

ENGINE ROOM MAINTENANCE (IPCC)		Semester	7
Course Code	BMR701	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	Theory		
<p>Course objectives:</p> <ul style="list-style-type: none"> • A knowledge of Watch-keeping of Engine Room in various types of ships and to prepare for Class IV MOT Examinations. • A knowledge of safe watch keeping practices in the engine room. • A knowledge of troubleshooting auxiliary machinery and its components. • A knowledge of troubleshooting of the main engine and its components. 			
<p>Teaching-Learning Process (General Instructions)</p> <p>These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations. 2. Chalk and Talk method for Problem Solving. 3. Adopt flipped classroom teaching method. 4. Adopt collaborative (Group Learning) learning in the class. 5. Adopt Problem Based Learning (PBL), which fosters students' analytical skills and develops thinking skills such as Evaluating, generalizing, and analyzing information. 6. Conduct Laboratory Demonstrations and Practical Experiments to enhance experiential skills. 			
MODULE-1			
<p>MAINTENANCE BASICS :</p> <p>Definition, Types of maintenance, Differences between inspection overhaul and repair, Risk assessment and checklists , Types of checklists on a ship, Permit to work system, Hot work precautions, PMS systems on board ships with examples, Stores and spares management on ships, Ordering of Stores and spares, Critical spares to be carried as per classification society for ER machinery, Differences between plant maintenance on shore and on ships, Non Conformities, Documents to be kept with respect to maintenance, externally generated documents, internally generated records, Identification and testing of critical equipment. Safe working Practices</p>			
MODULE-2			
<p>TROUBLESHOOTING OF MARINE DIESEL ENGINES: (Main engine and Gen diesel engine)</p> <p>Troubleshooting related to various types of marine diesel engines – Alarms. causes, effects, remedies and prevention of diesel engine not turning on Air and Fuel, knocking at TDC and BDC, black smoke in funnel, poor compression and combustion, early or advanced injection, turbocharger surging, scavenge fire, Air starting line explosion, crankcase explosion, exhaust uptake fire, Bearing failure, Sump contamination and Under size crank pin bearing in Generator Diesel engine</p>			
MODULE-3			
<p>Troubleshooting of Auxiliaries -</p> <p>Alarms, Causes, effects, remedy and prevention in auxiliary machinery like : Boilers, Purifiers, Heat exchangers, Air compressors, Cold chamber refrigeration system, AC compressor and AC system, Fresh water generators, Hydrophore, Centrifugal pump, Reciprocating Pump and Oil pump</p>			
MODULE-4			
<p>MAINTENANCE OF ENGINE COMPONENTS:</p> <p>Checking of foundation bolts, Checking of crankshaft deflection. Checking tie rods tension, Inspection of crankcase (checking of all clearances) and camshaft, Dismantle inspection and reassemble of main bearings, cross head bearings & bottom end bearings, Dismantle, overhaul and assembly of Cylinder cover and its mountings, piston, piston rings and piston assembly, stuffing box, Cylinder liner and cylinder lubrication, Thrust bearing, running gears inspection, chains drive inspection and tensioning.</p>			
MODULE-5			

DRY DOCKING:

Dry dock Planning, Dry dock works. Dry docks types. Vessel (particularly tanker) readiness for dry dock. Docking, removal and mounting of propeller, Removal of aft seal. Removal of propeller shaft. Propeller drop, rudder drop and other clearances, Maintenance of propeller, rudder, sea chest and undocking procedure. Bottom plug, Engineer role in the dry dock.

PRACTICAL COMPONENT OF IPCC *(May cover all / major modules)*

Sl.NO	Experiments
1	Dismantling and reassembling of Globe Valves
2	Dismantling and reassembling of SDNR valves
3	Dismantling and reassembling of a Centrifugal pump
4	Dismantling and reassembling of a Positive Displacement pump
5	Gasket making for flanges
6	Dismantling and reassembling of a 4 stroke engine cylinder head - 1
7	Dismantling and reassembling of a 4 stroke engine cylinder head - 2

Course outcomes (Course Skill Set):

At the end of the course the student will be able to :

CO1: Identify and define maintenance practices, problems arising in main engine, aux engine, engine components and dry docking(L1)

CO2: describe different procedures, troubles in main engine, auxiliary systems, components, dry docking of ships (L2)

CO3: Explain actions to be taken during spare management, during trouble shooting of main engine, Aux machines, and dry docking of tankers.(L2)

CO4: Practically dismantle and reassemble Valves and Aux equipment.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks**).
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test (**duration 02/03 hours**) after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks**.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored by the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Books

1. A.S.Tambwekar, "Watch Keeping for Marine Engineers", Bhandarkar Publications; Third Edition, ASIN : B06XFPWF7, 2014
2. Vikram Gokhale & N.Nanda, "Marine Engineering Practice and Ship safety and Environmental protection", 3rd Edition, Engage Enterprises Mumbai, 2002.
3. Heinz P. Bloch, Fred K. Geitner, "Machinery Component Maintenance and Repair" 3rd Ed. An imprint of Elsevier, 2010.
4. Elstan.A. Fernandez, "Marine Electrical Technology", 4th Edition, "Sterling Book House", Mumbai, 2004.

Reference Books:

1. IME Manuals and Ships Marine Manuals.
2. Instructions for S70MC MAN B&W engines. Volume II. Maintenance. Edition 5, 2009
3. Daihatsu Diesel Engine instruction book, Operation & maintenance manual for Daihatsu Diesel Engine Model - DV26, Model 6 PKT - TB-16.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=5Fs_81baXnk&list=PLcMTKBdlRako6-eaeYMAMzxpBV9pFUhS
- <https://www.youtube.com/watch?v=noZAiPjcSBc>
- https://www.youtube.com/watch?v=3wU-FBaz_pM

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Activity Based Learning (Suggested Activities in Class)/ Practical Based learning
- Discussions on service letters by the manufacturers to the ships
- Visit to ship/shipping campus/service center to see the overhaul of the machinery
- Case studies on bad maintenance practices and their effect on machinery.

MARINE CONTROL SYSTEMS (IPCC)		Semester	7
Course Code	BMR702	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	Theory		
Course objectives:			
<ul style="list-style-type: none"> ● To understand the fundamental concepts of Control systems and mathematical modeling of the system. ● To analyze the basics of stability analysis of the system. ● To analyse system response using logarithmic plots and root locus. ● To understand the basics of automation ● To design hydraulic and pneumatic circuits for automation 			
Teaching-Learning Process (General Instructions)			
These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.			
<ol style="list-style-type: none"> 1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations. 2. Chalk and Talk method for Problem Solving. 3. Adopt flipped classroom teaching method. 4. Adopt collaborative (Group Learning) learning in the class. 5. Adopt Problem Based Learning (PBL), which fosters students' analytical skills and develops thinking skills such as Evaluating, generalizing, and analyzing information. 6. Conduct Laboratory Demonstrations and Practical Experiments to enhance experiential skills. 			
MODULE-1			(08 HOURS)
INTRODUCTION TO CONTROL SYSTEMS AND MATHEMATICAL MODELS			
Introduction: Control system, Basic structure of control system, open and closed loop control systems, concept of feedback, various terminologies used in control systems: Plant, Process, system, disturbances, controlled variable, manipulated variable, transfer function etc. Various classifications of control systems, Application areas with examples.			
MODULE-2			(08 HOURS)
Programmable Logic Controller: Introduction to PLCs, Basic structure of PLC, Principle of operation, input and output processing, PLC programming language, ladder diagram, ladder diagrams circuits, timer counters, internal relays, master control, jump control, shift registers, data handling, and manipulations, analogue input and output, selection of PLC for application.			
MODULE-3			(08 HOURS)
Microprocessor & Microcontrollers: Introduction, Microprocessor systems, Basic elements of control systems, Microcontrollers, Difference between Microprocessor and Microcontrollers. Microprocessor Architecture: Microprocessor architecture and terminology-CPU, memory and address, I/O and Peripheral devices, ALU, Instruction and Program, Assembler, Data Registers, Program Counter, Flags, Fetch cycle, write cycle, state, bus interrupts. Intel's 8085A Microprocessor.			
MODULE-4			(08 HOURS)
Signal Conditioning: Introduction – Hardware – Digital I/O, Analog to digital conversions, resolution, Filtering Noise using passive components – Registers, capacitors, amplifying signals using OP amps. Digital Signal Processing – Digital to Analog conversion, Low pass, high pass, notch filtering. Data acquisition systems (DAQS), data loggers, Supervisory control and data acquisition (SCADA), Communication methods.			
MODULE-5			(08 HOURS)
HYDRAULICS AND PNEUMATICS			
Design of Hydraulic drives, hydraulic Circuit design, Components of pneumatic systems, Compressors, Pneumatic valves, pneumatic drives, design of pneumatic circuits. Physical concepts of pneumatics and electricals. Electro-Pneumatic components operation and application interpretation of electric ladder diagram. PPI & PID – controllers Application of Controls on Ships: Fuel oil viscosity control, Jacket/piston cooling temperature control			

PRACTICAL COMPONENT OF IPCC *(May cover all / major modules)*

Sl.NO	Experiments
1	Study hardware and software used in PLC
2	Implementation Logic Gates
3	Implementation Of PLC Arithmetic Instructions
4	Implementation Of PID Controller
5	Select pneumatic cylinder for given load and speed requirement
6	Design of multiplexer circuit using gates
7	Demonstration of 8085 Microprocessor Kit
<p>Course outcomes (Course Skill Set): At the end of the course the student will be able to: CO1: To understand various types of control systems and automation (L2). CO2: To describe mathematical models of control systems, stability analysis, basic principles of automation(L2) CO3: Apply mathematical models for mechanical control systems,PID controls, logarithmic plots, hydraulic systems(L3) CO4: Analyse control systems used in automation (L4)</p>	
<p>Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.</p>	
<p>CIE for the theory component of the IPCC (maximum marks 50)</p> <ul style="list-style-type: none"> ● IPCC means practical portion integrated with the theory of the course. ● CIE marks for the theory component are 25 marks and that for the practical component is 25 marks. ● 25 marks for the theory component are split into 15 marks for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and 10 marks for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus. ● Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for 25 marks). ● The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC. <p>CIE for the practical component of the IPCC</p> <ul style="list-style-type: none"> ● 15 marks for the conduction of the experiment and preparation of laboratory record, and 10 marks for the test to be conducted after the completion of all the laboratory sessions. ● On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day. ● The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks. ● The laboratory test (duration 02/03 hours) after completion of all the experiments shall be conducted for 50 marks and scaled down to 10 marks. ● Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for 25 marks. ● The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the 	

IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored by the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Books

1. K. Ogata, "Modern Control Engineering", Prentice Hall, 2010
2. Nagrath, I.J, Gopal, Madan, "A Textbook of Control Systems Engineering" New Age International, 2008
3. Barapate, "Control System" Tech Max publications, Pune, 2006
4. Nagoorkani A "Control System," RBA publications, Chennai, 2006

Reference Books

1. Richard Dorf & Robert Bishop, "Modern control system", Pearson Education, New Jersey 2005.
2. Gopal M, "Digital Control and State variable Methods", Tata McGrawHill, New Delhi, 2003
3. B.S Manke, "Linear Control Systems," Hanna Publications, Delhi 2002
4. B.C Kuo, "Automatic control systems", Prentice Hall, New Delhi, 2002.

Web links and Video Lectures (e-Resources):

<https://electrotechnical-officer.com/all-about-control-panels-control-system-on-ship/>
<https://www.youtube.com/watch?v=4iNThvr8nvM>
<https://www.youtube.com/watch?v=MCpKB5Gy7i8>
<https://www.vlab.co.in/>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Write small PLC Programs on Industrial Automation.
- Develop a prototype of a robot arm using Arduino.
- Preparation of charts showing the examples of open loop and closed loop control system

Marine Auxiliary Machinery & Systems		Semester	7
Course Code	BMR703	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	Theory/practical/Viva-Voce /Term-work/Others		
<p>Course objectives:</p> <ul style="list-style-type: none"> ● A theoretical Knowledge of the auxiliary equipment on ships and the engine room layout. ● A knowledge of engine room pipeline systems and the fittings. ● A knowledge of pumps and pumping systems. ● A Knowledge of the heat exchanger systems and steering systems. ● Understanding of boilers and its maintenance. ● Understand the working of deck machinery systems. 			
<p>Teaching-Learning Process (General Instructions) These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations. 2. Chalk and Talk 3. Adopt flipped classroom teaching methods. 4. Adopt collaborative (Group Learning) learning in the class. 5. Adopt Problem Based Learning (PBL), which fosters students' analytical skills and develops thinking skills such as evaluating, generalizing, and analysing information. 			
Module-1			8 HOURS
ENGINE ROOM LAYOUT, PIPING SYSTEMS AND FITTINGS			
<p>Layout of main and auxiliary machinery in Engine Rooms in different ships. Expansion joints in pipelines, Bilge – ballast, fuel oil bunkering and transfer system, bunkering procedure. domestic fresh water and sea water (Hydrophore) service system, drinking water system, Safety system - fire main.CO2 and sprinkler systems , Valves, Cocks , Packing, Joints, Filters And Strainers .</p> <p>Straight way cocks, right angled cock, T-cock, spherical cock, Boiler gauge glass cock (cylindrical cock). Globe valves, SDNR valve, swing check valve (storm valve), gate valves, butterfly valves, relief valves, quick closing valves, pressure reducing valves, control valves, change over valve chests, fuel oil transfer chest, valve actuators, Packings, Insulation of materials, Seals , filters in engine room</p>			
Module-2			8 HOURS
PUMPS & OTHER AUXILIARIES			
<p>Types of pumps for various requirements , Working principle and their characteristics, performance and application in ships – centrifugal pumps – gear pumps – screw pumps, Lobe pumps and reciprocating pumps bilge, ballast system ,applicable to tankers Pollution prevention equipment – 15 ppm Oily water separator, sewage treatment plant, and incinerator, - operation – sludge handling system</p> <p>Purifiers & Clarifiers (FO & LO), Fresh water Generators. Domestic fresh water system. Main air compressors – Working principles, arrangements and operation –Refrigeration & Air conditioning system including ducts.</p>			
Module-3			8 HOURS
HEAT EXCHANGERS:			
<p>Principle of surface heat transfer - description, contact heat transfer, construction of shell and tube type - flat plate type, single and double pass - lubricating oil coolers, fuel oil heaters, fresh water coolers, compressed air coolers, Main Engine charge air cooler, materials used in all the above heat exchangers, expansion allowance - temperature controls effect of air in the system</p> <p>Working principle and operation of Purifiers (LO and FO) and Main air compressors</p>			
STEERING SYSTEM:			
<p>Hydraulic Telemotor system (Transmitter and receiver), hydraulic power unit - hunting gear</p> <p>hele Shaw pump principle, construction and operation - pawl and ratchet mechanism, 2-ram and 4-ram steering gear - electric steering gear, principle and operation - Hunting gear and emergency steering gear.</p>			

Electrohydraulic steering gear, Rotary vane steering gear - principle - construction - operation	
Module-4	8 HOURS
MARINE BOILERS AND MOUNTINGS Types of Boilers - smoke and water tube and composite, Stresses in boilers refractory, boiler mountings, boiler water treatment and tests, boiler burners, cold start of boiler, shutting down of the boiler, boiler feed water system. Boiler FO system. Burners and forced draft fans. Economizer, Steam distribution system. Condensate system. Water trap and steam trap, Steam pipe insulation	
Module-5	8 HOURS
DECK MACHINERY AND SYSTEMS Working and construction of Mooring winches. Capstan ,Windlass and Anchor wash, Chain locker, bilge pumping arrangement . Deck hydraulic system, Derricks and cranes - electric and hydraulic, Gantry cranes. Life Boats & Life rafts, and Rescue bots .	
Course outcome (Course Skill Set) At the end of the course, the student will be able to : CO1: Locate and define various types of auxiliary machines, systems : piping systems, seals, valves, heat exchangers, pumps ,steering, sopep equipment and boiler systems (L1) CO2: Classify and compare various fuel, lubricating and cooling systems, pumps, heat exchangers, boilers , cranes(L2) CO3: Explain working of various piping systems in ER, pumps, heat exchangers, steering systems, seals, boilers in ER, capstan (L2) CO4: Apply the principles of Materials science , fluid dynamics and heat transfer to select and operate piping systems, valves, pumps, steering systems, boilers, deck machinery (L3)	
Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.	
Continuous Internal Evaluation: <ul style="list-style-type: none"> • For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks. • The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered • Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the CIE course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. • For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment. 	
Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.	
Semester-End Examination: Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (duration 03 hours). <ol style="list-style-type: none"> 1. The question paper will have ten questions. Each question is set for 20 marks. 2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module. 3. The students have to answer 5 full questions, selecting one full question from each module. 4. Marks scored shall be proportionally reduced to 50 marks 	

Suggested Learning Resources:**Books**

1. D.W. Smith, —" Marine Auxiliary Machinery ", 6th Edion, Buer worths, London, 1987.
2. H.D. McGeorge, — "Marine Auxiliary Machinery ", 7th Edion, Buer worth, London,2001.

Reference Books:

1. H.D. McGeorge, — " General Engineering Knowledge" , 3rd edion, Butter worth - Heineman, London, 1991.

Web links and Video Lectures (e-Resources):

- <https://www.dieselduck.info/machine/index.html>
- https://onlinecourses.nptel.ac.in/noc21_ch52/preview
- <https://www.tlv.com/global/TL/steam-theory/types-of-valves.html>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Organise Industrial visits to ports
- Case study on SOLAS and MARPOL
- Report on the future of shipping with strict pollution regulations
- Report on shipping and sustainability in India.

IMO AND MARITIME CONVENTIONS		Semester	7
Course Code	BMR714A	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory /practical/Viva-Voce /Term-work/Others		
<p>Course objectives:</p> <ul style="list-style-type: none"> ● A theoretical Knowledge of the regulations governing international shipping ● Basic knowledge of the IMO conventions. ● A understanding of ISM ● Basic understanding of surveying and its regulations. 			
<p>Teaching-Learning Process (General Instructions)</p> <p>These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations. 2. Chalk and Talk 3. Adopt flipped classroom teaching methods. 4. Adopt collaborative (Group Learning) learning in the class. 5. Adopt Problem Based Learning (PBL), which fosters students' analytical skills and develops thinking skills such as evaluating, generalizing, and analysing information. 			
Module-1			
<p>IMO and Local Administration</p> <p>History of IMO, structure of IMO, Explicit and tacit acceptance, International organizations associated with IMO, classification societies and their role in shipping, IMO and the Sustainable Development Goals, Background of classification societies, Principles and scope of classification, Certification of component and materials, Survey of ships during construction, Survey of ships in operational phase, requirement of class certificate, Shipping rules and organizations in India.</p>			
Module-2			
<p>SOLAS and Safety</p> <p>Overview of SOLAS, Applicability, SOLAS Requirements for machinery installation (Regulations Chapter II-I, Part C). UMS requirements (Regulations Chapter II-I, Part C), Arrangement for oil fuel, Lubrication oil and other flammable liquids (Chapter II-2 Part B Reg 4.2), Fire fighting (Chapter II-2 Part C Reg 10) and Escape Chapter II2 Part D Reg 13, 3.1, 3.3, 3.4, and 4), Operational requirements (Chapter II-2 Part E -Reg 14,15,16). SOLAS Rules for LSA – (Chapter III –, Part B Sec - 1 –Reg 7,Reg 8, Reg 9, Sec III –Reg 31, Reg 32 and 33)</p>			
Module-3			
<p>SOLAS and Polar Code</p> <p>Chapter Xi-1 –Enhanced maritime safety , Chapter XII – Additional safety for Bulk Carriers and Enhanced surveys, Ship identification Number , Requirement of Port State control, CSR Chapter XII – Damage stability, Structural strength (Reg 5) , Solid bulk cargo density declaration, (reg 10) Loading instrument (Reg 11) , Hold space, ballast and dry space water level detectors (Reg 12) , Availability of pumping systems (Reg 13) Polar code: introduction-Operating in polar waters-Main sources of hazards-Definitions-Regulatory framework- Overview-Application-General principles-Philosophy of the Code-Structure of the Code-Ship categories-Mean Daily Low Temperature (MDLT)-Polar Service Temperature (PST)</p>			
Module-4			

MARPOL and Load Line

Over view of MARPOL – Applicability Annex 1 – Standard discharge connection (Reg 13), Reg 14, Control of discharge of oil (Reg 15), Reg 16, Reg17, Reg 31 Control of discharge of Chemical, sewage, garbage, emission. Tier I, Tier II and Tier II engines. Overview of Load line – Rules for side scuttles, Air Pipes, windows, Hatch covers and Ventilators and railings

Module-5**ISM**

ISM - Objective - Definition of company, SMS, DOC, NC and major NC, Anniversary date. Functional requirement of SMS, Application. Company Responsibility and Authority, Designated Person (S) Masters Responsibility and Authority. Documentation for ship board operations. Emergency drills. Crew familiarization. Maintenance of the ship and equipment Audits and certification ISPS – Objective - CSO and SSO, ship security assessment. Ship Security Plan, security levels, Requirement of security level 1, 2 and 3 of ships. Ship security alert system (SOLAS Chapter XI – 2, Reg 6) Security equipment on ship and Port facilities. Security training and onboard drills – Port security.

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

- CO1: Identify and define the international and local maritime organizations, SOLAS, MARPOL, ISM and its related codes and Polar Code (L1)
- CO2: Classify organizations based on conventions, classify surveys, SOLAS amendments, MARPOL Annexes, ISM chapters, safety requirements for polar code (L2)
- CO3: Explain classification societies, SOLAS chapters for machinery ,polar code, Load line convention, Polar code (L2)
- CO4: Apply principles of management and engineering to study surveying, building ships as per SOLAS; MARPOL, ISM, Polar Code (L3)

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 220B2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy

as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

1. The question paper will have ten questions. Each question is set for 20 marks.

2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:**Books:**

1. Capt. Dara E. Driver, "Advanced Shipboard Management", I Edition, Rumar Publications, Mumbai, 1985.
2. Pinto, "Maritime Law", Bhandarkar Publications, 1998

Reference Books:

1. SOLAS Consolidated Edition 2020, International Maritime Organization; 7th ed.,2020,ISBN-13 : 978-9280116908
2. MARPOL Consolidated Edition 2018 (Vol A & B), Bhandarkar Publications; 2016th edition, 2018,ASIN : B071DFXF3H
3. Nilima, M.Chandiramani, "Carriage of goods by Sea and Multimodal Transport", 1st Edition, Saptarang Publication, Mumbai, 1996.

Web links and Video Lectures (e-Resources):

- <https://www.imo.org/en/KnowledgeCentre/ConferencesMeetings/Pages/SOLAS.aspx>
- [https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Prevention-ofPollution-from-Ships-\(MARPOL\).aspx](https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Prevention-ofPollution-from-Ships-(MARPOL).aspx)
- <https://www.youtube.com/watch?v=Q7Espb0afMw>
- <https://www.imo.org/en/MediaCentre/HotTopics/Pages/SustainableDevelopmentGoals.aspx>
- https://www.youtube.com/watch?v=X_x2_RTUiGM

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Organise Industrial visits to ports
- Case study on SOLAS and MARPOL
- Report on the future of shipping with strict pollution regulations
- Report on shipping and sustainability in India.

Marine Engineering Practice		Semester	7
Course Code	BMR714 B	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory/practical/Viva-Voce /Term-work/Others		
<p>Course objectives:</p> <ul style="list-style-type: none"> • The understanding of practices in main engine maintenance. • The understanding of practices in auxiliary engine maintenance. • The understanding of practices in air compressor and purifier maintenance. • The understanding of practices in maintenance of propeller and shaft. • The understanding of practices in maintenance of ancillary engine room machinery. 			
<p>Teaching-Learning Process (General Instructions) These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations. 2. Chalk and Talk 3. Adopt flipped classroom teaching methods. 4. Adopt collaborative (Group Learning) learning in the class. 5. Adopt Problem Based Learning (PBL), which fosters students' analytical skills and develops thinking skills such as evaluating, generalizing, and analysing information. 			
Module-1			
<p>Main Engine: Removal and maintenance carried out on : cylinder liners, cylinder heads, fuel valves, exhaust valves, starting air valves: The checks to be carried out after removal, liner removal and fitting, defects in liner, fuel valve testing, exhaust valve testing, removal inspection and fitting back of piston and piston rings, overhaul of piston, pressure testing of piston, various bearing clearances(cross head, main bearing), T/C maintenance.</p>			
Module-2			
<p>Auxiliary engine: Maintenance of components such as Fuel valve, cylinder head, pressure testing of fuel valve, pressure testing of cylinder head, removal and checking of piston, piston rings, bottom end bearings, con rod, con rod bolts, removal of main bearing, air cooler cleaning and inspection, lube oil cooler cleaning and inspection, T/C removal and inspection of various components.</p>			
Module-3			
<p>Air compressor: Construction of tandem type piston, Removal and maintenance of plate type valves, testing of plate type valves, faults in plate type valves, checking of bumping clearance and adjustment of clearance, crankcase inspection and oil condition monitoring, inspection and pressure testing of intercooler, inspection and maintenance of air bottles, requirement of air bottle according to classification society. Purifiers: Removal and inspection of purifier disc stack, maintenance of frictional brake, factors affecting the performance of purifier. Selection of gravity disc and use of nomogram table.</p>			
Module-4			
<p>Propellers and shaft: Propeller Shaft system, shaft checks, coupling bolts- tapered, conventional, pilgrim type coupling bolt, Muff coupling, stern tube sealing arrangement, propeller mounting methods- keyed and keyless, pilgrim nut method, oil injection propeller mounting.</p>			
Module-5			

Sewage treatment plant:

Requirement according to MARPOL, Biological sewage treatment plant construction working, Plant maintenance and routines, Vacuum type sewage treatment plant working and maintenance.

Incinerator: Requirement according to MARPOL, Construction and maintenance of a shipboard incinerator.

Oily water separator: Requirement according to MARPOL, construction and working of Simplex type oil/water separator with coalesce, maintenance of OWS, oil content monitoring system.

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

CO1: Identify and define various components of main engine, Auxiliary engine, air compressor, purifier, propeller, Marpol equipment (L1)

CO2: Classify the maintenance of main engine, Auxiliary engine, air compressor, purifier, propeller, Marpol equipment based on running hours (L2)

CO3: Explain the procedure for overhaul of components in main engine, Auxiliary engine, air compressor, purifier, propeller and Marpol equipment (L2)

CO4: Apply the principles of maintenance for Main engine , Aux engine :liners, pistons and bearings, shaft sealing , marpol equipment and interpret values from various clearances and readings. (L3)

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:**Books**

1. J. Cowley, The Running and Maintenance of Marine Machinery, Institute of Marine Engineers, 1992, 6th reprint
2. Paul A Russell, Leslie Jackson, Thomas D. Morton, Reeds Vol. 8: General Engineering Knowledge, 6th Edition, 2018, Bloomsbury, ISBN 9781472952714

Reference Books:

1. Manuals for the machinery from the manufacturers

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=5Fs_81baXnk&list=PLcMTKBdlRako6-eaeYMAMzxPkBV9pFUhS
- <https://www.youtube.com/watch?v=noZAiPJcSBc>
- https://www.youtube.com/watch?v=Bkkk3S7G_8o
- <https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Prevention-of->

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Watch videos of maintenance from makers and discuss in a flipped classroom
- Visit a marine workshop or ship-in-campus.
- Case studies on maintenance service letters.

SHIPPING TRADE		Semester	7
Course Code	BMR714C	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory /practical/Viva-Voce /Term-work/Others		

Course objectives:

- ☑ A comprehensive understanding of maritime trade.
- ☑ An understanding of the dynamics of cargo transport.
- ☑ The understanding of the pertinent maritime regulations.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk
3. Adopt flipped classroom teaching methods.
4. Adopt collaborative (Group Learning) learning in the class.
5. Adopt Problem Based Learning (PBL), which fosters students' analytical skills and develops thinking skills such as evaluating, generalizing, and analysing information.

Module-1**Basic Concepts and the Geography of Maritime Trade:**

Basic concepts of seaborne trade, Geography of Maritime Trade, Value added by seaborne transport, Oceans, distances and transit times, Maritime trading network, Europe's sea borne trade-North America's sea borne trade, South America's seaborne trade, Asia's sea borne trade-Africa's seaborne trade, Sea borne trade of the Middle east, Central Asia, Russia, Australia and Oceania.

Module-2

The Principles of Maritime Trade:

The Principles of Maritime Trade, building blocks of sea trade, countries that trade by sea, Trade theory and drivers of trade, Difference in production costs, Trade due to differences in natural resources, commodity trade cycles, Role of sea transport in trade, Transport of Bulk Cargoes, commercial origins of bulk shipping, the bulk fleet bulk trades, The principles of bulk transport, Liquid bulk transport, crude oil and oil products trade.

Module-3

Transport of Specialized and General Cargoes:

Transport of specialized and general cargo, Sea transport of chemicals, LPG trade, LNG trade, Transport of refrigerated cargo, Unit load cargo transport, Passenger shipping, Transport of General cargo, origins of the liner service, Economic principles of liner operation, General cargo and liner transport demand, Liner shipping routes, liner companies, liner fleet, principles of liner service economics, Pricing liner services, Liner conferences

Module-4

The Ship Providing Transport-the Design:

The Ship that provides transport, derived demand for ships, seven questions that define a design, Ships for general cargo trades, Ships for the dry bulk trades, Ships for liquid bulk cargoes, Gas tankers, Non-cargo ships, Economic criteria for evaluating ship designs.

Module-5

Economics of Shipbuilding & Ship Breaking:

The role of merchant shipbuilding and scrapping industries, regional structure of world shipbuilding, Shipbuilding market cycles, economic principles, ship building production process, Shipbuilding costs and competitiveness, ship recycling industry, Regulation of the Maritime Industry, How regulations affect maritime economics.

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

- CO1: Identify and define concepts of maritime trade, trade theory, principles of liner operation, ship design, ship recycling(L1)
- CO2: Classify trade according to geography, cargo, types of bulk cargo, ship building processes (L2)
- CO3: Explain value addition by shipping, major and minor bulk trades, liner trade, tanker design, regulation of ship recycling (L2)
- CO4: Examine trades in various geographical areas, trade due to differences in natural resources, design criteria, liner conferences, role of building and scrapping industries. (L3)

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- ☐ For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- ☐ The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- ☐ Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- ☐ For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students must answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks.

Suggested Learning Resources:**Books:**

1. Martin Stopford, Maritime Economics, 3rd Edition, Routledge, New York, 2008, ISBN 9780415275583
2. Wayne K. Talley, Port Economics, 2nd Edition, Routledge, New York, 2018, ISBN 9781138952195

Reference Books:

1. Kevin Cullinane (2011) International Handbook of Maritime Economics Edward Elgar publishing.
2. Wayne k. Talley (2012) The Blackwell Companion to Maritime Economics, Wiley-Blackwell: U.K.
3. ICS (2014) Introduction to Shipping.

Web links and Video Lectures (e-Resources):

- 🔗 <https://www.ics-shipping.org/shipping-fact/shipping-and-world-trade-driving-prosperity/>
- 🔗 <https://unctad.org/topic/transport-and-trade-logistics/review-of-maritime-transport>
- 🔗 <https://www.seatrade-maritime.com/technology/martin-stopford-four-point-plan-modernise-shippings->
- 🔗 <https://www.youtube.com/watch?v=j7RsRnYlz7I>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Organise Industrial visits to ports
- Case study on Covid-19 and change in shipping routes.
- Case study on the Sagar Mala project.
- Visit Dry docks or shipping offices

Underwater Vehicles		Semester	7
Course Code	BMR714D	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	Theory/practical/Viva-Voce /Term-work/Others		

Course objectives:

To impart knowledge to the students on:

- Marine Resources
- Underwater Exploration
- Subsea Pipeline and Risers
- Introduction to Underwater Vehicles
- Underwater Navigation & Sensing Systems

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk
3. Adopt flipped classroom teaching methods.
4. Adopt collaborative (Group Learning) learning in the class.
5. Adopt Problem Based Learning (PBL), which fosters students' analytical skills and develops thinking skills such as evaluating, generalizing, and analysing information.

Module-1
MARINE RESOURCES Introduction, Challenges in deep sea, Seafloor characteristics, Physical properties of sea water. Effects of density, salinity and temperature on sound speed, Ocean resources, classification, potential uses of sea, Mineral and hydrocarbon resources.
Module-2
UNDERWATER EXPLORATION Exploration, development, Underwater Sound Channels, Underwater instruments for positioning, signal transfer and mapping, production of hydrocarbons, deep sea mining – national developments
Module-3
SUBSEA PIPELINE AND RISERS Introduction subsea pipeline, Pipeline Elements, Piping material selection, Pipeline survey and mapping, Pipeline route; Pipeline Installation Methods. Riser – different types of risers
Module-4
INTRODUCTION TO UNDERWATER VEHICLES Introduction, unmanned marine vehicles – Applications, Unmanned surface vehicles, unmanned underwater vehicles – Remotely Operated Vehicles (ROVs) and Autonomous Underwater Vehicles (AUVs), Classification, Types of ROV services, Operations, Type of propulsions, Design theory – Vehicle design and stability
Module-5
UNDERWATER NAVIGATION & SENSING SYSTEMS Vehicle sensors; Function of sensors, Types of sensors, Sensor Categories Vehicle navigation sensors, Flux gate compass, Tether turn counter, Pressure-sensitive depth gauge, Obstacle avoidance sonar, Altimeter, Inclinometer, Vehicle lighting.
Course outcome (Course Skill Set) At the end of the course, the student will be able to : CO1: List the various challenges involved in the underwater exploration (L1) CO2: Explain the importance of ocean resources L2) CO3: Make use of the national developments in underwater exploration of resources (L2) CO4: Inspect the different pipeline methods and their installation with respect to subsea applications (L3)
Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.
Continuous Internal Evaluation: <ul style="list-style-type: none"> ☐ For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks. ☐ The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered ☐ Any two assignment methods mentioned in the 220B2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. ☐ For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.
Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:**Books**

1. G. Neumann & WJ Pierson, Jr., Principles of Physical Oceanography, Prentice Hall, 1st edn., 1966.
2. E S Cassdy, Introduction to Energy Resources, Technology and Society, Elsevier, 1st edn., 2000.
3. D S Cronon, Underwater Minerals, Academic Press, 1st edn., 1980.

4. Robert D. Christ and Robert L. Wernli, Sr. The ROV Manual - A User Guide for Remotely Operated Vehicles, 2nd ed. Elsevier, 2014

Reference Books:

1. Borges & Ginsburg, Ocean Year Book (Vol 1 – 4), The University of Chicago Press, 1983.
2. Ghosh & Mukhopadhyay, Mineral Wealth of the Ocean, Oxford & IBH Pub. Co., 2nd, 1999.

Web links and Video Lectures (e-Resources):

- <https://youtu.be/rBU8hFz-4tc>
- <https://education.nationalgeographic.org/resource/ocean-exploration/>
- <https://www.baliocean.com/blog/the-history-and-evolution-of-ocean-exploration/>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Visit to NITK to understand the research happening in UMV
- Build a UMV prototype

PORTS AND TERMINAL MANAGEMENT		Semester	VII
Course Code	BMR755A	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		
<p>Course objectives:</p> <ul style="list-style-type: none"> To familiarize the fundamental functions, operations, ownership and management structure of the ports and terminals. To understand the commercial, operational and technical components of ship management. 			
<p>Teaching-Learning Process (General Instructions)</p> <p>These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations. Chalk and Talk method Adopt flipped classroom teaching methods. Adopt collaborative (Group Learning) learning in the class. Adopt Problem Based Learning (PBL), which fosters students' analytical skills and develops thinking skills such as evaluating, generalizing, and analysing information. Conduct Laboratory Demonstrations and Practical Experiments to enhance experiential skills. 			
Module-1			
<p>PORT STRUCTURE AND FUNCTIONS</p> <p>Definition - Types and Layout of the Ports – Organisational structure-Fundamental observations. Main functions and features of ports: Infrastructure and connectivity - Administrative functions - Operational functions. Main services: Services and facilities for ships - Administrative formalities - Cargo transfer - Services and facilities for cargo.</p>			
Module-2			
<p>PORT OPERATIONS</p> <p>Berths and Terminals - Berth Facilities and Equipment - ship Operation - Pre- shipment planning, the stowage plan and on-board stowage - cargo positioning and stowage on the terminal - Developments in cargo/container handling and terminal operation - Safety of cargo operations - Cargo security: Measuring and evaluating performance and productivity.</p>			
Module-3			
<p>PORT DEVELOPMENT</p> <p>Phases of port development - Growth in world trade - Changes in growth - Development in terminal operation. Shipping technology and port: Ship knowledge - Ship development and port development - Port time and ship speed - Other technical development affecting port</p>			
Module-4			
<p>FUNCTIONS OF SHIPPING</p> <p>Ship: Types of ships - Principal dimensions - Ship's tonnages (GT, NT, DWT) - Cargo carrying capacity. Ship owners, operators and managers: Ship manager - Structure of ship owning and management organizations - Ship's personal - Agents.</p>			
Module-5			
<p>Registration - Types of registries - Flag - Classification - Port State Control - Inspections - Surveys - Conditions of survey and inspections - Other surveys. Insurance: Hull and machinery insurance - General average - Salvage - Third party recoveries - Claims and handling - Protection and indemnity.</p>			

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

- CO1: Describe the features of ports, port operations, functions of shipping (L1)
- CO2: Classify layout of ports, berth facilities, registries, hull and machinery, insurance (L2)
- CO3: Explain port operations, port development, functions of shipping, insurance (L2)
- CO4: Illustrate functions of ports, structure of ship owning and management, surveys .(L3)

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- ☒ For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- ☒ The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- ☒ Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- ☒ For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. PATRICK M.ALDERTON. 2008, Port Management and Operations. Informa Law Category, U.K.
1. ICS .2011/12, Ship Operations and Management. London, UK.

Reference Books:

1. WORLD BANK. 2007, Port Reform ToolKit. World Bank, Washington.
2. MARIA G.BURNS. 2014., Port Management and Operations. CRS Press, U.K
3. JOHN. W. DICKE. 2014, Reeds 21st Century Ship Management. Bloomsbury Publishing, U.K.
4. LUNY.H.V., LAI K.-H., CHENG T.C.E. CHENG. 2010, Shipping and Logistics Management." Springer, U.K.

Web links and Video Lectures (e-Resources):

• <http://shipping.nic.in/> (Ministry of Shipping, Govt. of India)
<http://ipa.nic.in/> (Indian Port Association)
www.ippta.org.in (Indian Private Ports and Terminals Association)
www.consulting.xerox.com/case-studies/...shipping-co/enus.html (International Shipping Company Case Study)
www.sugarcrm.com/industry/shipping-and-transport/case-study(CRM Shipping and Transport Case

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Business study on International ship management company
- Visit to ports, shipping office, or a stevedoring company
- Case study on CRM shipping and transport system.

TRANSPORT AND LOGISTICS MANAGEMENT		Semester	VII
Course Code	BMR755b	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

- The foundation for understanding the concepts of Logistic Management.
- Topics are designed to explore managerial principles and practices.
- Concepts of international trade and commerce.
- To have an understanding of operation research and quantitative techniques.
- To have an understanding of Port Management.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method
3. Adopt flipped classroom teaching methods.
4. Adopt collaborative (Group Learning) learning in the class.
5. Adopt Problem Based Learning (PBL), which fosters students' analytical skills and develops thinking skills such as evaluating, generalizing, and analysing information.
6. Conduct Laboratory Demonstrations and Practical Experiments to enhance experiential skills.

Module-1

INTRODUCTION:

Introduction to Logistics. Logistics and Competitive Strategy-Competitive advantage, Gaining competitive advantage through logistics-The mission of logistics management. Management principles and practices, Management information system, Human resources management.

Module-2

MANAGERIAL ECONOMICS:

Managerial economics, Finance accounting, Cost & Management accounting, International financial management. The shipping cycle - Shipping cycle and loan finance decision - Main sources of shipping finance-Issue of shares- types of shares- listing of shares in International stock exchanges in shipping markets

Module-3

INTERNATIONAL TRADE AND COMMERCE:

International trade & commerce, International transport system, International transport Law, Transport economics, import-export documentation and procedure, Multimodal transport. Logistic & Operations management.

Module-4

Quantitative techniques, Operation research, Research Methodology, Strategic management, International marketing (without numerical)

Module-5

PORT AND TERMINAL MANAGEMENT:

Port and Terminal Management, Port Economics, Logistics and Supply Chain Management, Port Pricing and Finance, Port Marketing & Services. Port ownership structure- Types of port ownership and administration - Organizations concerning ports - Boards governing the ports - Port management development

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

CO1: Describe the transport and Logistics strategy, Management principles and practices. (L1)

CO2: Understand the concept of managerial economics, international trade and commerce, import- export documentation and procedure. (L2)

CO3: Understand the quantitative techniques, operation research, and Research methodology.(L2)

CO4: Illustrate working of port management, organizational and administrative structure, personnel management, training and emergency drills of ships. (L3)

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- ☒ For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- ☒ The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- ☒ Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- ☒ For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:**Books:**

1. MARTIN, CHRISTOPHER, Logistics and Supply Chain Management. 2 nd edition. Pearson: New Delhi.
2. AGRAWAL, D. K. (2003) Textbook of Logistics and Supply Chain Management. MacMillan: New Delhi

Additional References:

1. PATRICK M.ALDERTON. 2008, Port Management and Operations. Informa Law Category, U.K.
2. LAMBERT, D.M., STOCK J.R. & LISA M. ELLRAM (1998) Fundamentals of Logistics Management. Irwin-McGraw-Hill: UK

Web links and Video Lectures (e-Resources):

- <https://archive.siam.org/journals/plagiary/1814.pdf>
- <https://www.udemy.com/course/transportation-and-logistics/>
- <https://www.coursera.org/learn/supply-chain-logistics>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Case study on the predicted growth of logistics in India.
- Visit to a logistics or shipping firm and write on the organisational structure.
- Trace the supply chain of the mobile phone that comes to the student and make a chart