacement/draft-curve and table, Light displacement& Load displacement

SYLLABUS

Introduction to ship building and materials used:

A typical ship construction program. Building berth. Building Dock. Multi-stage construction methods. Equipment used in building berths. Use of Goliath cranes. Floating Docks. Ship types. Shipyard layout. Classification societies, development and application of classification rules, role of statutory bodies. Materials for ship construction. Structural steels, special steels, non- ferrous steels, non-metallic materials, material properties and testing of materials. Joining methods of materials, non-destructive testing.

Storage and preparation of material and structural elements:

Material handling and storage, transport system in steel stockyard, material preparation Devices- cleaning, marking processes. The cutting process, Mechanical cutting, thermal Cutting, optically and numerically controlled cutting, bending of rolled and built-up sections, Plate bending. Nesting of plates.

Fabrication of sub-assemblies, units and hull erection:

Process of prefabrication, welding in prefabrication and erection stages, sub-assemblies, flat Sections, panels- flat and curved, double bottom sections, side tank units, fore-end and aftend Structures, deck and bulkhead structures. Assembly of hull-units. Erection of hull-units On building berth/dock.

Ship structural components:

Functions and details of ship structural components, framing systems, single and double Bottom construction, shell and deck plating, bulkheads, pillars, girders and hatch-coaming, Machinery casings, super structures and deck- houses. Bow and stern Structures. Bossing and Struts, bilge keels and fenders.

Out Fitting, Welding, Testing And Trials And Launching:

Various components of outfitting, consisting of systems, equipment and fittings of hull, Machinery and electrical groups. Hull Preservation methods. Various outfitting methods. Advanced outfitting. Methods of welding, metallurgy of welding weld defects, distortion and Stresses in welds, testing of welds. Inspection and testing during various stages of ship Construction. Testing of structures and tanks. Bollard tests and sea trials. Details of launching Arrangements.

References:

1. Merchant Ship Construction by D. A. Taylor

2. Ship Construction by D.J. Eyres

3. Ship Design and Construction by R.Taggart

NM 3106 Marine Thermal Lab

Periods/week : 3	Ses. : 50	Exam : 50
Examination Practical: 3hrs.		Credits: 1.5

List of experiments to be conducted:

1. Determination of flash and fire points of oil samples - using Cleveland's apparatus
2. Determination of flash point of oil samples - using Abel's and Pensky-Martin's apparatus
3. Determination of Kinematic viscosity - using Redwood Viscometer – I & II, Saybolt's viscometer
4. Determination of calorific value of solid and liquid fuels using Bomb Calorimeter.
5. Aniline point test,
6. Calibration of pressure gauge - dead weight tester.
7. Volumetric efficiency of reciprocating air compressor.
8. Valve timing diagrams of IC engines (2 & 4 stroke engines).
9. Study of equipment to supplement theory, Boiler models,& I.C. Engine Components.
10. Experiments covering performance and other tests on Diesel Engines – Single cylinder, and Multi cylinder
11. Experiments covering performance and other tests on Petrol Engines
12. Refrigerating system and ice plant
13. Wind Tunnel

NM 3107 NAPA LAB

Lab Periods/week : 3 Sessional. : 50 Exam: 50 Credits: 1.5

Course Objectives

- The objectives of the course are to provide training and provide hands on experience to the students on NAPA software for the purpose of hydrostatic calculations and resistance calculations

Course Outcomes

- At the end of the course, the student will be in a position to model a ship using the softare
- perform a detailed hydrostatic calculation
- Obtain the ship resistance

SYLLABUS

NAPA Main window features, Project Settings, Hull Modelling, Hydrostatic Calculations, Design Hydrostatics, Hydrostatics, Resistance, Report writing and explanation

NM 3108 (SC) Welding Practice

LIST OF EXPERIMENTS:
(Practical/hands on)

Arc welding of mild steel and stainless steel plates and thermal cycle, cooling rate, macrostructure and Micro structural characterization of welds and Arc welding safety(Lap Joints)

Arc welding of mild steel and stainless steel plates and thermal cycle, cooling rate, macrostructure and Micro structural characterization of welds and Arc welding safety(Butt Joints)

Arc welding of mild steel and stainless steel plates and thermal cycle, cooling rate, macrostructure and Micro structural characterization of welds and Arc welding safety(T-joint)

Arc welding of mild steel and stainless steel plates and thermal cycle, cooling rate, macrostructure and Micro structural characterization of welds and Arc welding safety(Flange Joints)

Study Experiments (Theoretical)

Spot welding and Spot Welding safety

TIG welding TIG welding safety.

Plasma welding and Plasma welding safety.

Submerged welding and Submerged welding safety.

NM 3109 INTERNSHIP-I

B. Tech -III Year- II Semester

Course code	Category	Course Title	Hours per week		Int Marks	Ext Marks	Total Marks	Credits
			L	P				
NM 3201	PC	Resistance and Propulsion	4	0	30	70	100	3
NM 3202	PC	Strength of Ships	4	0	30	70	100	3
NM 3203	PC	Ship Design - II	4	0	30	70	100	3
NM 3204	PE	Professional Elective II	4	0	30	70	100	3
NM 3205	OE	Open Electives II	4	0	30	70	100	3
NM 3206	PC	Marine Hydrodynamics Lab	0	3	30	70	100	1.5
NM 3207	PC	Marine Instrumentation and Metrology lab	0	3	50	50	100	1.5
NM 3208	PC	Ship Drawing - III	0	3	50	50	100	1.5
NM 3209	SC	Soft Skills	1	2	50	50	100	2
Total credits								**21.5**
Internship II								

NM 3201 RESISTANCE & PROPULSION

Periods/week : 4 Ses. : 30 Exam : 70

Examination Theory: 3hrs. Credits: 3

Course Objectives:

Students undergoing this course are expected:

- To understand and analyze the gas turbine engine and its components.
- To realize and analyze the thermodynamics of various component of a gas turbine engine.

Course Outcomes:

- Apply the working concept of various types of gas turbine engines in practical applications
- Differentiate between a subsonic and a supersonic inlet and further relate it to aerospace applications.
- Analyze the working concept of various types of compressors.
- Illustrate the operational and designing concepts of gas turbine blades.
- Examine the suitability of the combustion chamber & nozzle for a given gas turbine engine

SYLLABUS

Introduction to resistance: Concept of resistance, flow of non-viscous and viscous fluids past submerged bodies and surface of ships. Introduction to important components of resistance such as frictional resistance, wave making resistance, eddy making resistance and air & wind resistance. Dimensional analysis, conditions of similarity, corresponding speeds of ship and model, Introduction to towing tank experiments and determination of ship resistance.

Viscous resistance and air & wind resistance: Froude's experiments with planks and plates, Reynold's experiments with pipes. Turbulence stimulation, friction lines, form resistance, boundary layer separation, effect of hull roughness, appendage drag, resistance in shallow water full scale tests and ship model correlation.

Wave resistance, estimation of total resistance and effective horsepower: Kelvin wave pattern, waves generated by ship, wave interference, Froude's method of resistance prediction. Resistance data presentation, estimation of total resistance and effective power, trail and service allowances. Aspects of hull form design. Statistical analysis of resistance data by regression.

Propeller Design and hull propeller interaction: Screw propeller terminology and geometry. Dimensional analysis and conditions of similarity. Propeller in open water. Propeller coefficients, hull- propeller interaction, wake and thrust deduction, hull efficiency, relative rotative efficiency, propulsive coefficient. Cavitation, fully cavitating propellers. Propeller design using methodical series data, design of free running propellers, propellers for tugs and trawlers. Elementary treatment including basic principles of momentum theory, blade element theory, lifting line theory and lifting surface theory of propeller. Design of propellers for a variable wake.

Ship Propulsion devices, prediction of ship's power and strength of propellers: Ship Propulsion devices and their historical development, water jet propulsion, controllable pitch propellers, vertical axis propellers, shrouded propellers, tandem and contra-rotating propellers and paddle-wheels, super conducting electric propulsion. Model propulsion experiments in towing tanks and Cavitation tunnels. Ship trails and service performance analysis, estimation of power based on model experiments and propeller design charts, use of $B\rho$- δ charts,

Kt- Kq- J diagrams. Propeller blade strength methods of calculation, classification society rules, Propeller materials.

Reference Books:

1. Principles of Naval Architecture, Vol. II by Ed.V.Lewis.
2. Resistance and Propulsion of Ships by S.A.Harvald**.**
3. Marine Propellers and Propulsion by J.C.Carlton.

NM 3202 STRENGTH OF SHIPS

Periods/week : 4 Ses. : 30 Exam : 70

Examination Theory: 3hrs. Credits: 3

Course objective:

The course objective is to provide students with the knowledge and application skills to meet the knowledge, understanding, and practical assessment requirements for ship construction and stability as part of the requirements for an officer in charge of the navigational watch.

Course Outcomes:

- Determine whether stresses on the ship are within the permitted limits by use of stress data
- Understand the fundamental actions to take in the event of partial loss of intact buoyancy
- Demonstrate knowledge of the fundamental actions to be taken in the event of partial loss of intact buoyancy
- Use tables and diagrams of ship stability and trim data to calculate the ship's initial stability, drafts, and trim for any given disposition of cargo and other weights
- Demonstrate knowledge of principal structural members of a ship and the proper names for various parts

SYLLABUS

Introduction to functions and analysis of ship structures: 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. Modeling 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.

Longitudinal strength of hull girder and ultimate strength: Modeling of ship hull Girder as a beam. Assumed form of wave systems. Conditions of Hogging and Sagging. The buoyancy curve. The weight curve. 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.

Transverse strength of hull girder and ship hull material: 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.

Strength of bulk heads, decks and tank tops, foundations, super structure, deck houses and structural discontinuities and local strength problem: 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 on the basis of 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.

Theory of thin plates, buckling of structures, composite construction, grillage analysis, calculation of scantlings as per rules: 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.

REFERENCE BOOKS:

1. Ship Construction by D.J.Eyres Merchant Ship Construction by D.A.Taylor
2. Principles of Naval Architecture, Vol. II by Ed.V. Lewis.

NM 3203 SHIP DESIGN – II

Periods/week : 4 Ses. : 30 Exam : 70

Examination Theory: 3hrs. Credits: 3

Course objectives: Introducing basic ship theory, the ship design process, and systems engineering concepts. Hands on development of a computer code for ship hydrostatics analysis. Hands on experiments on ship stability and resistance. Visits and exercises on board ships. Individual ship design project and related workshops.

Course outcome:

This course gives an introduction to naval architecture, i.e. the engineering design of ships and other marine technology systems, and basic ship theory such as hydrostatics, stability, resistance and propulsion. The objective is that students after finishing the course shall be able to:

- Demonstrate knowledge and understanding of the scientific basis and proven experience of ship design and insight into current research and development work;
- Demonstrate methodological knowledge and understanding in ship hydrostatics, stability, resistance and propulsion;
- Demonstrate ability to model, simulate, predict and evaluate ships' hydrostatics, stability, resistance, and energy and resource efficiency, even on the basis of limited information;
- Demonstrate ability to critically, independently and creatively make the initial design of a ship for a certain transport scenario, taking into account relevant scientific, social, ethical, economic and environmental aspects, and international regulatory frameworks;
- Give an account of the international shipping markets and the corresponding stakeholders, goods flow paths, and ship types;
- Discuss the opportunities for seaborne transportation in a sustainable society and describe the shipping-related environmental problems and measures for tackling them;
- Demonstrate ability to plan and carry out advanced engineering tasks within given frames using appropriate methods and to evaluate this work;
- Demonstrate ability to clearly present and discuss engineering conclusions and the knowledge and arguments behind them, in dialogue with different groups, orally and in writing, in national and international contexts

SYLLABUS

General Arrangements of Ships: General arrangement of ships. Layout of main and other decks. Water tight subdivision of the ship's hull. Disposition of bulk heads and decks. Allocation of cargo and machinery spaces. Bridge and navigation spaces. Arrangements of tanks for fuel oil, ballast water and other liquids. Engine room layout. Cargo handling arrangement, requirement for ships. Accommodation in ships. Design philosophy of accommodation spaces. Living spaces, commissionery spaces, spaces for dining, recreation and services. Access diagrams. Design of super structure and layout. General arrangement and deck layout of general cargo ship, bulk carrier, oil tanker, container ship, passenger ship, fishing trawler, ferry, tug and dredger.

Hull Fittings, Navigational aids and lifesaving appliances: Closing devices, water tight, weather tight, gas tight and non-water tight floors. Windows and portholes. Bulkhead openings, hull openings, cargo port, bow doors, stern ramps. Man holes and access doors.

Hatch covers-weather deck and between deck. Types of hatch covers-sliding, rolling and pontoon. Operating mechanisms. Arrangements for ensuring water tightness. Lifesaving equipment primary and secondary types and ship requirements. Navigational equipment. Bulwarks railings and awnings, gangway, gangplanks, and gangway adders. Masts and rigging, mast designs.

Auxiliary machinery and other Ship Systems: Ship auxiliaries and equipment. Functions of auxiliary machinery and design requirements for location and installation. Selection of components and space allocation for ship systems including electrical system, Fuel and lubricating oil systems. Fresh water and sea water systems, Air conditioning, ventilation, and refrigeration systems, anchoring and mooring gear,

Steering gear types and location, automation of ship systems and ship operation. Unmanned machinery spaces.

International and National regulatory Bodies: Safety and habitability. Impact of the regulatory bodies in ship design, IMO and classification societies, SOLAS, ILLC, ITTC, MMD. Prevention of marine pollution-MARPOL regulations. Free board assignment. Stability in various operating conditions, important features of maritime law of India - regulations regarding a/c, ventilation, noise, vibrations. Survival after damage. Carriage of dangerous goods. Collision prevention.

Ship design organisation and design consideration for special ships and use of computers: Evolution of design philosophy. Changes effected over the years. The "Titatanic Disaster" and impact.

Design features of special types of ships- ice breakers, refrigerated cargo carriers, liquefied gas carriers, aircraft carriers, Ro-RO vessels, SWATH vessels, luxury passenger ships and high speed ships.

Double hull structures for tankers. Hatch coverless containers. Offshore supply vessels, deep sea fishing vessels, use of computers in design of general arrangement and systems. Trends of future developments. Aesthetic considerations in ship design.

Reference Books:

1. Ship Design and Construction by R.Taggart

2. Principles of Naval Architecture, Vol. 1,2&3 by Ed.V. Lewis

NM 3206 MARINE HYDRODYNAMICS LAB

Periods/week :3 Ses. : 50 Exam : 50

Examination Practical: 3hrs. Credits: 1.5

Experiments covering the following aspects:

- Pressure, Velocity and flow rate measurements,
- Calibration of Venturimeter.
- Reynolds number of steady pipe flow.
- Calibration of small orifices and mouth pieces.
- Calibration of orifice meters and flow nozzles.
- Vortex motion on the aft portion of blunt bodies.
- Pressure distribution around aerofoil sections.
- Determination of metacentric height of a floating model.
- Visits to Model testing tank to do ship model testing and understand basic facilities.

NM 3207 MARINE INSTRUMENTATION AND METROLOGY LAB

Periods/week: 3 Ses. : 50 Exam: 50

Examination Practical: 3hrs Credits: 1.5

Metrology experiments

- Calibration of mechanical comparator
- Calibration of Micrometer
- Testing of Concentricity trueness and parallelism of a mandrel
- Measurements of taper bar using Dial gauge, bevel protractor and sine bar.
- Distance between two holes of a template using Vernier height gauge.
- Measuring the central height of a circular spigot
- Measuring the pitch diameter, diametral pitch and pressure angle of an involute spur gear
- Study of flatness of slip gauges using optical flats and monochromatic light.
- Calibration of Vernier calipers.
- Calibration of Vernier Height gauge

Instrumentation experiments

- Calibration of thermocouple, thermisiters.
- Calibration of force and stresses using strain gauges.
- Flow rate measurement and roto meter.
- Calibration of pressure gauge.

NM 3208 SHIP DRAWING – III

Periods/week : 3 Ses : 50 Exam : 50

Examination Theory: 3hrs. Credits: 1.5

Theory (Stability and trim) Transverse and longitudinal stability and trim calculations, effects of movement of liquids, cargo, fuel, fresh water, grain, rules for stability. Calculations and plotting of cross curves, G-Z curves. Stability booklet for ships, DWT scale, cargo loading and unloading, Ballasting and de-ballasting. Inclining equipment, Calculation and estimation of GM in different service conditions. Weight calculations. Introduction and importance of weight calculations in ship design and construction. Calculation of weights of plates and sections, weight calculation data. Detailed estimation of steel weight of ship's hull. Calculation of LCG and VCG of ship and off centre line moments of ship. Calculation of total weight of the ship based on group weights. Calculation of centroid of sections and plates and other structural elements.

Practical: Drawing of Stability Curves, Analysis of inclining experiment and weight calculations, LCG and VCG calculation

NM 3209 (SC) Soft Skills

Course Objectives:

1. To develop skills to communicate clearly.
2. To aid students in building interpersonal skills.
3. To enhance team building and time management skills.
4. To inculcate active listening and responding skills.

Course Outcomes:

1. Make use of techniques for self-awareness and self-development.
2. Apply the conceptual understanding of communication into everyday practice.
3. Understand the importance of teamwork and group discussions skills.
4. Develop time management and stress management.

Syllabus

Introduction to Soft Skills: Communication – Verbal and Non Verbal Communication - Personal grooming (Etiquette, Attitude, Body Language), Posture, Gestures, Facial Expressions, Eye Contact, Space Distancing, Presentation Skills, Public Speaking, Just a Minute (JAM) sessions, Adaptability.

Goal Setting and Time Management: Immediate, Short term, Long term, Smart Goals, Strategies to Achieve goals, Types of Time, Identifying Time Wasters, Time Management Skills, Stress Busters.

Leadership and Team Management: Qualities of a Good Leader, Team Dynamics, Leadership Styles, Decision Making, Problem Solving, Negotiation Skills.

Group Discussions: Purpose (Intellectual ability, Creativity, Approach to a problem, Tolerance), Group Behaviour, Analysing Performance.

Job Interviews: Identifying job openings, Covering Letter and CVs / Resumes, Interview (Opening, Body-Answer Q, Close-Ask Q), Telephone Interviews, Types of Questions.

Reference Books:

1. Krannich, Caryl, and Krannich, Ronald L. *Nail the Resume! Great Tips for Creating Dynamite Resumes*. United States, Impact Publications, 2005.
2. Hasson, Gill. *Brilliant Communication Skills.* Great Britain: Pearson Education, 2012
3. Prasad, H. M. *How to Prepare for Group Discussion and Interview*. New Delhi: Tata McGraw-Hill Education, 2001.
4. Pease, Allan. *Body Language*. Delhi: Sudha Publications, 1998.
5. Rizvi, Ashraf M. *Effective Technical Communication*: India, McGraw-Hill Education. 2010

Thorpe, Edgar &Showick Thorpe. *Winning at Interviews*. 2nd Edition. Delhi: Dorling Kindersley, 2006.

(0891) 2844819 (0891) 2844820

ANDHRA UNIVERSITY: COLLEGE OF ENGINEERING
DEPARTMENT OF MARINE ENGINEERING

PROF. I.N.NIRANJAN KUMAR
Board of Studies Chairman

Dt:

To
The Registrar
Andhra University
Visakhapatnam.

(Through Proper Channel)

Sir

Sub: - Scheme, Syllabus of 3rd Year 4th Year B.Tech – 1st & 2nd Semester (2022-2023 Admitted batch) - Reg

With reference to above, I am herewith submitting the Scheme, Syllabus of 3rd Year B.Tech 1st & 2nd Semester (Naval Architecture and Marine Engineering) for the 2022-2023 admitted batch.

Thanking you sir,

Yours Sincerely,

Board of Studies Chairman