

Course Outcomes (COs)

Department of Marine Engineering

Programme Name :B.E.-Marine Engineering

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2022 Scheme (UG)

Course Outcome for Marine Engineering

Course Outcomes of Second -Year Courses

Course Name	BASIC SHIP KNOWLEDGE AND WATCH KEEPING
Course Code	BMR301
Course outcomes (COs): At the end of the course the student will be able to:	
BMR301.1	Define parts of a ship, types of vessels and watch keeping routines.
BMR301.2	Classify ship structures, vessel types, ranks; voyages and emergencies.
BMR301.3	Explain deck and engine room arrangements, ship operations, manning, COC and emergencies.
BMR301.4	Identify ship layouts, vessel types; requirements of competence and apply principles of seamanship to specific emergency scenarios.

Course Name	MANUFACTURING PROCESSES (IPCC)
Course Code	BMR302
Course outcomes (COs): At the end of the course the student will be able to:	
BMR302.1	Understand the concepts of metal casting, forming, welding and metal cutting
BMR302.2	Assess, compare and select appropriate manufacturing Processes.
BMR302.3	Apply principles of casting, forming, welding, and metal cutting to specific applications.
BMR302.4	Adapt the principles of manufacturing Processes to develop the mechanical components.

Course Name	MATERIAL SCIENCE
Course Code	BMR303
Course outcomes (COs): At the end of the course the student will be able to:	
BMR303.1	Understand behaviour of various materials with respect to crystal structure, mechanical behaviour, phase transformation and corrosion.
BMR303.2	Identify suitable materials for specific engineering applications.
BMR303.3	Investigate mechanical properties and microstructures of different materials.
BMR303.4	Analyze materials crystal structure, mechanical behaviour, phase transformation and corrosion, composition and their phase transformation.

Course Name	THERMODYNAMICS
Course Code	BMR304
Course outcomes (COs): At the end of the course the student will be able to:	
BMR304.1	Describe the fundamental concepts and principles of engineering thermodynamics.
BMR304.2	Understand the thermodynamic relations for different engineering applications.
BMR304.4	Apply the governing laws of thermodynamics for different engineering applications.
BMR304.5	Analyse the various thermodynamic processes, cycles and results.

Course Name	INTRODUCTION TO MODELLING AND DESIGN FOR MANUFACTURING
Course Code	BMEL305
Course outcomes (COs): At the end of the course the student will be able to:	
BMEL305.1	Demonstrate their visualization skills.
BMEL305.2	Apply limits and tolerances to assemblies and choose appropriate fits for given assemblies.
BMEL305.3	Produce the assembly drawings using part drawings.
BMEL305.4	Engage in lifelong learning using sketching and drawing as a communication tool.

Course Name	MECHANICS OF MATERIALS
Course Code	BMR401
Course outcomes (COs): At the end of the course the student will be able to:	
BMR401.1	Understand the concept of stress and strain in structural problems.
BMR401.2	Apply the concept of different elastic functions, stress and strain to solve structural problems.
BMR401.3	Analyze the influence of various geometric and loading parameters in axial, bending, shear and torsion.
BMR401.4	Analyze the concept of solid mechanics in designing structural members.

Course Name	MARINE ELECTRICAL TECHNOLOGY (IPCC)
Course Code	BMR402
Course outcomes (COs): At the end of the course the student will be able to:	
BMR402.1	Describe Ships electrical systems, power distribution systems, motor construction, protection, lighting and battery services.
BMR402.2	Explain AC and DC generator systems, protection and circuit breakers, fire protection on electrical systems, working of communication systems, various testing equipment.
BMR402.3	Examine and compare electrical generation systems, distribution systems, motor protection, lighting , battery systems, safety and insulation.
BMR402.4	Evaluate the performance of electrical machines and systems.

Course Name	FLUID MECHANICS & MACHINERY (IPCC)
Course Code	BMR403
Course outcomes (COs): At the end of the course the student will be able to:	
BMR403.1	Describe the fundamental concepts and principles of fluid mechanics and machinery.
BMR403.2	Understand the fluid dynamics relations for different engineering applications.
BMR403.3	Apply the governing laws of fluid mechanics for different engineering applications.
BMR403.4	Analyse the various fluid flow processes and turbomachines.

Course Name	MECHANICAL MEASUREMENTS & METROLOGY LABORATORY
Course Code	BMR404
Course outcomes (COs): At the end of the course the student will be able to:	
BMR404.1	Explain the Basic principles that govern the working of the measuring instruments.
BMR404.2	Demonstrate proficiency in applying principles of Mechanical Measurements & Metrology in laboratory settings.
BMR404.3	Utilize experimental techniques to demonstrate advanced proficiency in applying theoretical concepts to practical scenarios.
BMR404.4	Analyse and examine measurement precision and accuracy in the Mechanical Measurements & Metrology laboratory, drawing meaningful conclusions about their reliability.

2021 Scheme(UG)

Course Outcomes of Second-Year Courses

Course Name	Transform Calculus, Fourier Series and Numerical Techniques
Course Code	21MAT31
Course outcomes (COs): At the end of the course the student will be able to:	
21MAT31.1	Illustrate the concepts of– Laplace, Fourier & Z transformation, Fourier series , Numerical solutions of PDE & ODE and Calculus of variation .
21MAT31.2	Apply the above acquired knowledge to solve the problems in engineering.
21MAT31.3	Analyze the solutions of the real world problems using above techniques.
21MAT31.4	Interpret the overall knowledge gained to demonstrate the problems arising in practical situations.

Course Name	Manufacturing processes
Course Code	21MR32
Course outcomes (COs): At the end of the course the student will be able to:	
21MR32.1	Understand the concepts of metal casting, forming, welding and metal cutting.
21MR32.2	Assess, compare and select appropriate manufacturing processes.
21MR32.3	Apply principles of casting, forming and metal cutting to specific applications.
21MR32.4	Adapt the principles of manufacturing processes to develop the mechanical components.

Course Name	Material Science
Course Code	21MR33
Course outcomes (COs): At the end of the course the student will be able to:	
21MR33.1	Understand behaviour of various materials with respect to crystal structure, mechanical behaviour, phase transformation and corrosion .
21MR33.2	Identify suitable materials for specific engineering application
21MR33.3	Investigate mechanical properties and microstructures of different materials
21MR33.4	Analyze materials, composition and their phase transformation .

Course Name	Thermodynamics
Course Code	21MR34
Course outcomes (COs): At the end of the course the student will be able to:	
21MR34.1	Describe the fundamental concepts and principles of engineering thermodynamics.
21MR34.2	Understand the thermodynamic relations for different engineering applications.
21MR34.3	Apply the governing laws of thermodynamics for different engineering applications.
21MR34.4	Analyse the various thermodynamic processes, cycles and results.

Course Name	Machine Drawing and GD & T
Course Code	21MRL35
Course outcomes (COs): At the end of the course the student will be able to:	
21MRL35.1	Interpret the Machining and surface finish symbols on the component drawings.
21MRL35.2	Apply limits and tolerances to assemblies and choose appropriate fits for given assemblies.
21MRL35.3	Illustrate various machine components through drawings
21MRL35.4	Create assembly drawings as per the conventions.

Course Name	Complex Analysis, Probability and Linear Programming
Course Code	21MATME41
Course outcomes (COs): At the end of the course the student will be able to:	
21MATME41.1	Illustrate the concepts of– Complex functions, transformation, Probability distributions and Optimization techniques
21MATME41.2	Apply the above acquired knowledge to solve the problems in mechanical and allied branches of engineering.
21MATME41.3	Analyze the solutions of the real world problems using above techniques.
21MATME41.4	Interpret the overall knowledge gained to demonstrate the problems arising in practical situations.

Course Name	MARINE ELECTRICAL TECHNOLOGY
Course Code	21MR42
Course outcomes (COs): At the end of the course the student will be able to:	
21MR42.1	Describe Ships electrical systems, power distribution systems, motor construction, protection, lighting and battery services
21MR42.2	Explain AC and DC generator systems, protection and circuit breakers, fire protection on electrical systems, working of communication systems, various testing equipment.
21MR42.3	Examine and compare electrical generation systems, distribution systems, motor protection, lighting, battery systems, safety and insulation.
21MR42.4	Evaluate the performance of electrical machines and systems

Course Name	FLUID MECHANICS AND MACHINERY
Course Code	21MR43
Course outcomes (COs): At the end of the course the student will be able to:	
21MR43.1	Describe the fundamental concepts and principles of fluid mechanics and machinery.
21MR43.2	Understand the fluid dynamics relations for different engineering applications.
21MR43.3	Apply the governing laws of fluid mechanics for different engineering applications.
21MR43.4	Analyze the various fluid flow processes and turbo machines.

Course Name	BASIC SHIP KNOWLEDGE AND WATCH KEEPING
Course Code	21MR44
Course outcomes (COs): At the end of the course the student will be able to:	
21MR44.1	Define parts of a ship, types of vessels and watch keeping routines
21MR44.2	Classify ship structures, vessel types, ranks; voyages and emergencies
21MR44.3	Explain deck and engine room arrangements, ship operations, manning, COC and emergencies
21MR44.4	Identify ship layouts, vessel types; requirements of competence and apply principles of seamanship to specific emergency scenarios.

Course Name	MECHANICAL MEASUREMENTS & METROLOGY LABORATORY
Course Code	21MRL46
Course outcomes (COs): At the end of the course the student will be able to:	
21MRL46.1	Calibrate measuring instruments
21MRL46.2	Measure linear, angular dimensions and thread & gear tooth parameters using measuring instruments
21MRL46.3	Measure force, pressure, temperature and strain using indirect measuring methods
21MRL46.4	Analyze and examine measurement precision and accuracy in the Mechanical Measurements & Metrology laboratory, drawing meaningful conclusions about their reliability.

Course Outcomes of Third -Year Courses

Course Name	THEORY OF MACHINE
Course Code	21MR51
Course outcomes (COs): At the end of the course the student will be able to:	
21MR51.1	identify and enumerate different link based mechanisms with basic understanding of motion , Understand types of vibration, SHM and methods of finding natural frequencies of simple mechanical systems
21MR51.2	Understand the causes and effects of vibration in mechanical systems.
21MR51.3	Develop schematic models for physical systems and formulate governing equations of motion and vibrations.
21MR51.4	Analyse the mathematical models and to determine its response of real life engineering systems

Course Name	MARINE IC ENGINES AND PROPULSION SYSTEM (IPCC)
Course Code	21MR52
Course outcomes (COs): At the end of the course the student will be able to:	
21MR52.1	List basic cycles, Main engine parts, systems associated with Main engine and propulsion systems
21MR52.2	Explain timing diagrams, working of main engine components, fuel and Lube oil systems, control systems and propulsion systems.
21MR52.3	Select types of engines, components, piston rings and types of propulsion based on usage.
21MR52.4	Evaluate the performance of I C engines , components, systems and maneuvering propulsion systems.

Course Name	MECHANICS OF MATERIALS
Course Code	21MR53
Course outcomes (COs): At the end of the course the student will be able to:	
21MR53.1	Understand the concept of stress and strain in structural problems.
21MR53.2	Apply the concept of different elastic functions, stress and strain to solve structural problems.
21MR53.3	Analyse the influence of various geometric and loading parameters in axial, bending, shear and torsion.
21MR53.4	Analyse concept of solid mechanics in designing structural members.

Course Name	SHIP STRUCTURE AND CONSTRUCTION
Course Code	21MR54
Course outcomes (COs): At the end of the course the student will be able to:	
21MR54.1	Locate and define frames, bulkheads, loadline, deep tanks, anti-fouling systems.
21MR54.2	Classify and compare fore and aft end arrangements, plating systems, ship yard layouts, ship types wrt construction and materials.
21MR54.3	Explain stresses in ships: explain rudder construction, watertight bulkheads, watertight doors, sea trails, surface preparation of hulls.
21MR54.4	Apply the principles of Materials science and hydrostatics to study effects of stress on ship structures, fore and aft ends, midship sections , calculation of freeboard, offshore platforms.

Course Name	DESIGN LABORATORY
Course Code	21MRL55
Course outcomes (COs): At the end of the course the student will be able to:	
21MRL55.1	Compute the natural frequency of the free and forced vibration of single degree freedom systems, critical speed of shafts.
21MRL55.2	Carry out balancing of rotating masses and gyroscope phenomenon and analyse the governor characteristics.
21MRL55.3	Determine stresses in disk, beams and plates using photo elastic bench and determination of Pressure distribution in Journal bearing
21MRL55.4	Realize different mechanisms and cam motions

Course Outcomes of Third -Year Courses

Course Name	SHIP OPERATIONS AND MANAGEMENT
Course Code	21MR61
Course outcomes (COs): At the end of the course the student will be able to:	
21MR61.1	Describe the agents and agencies, conference systems, marine insurance, shipping act, shipping companies, Marine law
21MR61.2	Classify marine vehicles, charter parties, types of marine insurance, ships papers, types of shipping companies, marine disputes.
21MR61.3	Explain cargo handling, freight rates, P and I clubs, port procedures, manning of ships, marine arbitration
21MR61.4	Illustrate - damage to cargo, rate fixation, loss adjusting principles, duties during emergencies, voyage planning, admiralty law.

Course Name	MARINE THERMAL ENGINEERING (IPCC)
Course Code	21MR62
Course outcomes (COs): At the end of the course the student will be able to:	
21MR62.1	Explain the basic modes of heat transfer.
21MR62.2	Apply the laws of heat transfer for engineering problems.
21MR62.3	Solve thermal problems using correlations and charts/tables.
21MR62.4	Analyze various thermal systems by applying fundamental laws.

Course Name	NAVAL ARCHITECTURE
Course Code	21MR63
Course outcomes (COs): At the end of the course the student will be able to:	
21MR63.1	Define and explain various terms related to geometry of ship, hydrostatics, and stability of ship, propellers and rudders
21MR63.2	Apply the principle of hydrostatics, numerical integration (simpson's rule), forces on rudder and various conditions of stability of ships
21MR63.3	Analyse the stability of ships using the principle of hydrostatics
21MR63.4	Examine the conditions for stability of ships in real world scenarios.

Course Name	ANALYSIS AND SIMULATION LABORATORY
Course Code	21MRL66
Course outcomes (COs): At the end of the course the student will be able to:	
21MRL66.1	Use the modern tools to formulate the problem, create geometry, discretize, apply boundary conditions to solve problems of bars, truss, beams, and plate to find stresses with different-loading conditions.
21MRL66.2	Simulate the manufacturing processes and vibration related problems.
21MRL66.3	Create components through additive manufacturing technique.
21MRL66.4	Analyze the structural and thermal systems for its sustainability

Course Outcomes of Fourth -Year Courses

Course Name	MARINE AUXILIARY MACHINERY & SYSTEMS
Course Code	21MR71
Course outcomes (COs): At the end of the course the student will be able to:	
21MR71.1	Locate and define various types of auxiliary machines, systems : piping systems, seals, valves, heat exchangers, pumps ,steering, SOPEP equipment and boiler systems.
21MR71.2	Classify and compare various fuel, lubricating and cooling systems, pumps, heat exchangers, boilers , cranes.
21MR71.3	Explain working of various piping systems in ER, pumps, heat exchangers, steering systems, seals, boilers in ER, capstan.
21MR71.4	Apply the principles of Materials science , fluid dynamics and heat transfer to select and operate piping systems, valves, pumps, steering systems, boilers, deck machinery.

Course Name	ENGINE ROOM MAINTENANCE
Course Code	21MR72
Course outcomes (COs): At the end of the course the student will be able to:	
21MR72.1	Identify and define maintenance practices, problems arising in main engine, aux engine, engine components and dry docking.
21MR72.2	Describe different procedures, troubles in main engine, auxiliary systems, components, dry docking of ships.
21MR72.3	Explain actions to be taken during spare management, during trouble shooting of main engine, Aux machines, and dry docking of tankers.
21MR72.4	Identify and interpret alarms, faults during maintenance, failure of Main Engine, Aux Machines, when fixing propellers in drydock.

Course Name	Project work
Course Code	21MR76
Course outcomes (COs): At the end of the course the student will be able to:	
21MR76.1	Apply knowledge of mathematics, science and engineering to solve Marine engineering domain problems. .
21MR76.2	Design, develop, present and document innovative/multidisciplinary modules for a complete engineering system
21MR76.3	Utilize modern engineering tools, software and equipment to solve problem and engage in life-long learning to follow technological developments
21MR76.4	Function effectively as an individual, or leader in diverse teams, with the understanding of professional ethics and responsibilities.

2018 Scheme(UG)

Course Outcomes of Second-Year Courses

Course Name	Transform Calculus, Fourier Series & Numerical Techniques
Course Code	18MAT31
Course outcomes (COs): At the end of the course the student will be able to:	
18MAT31.1	Illustrate the concepts of– Laplace, Fourier & Z transformation, Fourier series, Numerical solutions of ODE and Calculus of variation .
18MAT31.2	Apply the above acquired knowledge to solve the problems in engineering.
18MAT31.3	Analyze the solutions of the real world problems using above techniques.
18MAT31.4	Interpret the overall knowledge gained to demonstrate the problems arising in practical situations.

Course Name	MATERIAL SCIENCE
Course Code	18MR32
Course outcomes (COs): At the end of the course the student will be able to:	
18MR32.1	Explain the mechanical behavior of different Engineering Materials.
18MR32.2	Identify different phases in the phase diagrams, TTT, CCT curves and classify different Heat treatment processes.
18MR32.3	Identify different materials composition, properties and applications.
18MR32.4	Recommend engineering materials for suitable applications.

Course Name	BASIC THERMODYNAMICS
Course Code	18MR33
Course outcomes (COs): At the end of the course the student will be able to:	
18MR33.1	Understand the definitions and laws of thermodynamics as applicable to matters.
18MR33.2	Apply the knowledge of thermodynamic laws for the energy transfer, entropy to solve numerical problems.
18MR33.3	Apply the knowledge of laws of thermodynamics to the pure substances and ideal /real gasses.
18MR33.4	Analyse the thermodynamic systems using thermodynamic laws for the solution of complex thermal problems.

Course Name	MECHANICS OF MATERIALS
Course Code	18MR34
Course outcomes (COs): At the end of the course the student will be able to:	
18MR34.1	Understand simple, compound, thermal stresses, their relations ,strain and deformations
18MR34.2	Apply the knowledge of stresses, strains and deformations for structural members
18MR34.3	Apply the knowledge of stresses and strains for components subjected to bending and shear loads
18MR34.4	Analyze the shafts subjected to twisting loads and Compare different columns

Course Name	ELEMENTARY NAVIGATION, SEAMANSHIP AND SURVIVAL AT SEA
Course Code	18MR35
Course outcomes (COs): At the end of the course the student will be able to:	
18MR35.1	Define and explain the terms and laws related to merchant ships, navigation, and seamanship
18MR35.2	Apply the principles of seamanship and navigation to specific shipboard scenarios
18MR35.3	Analyze the procedures for safe navigation and seamanship in emergency scenarios.
18MR35.4	Determine and justify the actions to be taken in case of emergencies on board merchant ships.

Course Name	MECHANICAL MEASUREMENTS AND METROLOGY
Course Code	18MR36
Course outcomes (COs): At the end of the course the student will be able to:	
18MR36.1	Understand the concepts of metrology and measurement.
18MR36.2	Understand the working and usage of measuring instruments.
18MR36.3	Apply the concepts of gauge design and application.
18MR36.4	Analyze the process of measurements in gears and screw threads.

Course Name	MATERIAL TESTING LAB
Course Code	18MRL37
Course outcomes (COs): At the end of the course the student will be able to:	
18MRL37.1	Acquire experimentation skills in the field of material testing.
18MRL37.2	Develop theoretical understanding of the mechanical properties of materials by performing experiments.
18MRL37.3	Apply the knowledge of testing methods in related areas.
18MRL37.4	Analyze material failure and determine the failure inducing agent/s.

Course Name	MECHANICAL MEASUREMENTS AND METROLOGY LAB
Course Code	18MRL38
Course outcomes (COs): At the end of the course the student will be able to:	
18MRL38.1	Understand Calibration of pressure gauge, thermocouple, LVDT, load cell, micrometer.
18MRL38.2	Apply concepts of Measurement of angle using Sine Centre/ Sine Bar/ Bevel Protractor, alignment using Autocollimator/ Roller set.
18MRL38.3	Demonstrate measurements using Optical Projector/Tool maker microscope, Optical flats, surface roughness.
18MRL38.4	Analyze tool forces using Lathe/Drill tool dynamometer and Screw thread parameters using 2-Wire or 3-Wire method, gear tooth profile using gear tooth Vernier/Gear tooth micrometer

Course Name	Complex Analysis, Probability And Statistical Methods
Course Code	18MAT41
Course outcomes (COs): At the end of the course the student will be able to:	
18MAT41.1	Illustrate the concepts of– complex functions, transformation, Probability distributions and Statistical methods.
18MAT41.2	Apply the above acquired knowledge to solve the problems in engineering.
18MAT41.3	Analyze the solutions of the real world problems using above techniques.
18MAT41.4	Interpret the overall knowledge gained to demonstrate the problems arising in practical situations.

Course Name	THEORY OF MACHINES
Course Code	18MR42
Course outcomes (COs): At the end of the course the student will be able to:	
18MR42.1	Identify and enumerate different link based mechanisms with basic understanding of motion.
18MR42.2	Understand and illustrate various power transmission mechanisms using suitable methods.
18MR42.3	Apply the various mechanisms for engineering problems using suitable methods.
18MR42.4	Design and evaluate the performance of different motion of mechanical components.

Course Name	APPLIED THERMODYNAMICS
Course Code	18MR43
Course outcomes (COs): At the end of the course the student will be able to:	
18MR43.1	Explain thermodynamic cycles/ relations for thermal engineering applications to find work and efficiency/performance.
18MR43.2	Apply the laws of thermodynamics to determine the performance parameters of thermal engineering applications
18MR43.3	Solve thermal engineering problems using thermodynamic relations and charts
18MR43.4	Analyse modifications of basic thermodynamic cycles for optimizing work and Increasing efficiency/ performance of thermal engineering applications

Course Name	SHIP STRUCTURE AND CONSTRUCTION
Course Code	18MR44
Course outcomes (COs): At the end of the course the student will be able to:	
18MR44.1	Define the basic principles that govern Ship construction and its building
18MR44.2	Describe the Various framing systems that are used in ship construction and classify and explain various ship designs.
18MR44.3	Demonstrate an understanding of ship construction with the help of detailed sketch of the ships cross sectional diagrams
18MR44.4	Analyze how stress affect ships and the constructional features that mitigate them, Ship building process in shipyards.

Course Name	MARINE HEAT ENGINE AND AIR CONDITIONING
Course Code	18MR45
Course outcomes (COs): At the end of the course the student will be able to:	
18MR45.1	Summarize the basic concepts of refrigeration cycle, and the concepts of thermodynamic process.
18MR45.2	Explain the theoretical aspects of marine heat engine and air conditioning systems.
18MR45.3	Apply design concepts of reciprocating compressor, marine refrigeration plants, air conditioning system, and heat exchangers.
18MR45.4	Inspect technical problems related to marine heat engine and air conditioning system

Course Name	FLUID MECHANICS
Course Code	18MR46
Course outcomes (COs): At the end of the course the student will be able to:	
18MR46.1	Describe the fundamental concepts and principles of fluid mechanics and machinery.
18MR46.2	Understand the fluid dynamics relations for different engineering applications.
18MR46.3	Apply the governing laws of fluid mechanics for different engineering applications.
18MR46.4	Analyze the various fluid flow processes.

Course Name	MACHINE SHOP AND FOUNDRY LAB
Course Code	18MRL47
Course outcomes (COs): At the end of the course the student will be able to:	
18MRL47.1	Utilize various tools in the foundry and machining process.
18MRL47.2	Demonstrate various skills in preparation of molding.
18MRL47.3	Apply the principles of turning ,milling ,shaping and hand tools and develop mechanical components

Course Name	COMPUTER AIDED MARINE ENGINEERING DRAWING
Course Code	18MRL48
Course outcomes (COs): At the end of the course the student will be able to:	
18MRL48.1	Demonstrate their visualization skills.
18MRL48.2	Apply limits and tolerances to assemblies and choose appropriate fits for given assemblies. Make component drawings.
18MRL48.3	Produce the assembly drawings using part drawings.
18MRL48.4	Engage in lifelong learning using sketching and drawing as communication tool.

Third-Year Courses

Course Name	MANAGEMENT AND ECONOMICS
Course Code	18MR51
Course outcomes (COs): At the end of the course the student will be able to:	
18MR51.1	Explain the concept in management and apply the same in an organization.
18MR51.2	Compare the functional concepts and interest rates pertaining to personal loans, EMI payment and taxation.
18MR51.3	Apply the knowledge of engineering economics to evaluate the present, future annual worth and also rate of return of assets to select the best economic model.
18MR51.4	Apply the principles of costing and depreciation to estimate selling price and depreciation of commodities.

Course Name	NAVAL ARCHITECTURE
Course Code	18MR52
Course outcomes (COs): At the end of the course the student will be able to:	
18MR52.1	Define and explain various terms related to geometry of ship, hydrostatics, and stability of ship, propellers and rudders.
18MR52.2	Understand the principle of hydrostatics, numerical integration (Simpson's rule), forces on rudder and various conditions of stability of ships.
18MR52.3	Apply the principles of hydrostatics and conditions of stability to determine the design factors of ship.
18MR52.4	Analyze the stability of ships using the principle of hydrostatics.

Course Name	MARINE INTERNAL COMBUSTION ENGINE- I
Course Code	18MR53
Course outcomes (COs): At the end of the course the student will be able to:	
18MR53.1	Classify the Various types of forces and stresses acting on Marine Diesel Engines, development in modern engines.
18MR53.2	Explain the construction and operations of Starting and reversing systems of different Marine Diesel Engines, Constructional details.
18MR53.3	Understand the principle of lubricating systems and Troubleshooting in Diesel Engines and Actions in Emergency situations.
18MR53.4	Apply the processes related to Maneuvering system and associated with Automation in Modern Diesel Engine.

Course Name	MARINE AUXILIARY MACHINES
Course Code	18MR54
Course outcomes (COs): At the end of the course the student will be able to:	
18MR54.1	Identify the main components and systems essential for ship operation, including auxiliary equipment, engine room layout, pipelines, pump fittings, and steering systems.
18MR54.2	Classify the critical parts of auxiliary equipment, engine room layouts, pipeline systems, and ship fittings.
18MR54.3	Interpret the principles of pumps, pumping systems, and steering systems' working, testing, and maintenance.
18MR54.4	Apply maintenance processes to ensure safe and efficient vessel operations concerning auxiliary equipment and safety systems.

Course Name	TURBOMACHINES
Course Code	18MR55
Course outcomes (COs): At the end of the course the student will be able to:	
18MR55.1	Explain various types of turbo machines and related performance factors
18MR55.2	Determine the velocity triangles for different turbo machineries and to apply the affinity laws to pumps and turbines
18MR55.3	Explain the working principles of turbomachines and apply it to various types of machines.
18MR55.4	Analyse the turbo machines through graphical and analytical methods and determine its performance parameters.

Course Name	MARINE BOILERS
Course Code	18MR56
Course outcomes (COs): At the end of the course the student will be able to:	
18MR56.1	Define the terms related to Marine boilers, mountings and ancillaries, water treatment, operation of the boiler, and understand the various processes.
18MR56.2	Explain the functions and types of boiler ancillaries, mountings, boiler water tests, and treatments.
18MR56.3	Apply the principles of boiler construction, operation and treatment to specific applications.
18MR56.4	Analyse the processes in boiler operations, maintenance and treatment.

Course Name	MARINE ENGINE LAB
Course Code	18MRL57
Course outcomes (COs): At the end of the course the student will be able to:	
18MRL57.1	Determine key properties of lubricating oils and various fuels.
18MRL57.2	Measure the valve timing and port opening of both 4-stroke and 2-stroke I.C. engines and analyse their operational cycles.
18MRL57.3	Analyze the performance characteristics of I C engines.
18MRL57.4	Evaluate performance metrics across different I.C. engine types.

Course Name	FLUID MECHANICS AND MACHINES LAB
Course Code	18MRL58
Course outcomes (COs): At the end of the course the student will be able to:	
18MRL58.1	Evaluate the factors affecting flow in pipes, including friction and minor losses.
18MRL58.2	Calibrate various flow measuring devices such as orifice plates, nozzles, venturimeters, and V-notches.
18MRL58.3	Assess the performance characteristics of different hydraulic turbines and pumps.
18MRL58.4	Analyze the efficiency and operational parameters of air compressors and blowers.

Course Name	HEAT TRANSFER
Course Code	18MR61
Course outcomes (COs): At the end of the course the student will be able to:	
18MR61.1	Explain the basic modes of heat transfer and its associated laws
18MR61.2	Apply the laws of heat transfer for conduction , convection , radiation related engineering problems
18MR61.3	solve heat transfer problem using correlations
18MR61.4	Analyze various heat transfer systems by using fundamental laws

Course Name	MARINE INTERNAL COMBUSTION ENGINE-II
Course Code	18MR62
Course outcomes (COs): At the end of the course the student will be able to:	
18MR62.1	Classify the Various types of forces and stresses acting on Marine Diesel Engines.
18MR62.2	Explain the construction and operations of Starting and reversing system of different Marine Diesel Engines
18MR62.3	Apply the processes related to Maneuvering system and associated with Automation in Modern Diesel Engine.
18MR62.4	Analyse the working of lubricating systems, troubleshooting Diesel Engines and Actions to be taken in Emergency situation.

Course Name	MARINE ELECTRICAL TECHNOLOGY
Course Code	18MR63
Course outcomes (COs): At the end of the course the student will be able to:	
18MR63.1	Understand marine electrical systems, including generators, power distribution, and safety precautions in the marine environment.
18MR63.2	Apply regulations and safety measures for electrical equipment in hazardous areas, while comprehending different AC distribution systems and emergency power supplies on vessels.
18MR63.3	Analyze instrumentation, protection devices, and paralleling techniques for alternators, while identifying circuit faults and protection methods for electrical components.
18MR63.4	Evaluate various propulsion systems, troubleshoot engine room emergencies, and analyze steering systems and motor starting procedures for marine electrical machines

Course Name	HEAT TRANSFER LAB
Course Code	18MRL66
Course outcomes (COs): At the end of the course the student will be able to:	
18MR66.1	Determine the thermal properties of materials, including conductivity, emissivity, and overall heat transfer coefficients.
18MR66.2	Analyze the performance and behavior of different heat transfer mechanisms, including conduction, convection (both free and forced), and radiation.
18MR66.3	Analyze the performance characteristics of heat exchangers , Refrigeration and AC systems , encompassing parallel flow, counter flow, and transient conduction scenarios.
18MR66.4	Analyze the performance of parallel flow, counter flow, and transient conduction scenarios.

Course Name	MARINE ELECTRICAL LAB
Course Code	18MRL67
Course outcomes (COs): At the end of the course the student will be able to:	
18MRL67.1	Determine the load characteristics of various dc motors and generators.
18MRL67.2	Analyze the load characteristics of D.C. shunt and compound generators, focusing on their configurations such as short shunt and long shunt.
18MRL67.3	Assess motor control techniques, exploring methods such as electrical braking, armature voltage control, flux control, and the Ward Leonard method.
18MRL67.4	Conduct foundational tests, like Swinburne's, Hopkinson's, and Fields, to understand motor dynamics and properties.

Fourth-Year Courses

Course Name	MECHANICAL VIBRATION
Course Code	18MR71
Course outcomes (COs): At the end of the course the student will be able to:	
18MR71.1	Describe the fundamentals of sound, noise, vibration, and their control strategies in mechanical systems.
18MR71.2	Apply principles to derive equations of motion for undamped, damped, and forced vibrations in various mechanical systems.
18MR71.3	Analyze and solve vibration problems, considering un damped, damped, and forced vibrations in single and multi-degree-of-freedom systems. Evaluate frequency response, phase angles, and vibration isolation.
18MR71.4	Analyze advanced techniques to assess dynamic behavior, including numerical methods, modal analysis, and condition monitoring

Course Name	18MR72
Course Code	ADVANCED MARINE AUXILIARY MACHINES
Course outcomes (COs): At the end of the course the student will be able to:	
18MR72.1	Understand MARPOL regulations and the operation of associated equipment such as oil water separators, incinerators, and sewage plants.
18MR72.2	Apply knowledge about marine fuels, lubricants, their properties, and practical aspects of ship maintenance, repair, noise control, and vibration management.
18MR72.3	Analyze the functioning of oil purifiers, air compressors, and deck machinery, and delve into the theory behind oil purification and air compression.
18MR72.4	Evaluate marine refrigeration and air-conditioning systems, emphasizing their operation, troubleshooting, and ventilation mechanisms.

Course Name	VIBRATION LAB
Course Code	18MRL76
Course outcomes (COs): At the end of the course the student will be able to:	
18MR76.1	Demonstrate the need and importance of vibration analysis in mechanical design of machine parts that operate in vibratory conditions.
18MR76.2	Determine vibratory responses of SDOF and MDOF systems to harmonic, periodic and no periodic excitation
18MR76.3	Analyze frequency and time response of vibratory systems.
18MR76.4	Analyze the mathematical model of a linear vibratory system and real life engineering systems to determine its response

Course Name	SIMULATION LAB
Course Code	18MRL77
Course outcomes (COs): At the end of the course the student will be able to:	
18MR77.1	Apply knowledge in CNC part programming using CAM packages, emphasizing the simulation of turning and milling operations.
18MR77.2	Investigate and simulate physical phenomena such as the fall of a sphere in a viscous medium and the frequency response of a spring-mass system.
18MR77.3	Analyze servo-mechanism feedback systems through simulations in both time and 's' domains.
18MR77.4	Analyze the simulations for specialized areas within the engineering field.

Course Name	Project Work Phase-I
Course Code	18MRP78
Course outcomes (COs): At the end of the course the student will be able to:	
18MR78.1	Apply marine engineering principles to address practical maritime challenges in industry or contribute to research advancements.
18MR78.2	Plan, assess and design marine engineering projects effectively, while communicating ideas clearly in both speech and writing.
18MR78.3	Master marine engineering concepts for leading medium sized projects in industry or proposing innovative research approaches.
18MR78.4	Execute comprehensive problem solving in marine engineering, including problem identification, solution design and implementation

Course Name	ENGINE ROOM MANAGEMENT
Course Code	18MR81
Course outcomes (COs): At the end of the course the student will be able to:	
18MR81.1	Identify and define maintenance practices, problems arising in main engine, aux engine, engine components and dry docking.
18MR81.2	Describe different procedures, troubles in main engine, auxiliary systems, components, dry docking of ships.
18MR81.3	Explain actions to be taken during spare management, during trouble shooting of main engine, Aux machines, and dry docking of tankers.

18MR81.4	Analyze the procedures for safe watch keeping during engine room emergencies, troubleshooting of aux machines, main engine, replacement of engine components, electrical machines
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Course Name	PROJECT WORK PHASE – II
Course Code	18MRP83
Course outcomes (COs): At the end of the course the student will be able to:	
18CMR82.1	Apply marine engineering principles to address practical maritime challenges in industry or contribute to research advancements.
18CMR82.2	Plan, assess and design marine engineering projects effectively, while communicating ideas clearly in both speech and writing.
18CMR82.3	Master marine engineering concepts for leading medium sized projects in industry or proposing innovative research approaches.
18CMR82.4	Execute comprehensive problem solving in marine engineering, including problem identification, solution design and implementation