

UNIVERSITY OF MUMBAI
No. UG/237 of 2010

CIRCULAR:-

A reference is invited to the Ordinances, Regulations and syllabi relating to the Bachelor of Engineering degree course vide office Circular No.UG/47 of 2005, dated 29th January, 2005 and the Principals of the affiliated Colleges in Engineering are hereby informed that the recommendation made by the faculty of Technology at its meeting held on 9th December, 2009 has been accepted by the Academic Council at its meeting held on 27th July, 2010 vide item No. 4.12 and that, in accordance therewith, the revised syllabus of Fourth Year (Semester VII & VIII) of the B.E. Degree Course in branch of Marine Engineering is as per Appendix and that the same has been brought into force with effect from the academic year 2010-2011.

MUMBAI-400 032
12th August, 2010

L. R. Mane
Offg. Registrar

To,

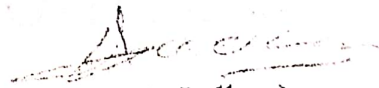
The Principals of the affiliated Colleges in Engineering.

A.C./4.12/27/07/2010

No. UG/237-A of 2010, MUMBAI-400 032 12th August, 2010

Copy forwarded with compliments for information to:-

- 1) The Dean, Faculty of Technology,
- 2) The Chairman, Board of studies in Mechanical Engineering,
- 3) The Controller of Examinations,
- 4) The Co-Ordinator, University Computerization Centre,


(D. N. Jadhav)
Ag. Deputy Registrar
(UG/PG Section)

Copy to:-

The Director, Board of College and University Development, the Deputy Registrar (Eligibility and Migration Section), the Director of Students Welfare, the Executive Secretary to the Vice-Chancellor, the Pro-Vice-Chancellor, the Registrar and the Assistant Registrar. Administrative sub-center, Ratnagiri for information.

The Controller of Examinations (10 copies), the Finance and Accounts Officer (2 copies), Record Section (3 copies), Publications Section (5 copies), the Deputy Registrar, Enrolment, Eligibility and Migration Section (3 copies), the Deputy Registrar, Statistical Unit (2 copies), the Deputy Registrar (Accounts Section), Vidyanagari (2 copies), the Deputy Registrar, Affiliation Section (2 copies), the Professor-cum-Director, Institute of Distance and Open Learning Education, (10 copies) the Director University Computer Center (IDE Building), Vidyanagari, (2 copies) the Deputy Registrar (Special Cell), the Deputy Registrar, (PRO) the Assistant Registrar, Academic Authorities Unit (2 copies), the Executive Authorities Unit (2 copies). They are requested to



UNIVERSITY OF MUMBAI



Revised Syllabus
for the
Final Year
(Semester VII & VIII)
of the
B.E. Degree Course
in
Marine Engineering

(With effect from the academic year 2010-2011)

Scheme of Evaluation (R 2007)

(with effect from the academic year 2010-2011)
Course B. E. (Marine Engineering)

Semester VII *

Subject	No. of Periods per week (60 minutes each)			Duration of Theory	Marks				
	Lecture	Practical	Tutorial		Theory	Term Work	Practical (2 hour).	Oral	Total
Sea Voyage / On Board Training on Ship Campus/Industry & Project	-	-	-	-	-	200		100	300

* The course contents in Semester VII and Semester VIII are inter-changeable. The examination for both semesters will be at the end of the VIII Semester.

1. Training / Project work of the candidate is to be monitored and recorded on monthly basis by the college.
2. Sea Voyage / On board Training / Training on "Ship in Campus" / Industry and Project is to be of 22 weeks duration.
3. Contact Teaching hours for Shore –based training –one hour per student per week.
4. Senior Marine Engineers ashore shall be mentor and supervise the progress of the trainees on board the ship/industry.
5. Ship-Board Training and Assessment Record: Approved Training and Assessment (TAR) Book is to be duly filled-in and certified by competent authority.

Approved Ship Board Training

B. E. Marine Engineering Semester VII

Project Supervision & Guidance : 1 hour per student per week.

Evaluation : Term Work

: 200 Marks

: Oral

: 100 Marks

Objective : To acquaint the student with overall functioning of a ship, exposure to the Ship's Organization Structure, various direct / Indirect activities and procedures associated with the operation of the ship. On completion of the training, the trainee will be competent to keep independent watch of all the machinery of the engine room.

Approach : Hands on experience in tackling real operational situations, and investigative assignments. The approach is to complete the task of each competence under the four functions of the engine room of a ship.

An investigative and analytical approach looking at a problem in its entirety and not in isolation. The project report should contain problem definition and objective, background information, possible approaches and approach selected, data identification, analysis or investigation carried out, results and discussions and jobs done. Specific study stressing clarity, brevity and simplicity of styles. Safety and Risk analysis will form intrinsic part of the report.

Detailed Syllabus

Project Areas

1. Familiarisation with the ship, machinery plant and equipments, including Fire fighting appliances and Life Saving appliances of the ship.
2. Various systems as per T.A.R. Book
3. ISM Code as practiced onboard.
4. Identification of further areas of detailed specializations to be pursued in future career.
5. Computerised Planned Maintenance System (PMS) of the ship.
6. Stores and spares inventory control system of the ship.
7. Familiarity with training manuals and operation manuals of machinery as provided under procedure of ISM manuals.

University of Mumbai

Scheme of Evaluation (R 2007)

(with effect from the academic year 2010-2011)

Course B. E. (Marine Engineering)

Semester VIII *

	No. of Periods per week (60 minutes each)			Duration of Theory	Marks				Total
	Lecture	Practical	Tutorial		Theory	Term Work	Practical	Oral	
Architecture & Construction. III	4	-	2	3	100	25	-	25	150
Marine Engineering	4	-	2	3	100	25	-	25	150
Management and Engineering	4	-	2	3	100	25	-	25	150
Competence of Ship-keeping & Ship-Operations.	3	-	2	3	100	25	-	25	150
Marine Engineering	5	-		3	100	25	-	25	150
Marine and Marine Management Science	3	-	2	3	100	25	-	25	150
Fire Prevention Control	23	-	10		600	150	-	150	900

The course contents in Semester VII and Semester VIII are inter-changeable. The examination for both semesters will be at the end of the VIIIth Semester.

Proposed Elective (to choose one only)

1. Marine Steam Turbines
2. Gas Turbines
3. Double Hull Tank Vessels
4. Advance Marine Heat Engines (Co-cycles)
5. Non Destructive Testing
6. Welding Technology in Ship-building.
7. Advance Fluid Mechanics

CLASS: B.E. (Marine Engineering)			Semester VIII
SUBJECT : 01 - Naval Architecture and Ship Construction - III			
Periods per week	Lecture		4
1 period of 60 min	Practical		
	Tutorial		
		Hours	2
Evaluation System	Theory Examination	3	Marks
	Practical	-	100
	Oral Examination	-	-
	Term Work	-	25
			25

Sr. No.	Details	Hrs.
Module 01	STRENGTH OF SHIPS Longitudinal strength : curves of weight, buoyancy, load, shear force and bending moment in still water and in waves. Approximation of maximum shear force and bending moment. Calculation of section modulus and bending stress. Strength of bulkheads.	06
Module 02	SHIP HULL VIBRATION. Vibration of a ship as a free-free beam of variable cross-section. Effects of added mass and rotary inertia. Empirical formulas for frequencies of vertical and horizontal vibration. Exciting forces. Effects of vibration. Methods to reduce vibration.	06
Module 03	RESISTANCE AND POWERING Components of the total resistance of a ship. : frictional and residuary, viscous and wave making. Froude's and ITTC formulas for frictional resistance. Froude's law of comparison. Determination of effective power from model tests. Ship correlation factor. Admiralty coefficient. Fuel consumption and fuel coefficient.	10
Module 04	PROPULSION AND PROPELLERS Propeller action. Screw propeller geometry. Measurement of pitch. Momentum and blade element theories of propellers. Laws of similitude. Wake and thrust deduction. Apparent and real slip. Powers and efficiencies related to the ship propulsion system. Quasi propulsion coefficient. Propulsion model tests. Cavitation. Strength of propeller blades. Propeller thrust and thrust pad bearing pressure. Ship trials and ship-model correlation. Service performance. Unconventional propulsion devices.	18
Module 05	MANOEUVRABILITY AND RUDDERS Action of a rudder in turning a ship. Turning circle parameters. Heel while turning. Forces on a rudder. Torque and bending moment on rudder stock. Rudder design. Manoeuvring trials. IMO manoeuvring criteria. Manoeuvring in confined waters. Unconventional manoeuvring devices.	08
Module 06	SEAKEEPING Regular and irregular waves in the sea. Ship motions – surge, sway, heave, roll, pitch and yaw. Free, forced, undamped and damped oscillations. Natural periods of roll, pitch and heave. Ship motions in a seaway. Encounter frequency. Roll reduction devices.	08

Assignments :

1. Longitudinal strength calculation of a ship.
2. Calculation of effective power of a ship from model data.
3. Essay on Types of Propellers.
4. Calculation of rudder stock diameter.
5. Study of anti-rolling devices.

Examination :

1. The question paper will comprise of a total of seven questions, each of 20 marks.
2. Only five questions need to be answered.
3. Question 1 will be compulsory, and based on the maximum part of the syllabus.
4. The remaining questions will be mixed in nature (for example, suppose Q. 2 has Part (a) from Module 3, then Part (b) will be from any module other than Module 3).
5. In the question paper, the weightage of each module will be proportional to the number of lecture hours for that module mentioned in the syllabus.

Examination :

The oral examination will be based on the above syllabus.

Work :

Work shall consist of five assignments and one or more written tests. The distribution of marks for work shall be as follows :

• Assignments	15 marks
• Written tests	10 marks
TOTAL	25 marks.

Books :

1. An Introduction to Naval Architecture, E.C. Tupper, Butterworth-Heinemann, Oxford, U.K.
2. Basic Ship Theory, K.J. Rawson and E.C. Tupper, Butterworth-Heinemann, Oxford, U.K.
3. Ships and Naval Architecture, R. Munro-Smith,

References :

1. Principles of Naval Architecture, E.V. Lewis (Editor), Society of Naval Architects and Marine Engineers, Jersey City, U.S.A.

CLASS: B. E. (Marine Engineering)			Semester-VIII	
SUBJECT: - 02 - Marine Engineering Measurements and Control Engineering				
Periods per week 1Period of 60 min.	Lecture	4		
	Practical	2		
	Tutorial	-		
Evaluation System	Theory Examlnation	Hours	3	Marks
	Practical		----	100
	Oral Examination		----	---
	Term Work			25

Sr. No.	Details	Hrs.
Module 01	MEASUREMENTS: Significance of Measurements, Mechanical Measurements. Classification of measuring instruments, generalized measurement system, types of inputs: Desired, interfering and modifying. Static characteristics:- Static calibration, Accuracy, Static error, Sensitivity, Precision, Reproducibility, Hysteresis, Threshold, Linearity, Drift, Span & Range etc. Errors in measurement: Types of errors, effect of component errors on combination and distribution of combination errors on components. Probable errors.	10
Module 02	DISPLACEMENT MEASUREMENT:- Transducers for displacement measurement, Potentiometer, LVDT, Capacitance type, Piezoelectric transducers. Etc. Strain Measurement:- Theory of Strain Gauges. Gauge factor, Temperature compensation, Bridge circuit, Orientation of Strain Gauges for Force and Torque measurement, Strain Gauge based, Load Cells and Torque Sensors. Angular Speed Measurement:- Tachometers, Tachogenerators and Stroboscopic Methods.	10
Module 03	PRESSURE AND VACUUM MEASUREMENT:- Pressure standards, Elastic pressure transducers viz. bourdon Tubes, Diaphragms and Bellows. Vacuum gauges viz. McLeod gauge, Ionization and Thermal Conductivity gauges, High Pressure Measurements, Bridgemen gauge, Calibration of pressure sensors. Temperature Measurement:- Thermodynamic Temperature Scale and IPTS. Electrical methods of temperature measurement, Resistance thermometers, Thermostats and Thermocouple.	10
Module 04	CONTROL SYSTEMS:- Introduction:- Types of control systems, closed loop, open control systems, servomechanisms, development of automatic controls.	04
Module 05	MATHEMATICAL MODELS OF PHYSICAL SYSTEMS:- Differential equations and transfer function of Physical Systems. Order of Systems. Standard Inputs like, Step, Ramp, Terminated, Ramp, Sinusoidal and impulse inputs. Dynamic characteristics of first and second order instruments. Component of Control Systems:- Servomotors, Components of Hydraulic and pneumatic control system and their working principles. Transfer function of these components (No Derivations), Block Diagrams. Characteristics on Closed Loop Systems:- Sensitivity to parameter variations, Transient	13

response Effect of disturbance signal, Steady state errors, Negative and positive feed back, Disadvantages of feed back.

PERFORMANCE OF CONTROL SYSTEMS:- Steady state performance and steady state errors.

Stability of linear Systems:- Concepts of stability, Necessary conditions, The Routh-Hurwitz criterion for stability, Relative stability analysis, Root Locus Concepts.

13

Frequency Response Analysis:- Correlation between time and frequency response. Polar Plots and Bode plots. Stability in frequency domain (Concepts only).

Experiments: (Any Five)

At least Five, laboratory experiments out of which 2 would be on control system and rest on measurements.

Examination:

Question paper will comprise of total seven questions, each of 20 Marks

Only five questions need to be solved.

Question one will be compulsory and based on maximum part of syllabus.

Remaining questions will be mixed in nature (for example suppose Q.2 has part (a) from module 3 then part

(b) will be from any module other than module 3)

In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Examination

Examination will be based on one experiment performed from the list of experiments given in the syllabus and the

will be based on the same experiment.

Work:

Work shall consist of minimum five experiments, assignments and written test. The distribution of marks for work shall be as follows:

Laboratory work (experiments/assignments):	15	Marks.
Test (at least one):	10	Marks.
TOTAL:	25	Marks.

Books:

1. Measurement Systems (Applications and Design) – E.O. Doebelln – McGraw Hill.
2. Mechanical Engineering Measurements – A.K. Sawhney – Dhanpat Rai & Sons, New Delhi.
3. Instrumentation & Mechanical Measurements – A.K. Thayal.
4. Instrumentation Devices & System – C.S. Rangan & G.R. Surma – Tata McGraw Hill.
5. Control System Engineering : By Nagrath I.J. and Gopal M. (Wiley Eastern Ltd.)
6. Modern Control Engineering : By K. Ogata (Prentice Hall)
7. Process Control Instrumentation Technology : By Curtis D. Johnson (Printice Hall of India)
8. Reeds Instrumentation and Control Systems : (Adlard Coles Nautical)

References:

1. Experimental Methods for Engineers – J.P. Holman – McGraw Hills Int. Edition.
2. Engineering Experimentation – E.O. Doebelln – McGraw Hills Int. – Edition.
3. Automatic Control Engineering : Francis H. Raven.
4. Programmable Logic Controllers : John R. Hackwarth, Frederick D. Hackworth (Pearson Education Low Price Edition).

CLASS: B. E. (Marine Engineering)			Semester-VIII
SUBJECT: - 03 - Competence of Watchkeeping and Shipboard Operation			
Periods per week 1 Period of 60 min.	Lecture	4	
	Practical	2	
	Tutorial	-	
Evaluation System		Hours	Marks
	Theory Examination	3	100
	Practical	--	--
	Oral Examination	--	25
	Term Work	---	25

Sr. No.	Details	Hrs.
Module 01	STCW 95 Familiarization to International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended in 1995 (STCW Convention) Articles, Resolutions, Regulations in VII Chapters, Code A (Section A in VIII Chapters), Code B (section B in VIII Chapters) Specification of minimum standards in Chapters III, V and VI of Code A. Special Watchkeeping in Oil Tankers, Chemical Tankers, Liquefied Gas Tankers. Concept of function, competence, and level based training.	10
Module 02	<u>Watchkeeping arrangements and Principles to be observed by officer in charge of an Engineering watch</u> Minimum standards regarding watchkeeping. Operations and watch requirements. Fitness for duty. Requirements for certification. Demonstrate ability to undertake, at the operational level, competence (i.e. tasks, duties and responsibilities) listed in column 1 of table A-III/1. The minimum knowledge, Understanding and Proficiency required for certification as listed in column 2 of table A-III/1. Training and experience to achieve the necessary theoretical knowledge, Understanding and Proficiency as per section A-VIII/2 part 3-2- <i>Principles to be observed in keeping an engineering watch</i>. Taking over the watch at underway and performing the engineering watch. Engine log book. Oil record book Engineering watchkeeping under different conditions and in different areas. Watchkeeping in anchorage and in port. Watch in port on ships carrying hazardous cargo.	10
03	Competences under following functions. Function 1 : Controlling the operation of ship and care for the persons onboard at operational level Function 2 : Marine Engineering at operational level. Function 3 : Electrical, Electronic and Control engineering at the operational level. Function 4 Maintenance and Repair at operational level.	08
Module 04	<u>International Legislation for Ships</u> Familiarization with IMO conventions concerning safety, protection of environment	14

and security measures. Articles, Resolutions, Regulations, Codes, Circulars and Guidelines. Salient features of IMO Conventions like SOLAS, MARPOL, Load Line, Tonnage. Familiarization with codes such as BC, IBC, IGC, IMDG, ISM, ISPS, FSS, LSA.

Legislation – Merchant shipping Act and Rules made there under

Salient features of M. S. Act. Registration of ships, ships papers, handling shipping casualties such as collision, fire, grounding and their official enquiry. Vessels in distress. Various penalties under Merchant Shipping Act.

Surveys and Certification

Inspection, surveys and audit by Administration, Port State and Classification society authorities. Mandatory statutory certificates of ships by Administration.

- Initial, periodical, intermediate and annual surveys.
- Role and scope of port state control inspection, clear ground, detention.
- Role of Classification Society - Maintenance of class of ships, to work as Recognized Organisation (RO) and consultancy services.

Ship operation

Planning, sailing, schedules, Influencing factors, imbalance in sea trade, counter action, voyage estimation, manning of ships, engagement and discharge of crew, economic factors, engagement of multinational crew, seamen's welfare. Commercial shipping practices. Impact of ISM Code and ILO Convention on Safe Operation of Ships, Manning, Health, Safety and Work Environment for seafarers. Emergency and Damage control plan for fire, explosion, collision, grounding, major spill of oil and chemical and other cargoes. Organization of emergency drills.

- Genesis, prevention and safe guard against fraud, piracy and ship security threats. Observance of port procedure, pilotage procedure. Flags of convenience, flags of discrimination and their effects on shipping. Duties regarding pollution prevention, SOPEP / OPRC convention, SMPEP/ HNS-OPRC Protocol.

Assignments / experiments (any five)

Study of the STCW 95 Chapter III with particular emphasis on the specification of minimum standard of competence for officers in charge of an engineering watch at operational, level naming and explaining all the 4 columns. Also Observe and list out all the tables in chapter V & VI, clearly explaining their purpose to-words training.

Learns by visit to a ship how to maintain a safe watch in Engine Room by keeping actual watch while the vessel in port by noting parameters of machinery and also comparing with principles to be observed in keeping Engineering watch as detailed in Chapter VIII of STCW 95. Prepare an essay of above for watch keeping.

- While the ship is underway
- While the ship is on anchorage

Learns the construction, operation and maintenance of all the life saving appliances of a cargo ship by visit to a ship. Write a report on S. E. Items with sketches wherever required.

4. During your visit to the ship, note down all the expected emergency situations that may occur in a ship. learns his duties during emergency. Notes the preventive actions required to be performed by a watch keeping Engineer. Notes the emergency drills as per ISM manual. Writes an essay on above.
5. Detail the Required Performance of competence for the following functions :
 - a) Operate main and auxiliary machinery and associated control system.
 - b) Ensure compliance with pollution prevention requirements.
6. Study the relevant portion of IMO conventions, SOLAS, MARPOL, Load Line which directly concerns E. R. watch keeping officers. Takes reference to relevant National and classification Rules. Make a dissertation on above.
7. Makes a study of the E. R. ISM Manual of a ship. Notes down his role in Operation with particular emphasis on key operations.

Theory Examination;

6. Question paper will comprise of total seven questions, each of 20 Marks
7. Only five questions need to be solved.
8. Question one will be compulsory and based on maximum part of syllabus.
9. Remaining questions will be mixed in nature (for example suppose Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
10. In question paper weightage of each module will be proportional to number of respective lecture hours mentioned in the syllabus.

Oral Examination

Oral Examination will be based on modules given in the syllabus

Term work:

Term work shall consist of 5 experiments, assignments and written-test. The distribution of marks for term work shall be as follows.

Laboratory work (experiments / assignments).....	(15 marks)
Test (at least one)	(10 marks)
Total	25 marks

Text Books :

1. IMO Model Course 7.04 officer in charge of an Engineering watch
2. The Running and Maintenance of Marine Machinery, Cowley, Institute of Marine engineers, London
3. General Engineering knowledge, H. D. McGeorge, Butterworth Heinman
4. Marine Diesel Engine, Pounder, Elsevier

Reference Books :

1. All relevant IMO Conventions & Codes as mentioned in syllabus
2. STCW Convention
3. ILO Convention
4. ILO Book on Code of Safe Working Practices

B. E. (Marine Engineering)		Semester-VIII	
Syllabus - 04 - I. Marine Steam Turbines, Elective, Group I			
Lect. - 04 - I. Marine Steam Turbines, Elective, Group I 1 Period of 60 min.	Lecture	3	
	Practical		
	Tutorial	2	
Propulsion System	Theory Examination	Hours	Marks
	Practical	3	100
	Oral Examination	--	--
	Term Work	--	25
		---	25

Details		Hrs.
Module 01	<u>Layout of different plants</u> General layout of plant and description of a modern steam Turbine installation for Main propulsion including auxiliaries and turbo generators. Description of a steam plant used for cargo pumps in super tankers including use of steam for Heavy oil heating and other similar use. Description of a steam plant used for heavy oil heating, accommodation and other similar use.	08
Module 02	<u>Construction details of Turbines and Auxiliaries</u> Impulse Turbine – pressure compound and velocity compound and combination of both stages. Reaction stages, Astern Turbine stages, Different types of rotors and cylinders. Types of blades, methods of fixing. Nozzles and Diaphragms, Labyrinth and carbon packing glands. Manoeuvring, bleed and drain valves, Bulkhead stop valve. Main bearings, thrust bearing, safety trips of turbines. Gland steam supply and leak off arrangements. Auxiliary machineries and pumps Turbo Generator system, Main Boiler Plant system with fuel system. Condensate, Main sea water and feed pump. Evaporators.	08
Module 03	<u>Lubrication of Turbines</u> Suitable oil and their properties. Lubrication of main bearings, thrust bearings and gears. Gravity and pressure lubrication oil system. L. O. purifiers.	06
Module 04	<u>Reduction Gears</u> Reduction Ratio. Type of gears. Gear construction. Various arrangements of marine gears including articulated, nodal drive and quill shaft. Flexible coupling. Gear inspection and defects identification	06

Module 05	<u>Condensers, Heat exchangers, Air ejectors.</u> Shape and type of condensers including re-generating type. Construction details of condensers, Heat exchangers. Description of L. P., D. C. and H. P. Heaters including economizers in Boiler. Air ejector system. Air extraction pump.	07
Module 06	<u>Operation and maintenance</u> Turbine supply steam from Boiler, turbine drain system, turbine gland system, warming through a turbine plant. Live steam and bleed steam systems. Putting a steam plant on load from cold. Control of speed and propulsion in restricted waters. Shutting down operation, manoeuvring operation, full away operation. Maintenance of plant while on load. Repairs and inspection on shut down of plant. Overhaul of Heat exchangers and pumps including their surveys.	07

List of Assignments (Experiments) : (any five)

1. Tracing the layout of Steam plant and piping system on ship and labeling as fitted on steam plant of a ship.
 - 0.1 for heavy fuel oil heating, accommodation heating and similar uses.
 - Or
 - 0.2 for cargo pumps in addition to 0.1 of above
 - 0.3 for propulsion plant
2. Visit to power plant, perform experiment on working principle of steam condensate. Comparison with shipboard condenser.
3. Visit to power plant, perform experiment on working principle of air extraction from steam condensate. Comparison with shipboard air extraction system.
4. Visit to power plant, perform experiment on Direct Contact heater. Comparison with shipboard Direct Contact heater.
5. Visit to power plant, perform experiment on working principle of high pressure feed heater. Comparison with shipboard high pressure feed heater.
6. Visit to power plant, perform experiment on working principle of feed pump compare with shipboard feed pump.
7. Study of a modern reduction gear arrangement of a steam propulsion plant including Lubrication of bearings and gear mesh.

Theory Examination:

11. Question paper will comprise of total seven questions, each of 20 Marks
12. Only five questions need to be solved.
13. Question one will be compulsory and based on maximum part of syllabus.
14. Remaining questions will be mixed in nature (for example suppose Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
15. In question paper weightage of each module will be proportional to number of respective lecture hours mentioned in the syllabus.

Examination - will be based on one experiment performed from the list of experiments given in the syllabus.
work will be based on the same experiment.

work shall consist of minimum 5 experiments, assignments and written test. The distribution of marks for term work shall be as follows :-

Term work (experiment / assignment) (15 marks)

..... (10 marks)

..... (at least one)

25 marks

Book
Running and maintenance of marine Machinery, Dr. Cowley, Institute of marine Engineers , London.
Marine Steam Engineering Knowledge -- Fox and MC Brine, Newness, Butterworth.
Marine Steam Engineering Knowledge, Vol-9 Reed's
Practical Marine Engineering, Vol -- 1, Vol - 2, SNAME

Reference Book

Marine Engineering Practice Series, 20 part in 3 volumes, Institute of Marine engineers, London.
Marine Steam Turbine -- Theory and Practice. Kearnon.

CLASS: B. E. (Marine Engg.)			Semester-VIII
SUBJECT: - 04-02 - Gas Turbines, Elective, Group II			
Periods per week 1 Period of 60 min.	Lecture	3	
	Practical		
	Tutorial	2	
Evaluation System		Hours	Marks
	Theory Examination	3	100
	Practical	-	--
	Oral Examination	--	25
	Term Work	-	25

Sr. No.	Details	Hrs.
Module 01	Gas Turbines Cycle. : Simple Cycle GAS Turbines, Recuperative / Regenerative cycle gas turbines..	06
Module 02	Gas Turbine Plants : Aircraft Derivative Units (ADGT) Heavy duty gas turbine (NDGT)	08
Module 03	Marine Applications of Gas Turbines : Warships, Cruise vessels other vessels. Advantage and disadvantage of Gas Turbines over other power plants for Marine Work.	12
Module 04	Associated Machinery : Compressor, Fuel pump, Water Pumps, gear box, Reversing Mechanism, Mountings.	06
Module 05	Gas Turbine : Compounded to Diesel Engine (CODOG) or other gas turbine (COGOG)	06
Module 06	Contract specification, sea Trials and acceptance .	04

Experiments (Assignment) :

- Write an essay on "Kaveri" the Gas Turbines Engine. Indigenously for Indian Navy.
- Make a complete Heat Balance chart for any Gas Turbine.
- Sketch and Describe an ADGT. Give details of Blade Design and Materials.
- Within same parameters of temperature and Enthalpy show how compounding the Gas Turbine with another heat engine will improve thermal efficiency.
- Show how gas turbine may provide an acceptable solution when reduction of NO_x is of Prime importance.

Examination:

- Question paper will comprise of total seven questions, each of 20 Marks
- Only five questions need to be solved.
- Question one will be compulsory and based on maximum part of syllabus.
- Remaining questions will be mixed in nature (for example suppose Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
- In question paper weightage of each module will be proportional to number of respective lecture hours mentioned in the syllabus.

Examination : Will be based on assignments

Work:

Work shall consist of Five assignments and written test. The distribution of marks for term work shall be as follows:

Laboratory work (experiments/assignments):	15	Marks.
Test (at least one):	10	Marks.
TOTAL:	25	Marks.

Books:

Internal Combustion Engine :	D. K. Sanyal
Marine Engineering :	R. Harrington
Modern Marine Engineers Manual - 2, 2 nd Edition	Cornell Maritime Press.
Gas Turbine	Cohen & Rogers
Steam and Gas Turbines.	R. Yadav

References:

Design and construction SNAME

CLASS: B.E. (Marine Engineering)			Semester VIII
SUBJECT 04-03 - : Double Hull Tank Vessels - Elective Group III			
Periods per week	Lecture	3	
1 period of 60 min	Practical		
	Tutorial	2	
Evaluation System		Hours	
	Theory Examination	3	Marks
	Practical	-	100
	Oral Examination	-	-
	Term Work	-	25
			25

Sr. No.	Details	Hours
Module 01	INTRODUCTION Marine transportation of crude oil and its products. Categories of oil cargo and their properties. Types of oil tankers. Factors affecting design of oil tankers. Environmental considerations. MARPOL. Developments leading up to the adoption of double hull tankers. Phasing out of single hull tankers. Alternatives to the double hull oil tanker – the mid-deck and the Coudombi egg concepts. Economics of single and double hull oil tankers.	08
Module 02	MAIN FEATURES OF DOUBLE HULL OIL TANKERS Preferred-tanker sizes. General arrangements of double hull oil tankers. Cargo tank and ballast tank arrangement. Machinery arrangement. Mooring system. Emergency towing arrangements. Propulsion arrangements. Manoeuvrability. Safety and fire-fighting arrangements.	08
Module 03	DESIGN CONSIDERATIONS Relation between deadweight and main dimensions, light weight, power and ballast capacity. Subdivision and stability. MARPOL requirements for double hulls. Intact stability requirements. Ballast draught. Damage stability. Cargo tank dimensions and accidental outflow considerations.	08
Module 04	CARGO RELATED SYSTEMS Cargo piping. Cargo pump room. Submerged pumps in cargo tanks. Stripping arrangements. Cargo heating. Tank cleaning – crude oil washing. Tank venting and inert gas system. Gas freeing. Vapor recovery systems. Ballast system.	06
Module 05	DOUBLE HULL TANKER STRUCTURE Structural midship sections of double hull tankers. Arrangement of primary structure in tankers of different sizes. Yield, buckling and fatigue considerations. Sloshing. Ability to withstand collision and grounding. Critical areas in double hull tanker structure. Effect of misalignment. Stress concentration locations. Use of higher strength steels. Owner's margins. Arrangements for facilitating inspections and surveys.	06
Module 06	PROTECTION AGAINST CORROSION Corrosion control in ballast tanks. Hard and soft coatings. Typical coating systems. Quality standards for coatings. Cathodic protection.	06

Assignments :

- Study of IMO requirements regarding oil pollution.
- Calculation of double bottom height and wing tank width for adequate ballast capacity.
- Drawing of structural midship section of a double hull tanker.
- Line drawing of a cargo piping system.
- Study of ballast water management in a double hull oil tanker.

Examination :

- The question paper will comprise of a total of seven questions, each of 20 marks.
- Only five questions need to be answered.
- Question 1 will be compulsory, and based on the maximum part of the syllabus.
- The remaining questions will be mixed in nature (for example, suppose Q. 2 has Part (a) from Module 3, then Part (b) will be from any module other than Module 3).
- In the question paper, the weightage of each module will be proportional to the number of lecture hours for that module mentioned in the syllabus.

Examination :

The oral examination will be based on the above syllabus.

Work :

Work shall consist of five assignments and one or more written tests. The distribution of marks for work shall be as follows :

• Assignments	15 marks
• Written tests	10 marks

TOTAL	25 marks.

Books :

- Guidelines for Inspection and Maintenance of Double Hull Tank Vessels, TSCF, Witherby.
- Ship Design and Construction, T. Lamb (Editor), Society of Naval Architects and Marine Engineers, Jersey City, U.S.A.

References :

- Ship design and construction, Taggart, SNAME
- SOLAS 74
- MARPOL 73/78

CLASS: BE (Marine Engineering)			Semester- VIII
SUBJECT: - 04-04 Advance Marine Heat Engines (Co-Cycles), Elective, Group IV			
Periods per week 1 Period of 60 min.	Lecture	03	
	Practical	02	
	Tutorial	--	
Evaluation System	Hours		Marks
	03		100
			--
			25
	Theory Examination		25
	Practical		
	Oral Examination		
	Term Work		

Sr. No.	Details	Hrs.
Module 01	Complex Heat Engine Plants Combined Steam Turbine and diesel engine cycles, combined steam turbine and gas turbine cycles, combined gas turbine and diesel engine cycles.	05
Module 02	Analysis of Heat Engine Plants Different methods of improving the overall thermal efficiency of the entire plant. Design of the most optimum condition and combination of complex plants. Cascade refrigeration plants Free Piston gas generators.	05
Module 03	Turbo Blowers and Turbo Compressors Compressor Characteristics for axial flow compressors and centrifugal compressors. Stalling of compressors. Turbine characteristics. Matching of components like compressor and turbine. Performance of different units in combination in single shaft arrangement.	10
Module 04	Combustion and Flame Stabilization Combustion of liquid fuels, atomization, mixing, combustion curve and different methods of flame stabilization, design of combustion chamber. Spray of fuel. Pre-mixing of gaseous fuels for combustion. Stability of flame.	10
Module 05	Heat Exchangers Design of different types of compact heat exchangers for different applications, e.g. air pre heater, economizers, feed heaters, gas and oil heaters, coolers.	09
Module 06	Maintenance & Selection Maintenance of Heat Engine Plant & Selection Criteria	03

Experiments:

1. Study of a combined steam turbine and diesel engine plant proposed to be installed in super tanker, showing the cycles.
2. Similar study as detailed in 1 of above for a combined steam turbine and gas turbine plant.
3. Similar study as detailed in 1 of above for a combined gas turbine and diesel engine plant.
4. Study of gas turbine main engine plant either of a cargo ship or war ship, making a detailed sketch of axial compressor, combustion chamber and gas turbine in single shaft arrangement.
5. Write an essay on the modern developments which have taken place in heat exchangers for reliability and efficiency.

Examination:

1. Question paper will comprise of total seven questions, each of 20 Marks
2. Only five questions need to be solved.
3. Question one will be compulsory and based on maximum part of syllabus.
4. Remaining questions will be mixed in nature (for example suppose Q.2 has part (a) from module 1 then part (b) will be from any module other than module 3)
5. In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Examination

Practical and oral examination will be based on one experiment performed from the list of experiment given in the syllabus and the oral will be based on the same experiment.

Work:

Term work shall consist of minimum 04 experiments, assignments and written test. The distribution of marks for term work shall be as follows:

• Laboratory work (experiments/assignments):	15	Marks.
• Test (at least one):	10	Marks.
TOTAL:	25	Marks.

Books:

1. Power Plant Engineering, P.C.Sharma, S.K. Kataria & Sons.
2. Heat and Mass Transfer, Domkundwar.
3. Power Plant Engineering- R. K. Rajput

References:

1. Steam and Gas Turbines, R. Yadav
2. Thermal Engineering - Domkundwar

CLASS: BE (Marine Engineering)			Semester- VIII
SUBJECT: - 04-05 :- Non Destructive Testing, Elective, Group V			
Periods per week 1 Period of 60 min.	Lecture	03	
	Practical	02	
	Tutorial	-	
Evaluation System		Hours	Marks
	Theory Examination	3	100
	Practical	---	---
	Oral Examination	---	25
	Term Work	---	25

Sr. No.	Details	Hrs.
Module 01	Introduction What is NDT, comparison between destructive and NDT, importance of NDT, scope of NDT, methods and problems, difficulties of NDT, comparison and selection of NDT methods, future progress in NDT, economics aspects of NDT.	04
Module 02	Ultrasonic Testing Principle, wave propagations, Types of waves, frequency, velocity, wavelength, reflection, divergence, attenuation, mode conversion etc. in ultrasonic, UT testing methods, contact testing, and immersion testing, normal beam and straight beam testing, angle beam testing, dual crystal probe testing, ultrasonic testing techniques. Resonance testing, through transmission testing technique, pulse echo testing technique, instruments used in UT, accessories such as transducers, types, various types, frequencies and sizes commonly used, cables, reference blocks with artificially created defects, calibration of equipment, testing of materials such as products like plates and round bars, weld joints, castings, forgings, UT of nonmetals, advantages, limitations of UT, defects in various products.	08
Module 03	Radiography Testing Basic principle, Electromagnetic radiation sources: X-ray source, production of X-rays, high energy X-ray source, gamma ray source. Properties of x-rays and gamma rays. Inspection techniques like SWSI, DWSI, DWDI, panoramic exposure, real time radiography, films used in industrial radiography, types of films, speed of films, qualities of films, screens used in radiography, quality of a good radiograph, film processing, interpretation, evaluation of test results, safety aspects required in radiography, advantage and limitations, standards.	08
Module 04	Eddy Current Testing Principle of ECT, Physical aspects of ECT, like conductivity, permeability, resistivity, inductance, inductive reactance, impedance etc., field factor and lift of effect, edge effect, end effect, Impedance, plane diagram in brief, depth of penetration of ECT, relation between frequency and depth of penetration in ECT. Equipments and accessories, various application of ECT such as conductivity measurement hardness measurement, defect detection, coating thickness measurement, coating of materials etc., advantages and limitation of ECT.	08

Magnetic Particle Testing

Principles of MPT, basic physics of magnetism, permeability, flux density, cohesive force, magnetizing force, retentivity, residual magnetism etc., methods of magnetization, magnetization techniques such as head shot technique, cold shot technique, central conductor testing, magnetization using products using yokes, direct method of magnetism, indirect method of magnetization.

07

Continuous testing of MPT, residual technique of MPT, system sensitivity, checking devices in MPT, interpretation of MPT, indications, advantage and limitation of MPT.

Dye Penetrant Testing

Principles of DPT, properties required in a good, penetrant and development which are used as consumable in dye penetrant testing, qualification of penetrant testing consumable, types of penetrants, types of developers, use of various types of penetrants and developers for various application, DPT technique, or test procedure, interpretation and evaluation of penetrant test indication such as relevant indications, non relevant indications, false indication, safety precaution required in penetration testing.

07

Experiments:

04 Study Experiments on above syllabus.

Examination:

Question paper will comprise of total seven questions, each of 20 Marks

Only five question need to be solved.

Question one will be compulsory and based on maximum part of syllabus.

Remaining questions will be mixed in nature (for example suppose Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)

In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Examination

Practical and oral examination will be based on one experiment performed from the list of experiment given in the syllabus and the oral will based on the same experiment.

Works:

Work shall consist of minimum 04 experiments, assignments and written test. The distribution of marks for term work shall be as follows:

Laboratory work (experiments/assignments): 15 Marks.

Test (at least one): 10 Marks.

TOTAL: 25 Marks.

Books:

NDT, Krant Krammer

Ultrasonic Testing, Krant Krammer (Narosa Publishing House)

Techniques of NDT, Hogarth & Blitz (Butterworth & Co. Pub.)

Practical NDT, Baldev Raj & Jaya Kumar, (Narosa Publishing House)

Principles and Practice of NDT, J.H. Lambie (Heywood & Company Ltd.)

References:

Book of NDT, Robert C. Mc Master Vol.-I and Vol.-II (ASTM)

CLASS: B. E. (Marine Engineering)			Semester-VIII	
SUBJECT: - 04 -06 - Welding Technology in Ship-Building , elective Group VI				
Periods per week 1Period of 60 min.	Lecture		3	
	Practical		2	
	Tutorial		-	
Evaluation System	Theory Examination	Hours	3	Marks
	Practical		--	100
	Oral Examination		--	--
	Term Work		---	25

Sr. No.	Details	Hrs.
Module 01	Welding process : Fusion welding, Resistance welding, Argon-arc welding and Gas welding, Electron beam welding, Plasma arc welding, Laser welding, Bronze welding, Under water welding.	06
Module 02	Weldability of steels : Plain carbon steels – mild steel, medium carbon steel, High carbon steel, tool steels, low alloy and high alloy steels, stainless steels, Austenitic Manganese steel. Weldability of cast iron and casting – gray cast iron, malleable cast iron, spheroidal graphite cast iron, selection of cast iron, electrodes and welding rods – methods of welding.	10
Module 03	Weldability of aluminum and its alloy : Metallurgical behavior during welding, choice of methods, welding rods, fixtures, methods of welding. Weldability of copper and copper alloys : Copper Brasses, Manganese, Bronze Aluminum Bronze, welding of dissimilar metal joint on copper and copper alloys, methods of welding.	10
Module 04	Metallurgical concept of weldability – Temperature changes in welding concept of weldability, carbon equivalent, cracking of welds, weldability testing, welding metallurgy of dissimilar metals, heat treatment of welds.	06
Module 05	Design and fabrications – Designing for welding types of joints welds and stress distribution, layer sequences, deposition rates, expansion, contraction and residual stresses in welded structure.	06
Module 06	Indian standards for welding electrodes, fluxes and properties, electrode selection.	04

Experiments/ Assessments

- Write an essay on Weldability of steels starting from plane carbon steels to high alloy steels, and stainless steel.
- Write an essay on weldability of cast iron
- Write an essay on weldability of Aluminum and its alloy

Examination

Question paper will comprise of total seven questions, each of 20 Marks

Only five questions need to be solved.

Question one will be compulsory and based on maximum part of syllabus.

Remaining questions will be mixed in nature (for example suppose Q.2 has part (a) from module 1 then part (b) will be from any module other than module 3)

In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Examination

Examination will be based on assignments

Work

Term work shall consist of at least 5 assignments based on the syllabus.

Assignments : 15 Marks

Test : 10 Marks

: 25 Marks

Books

Welding and Welding Technology, Richard L. Little, Tata McGraw Hill Pub.

Welding Design and Processes, Hilton and Richard Chapman & Hall Pub.

Welding Engineering, Gupta & Kaushish.

Reference Books

Welding Engineers Handbook, Oates J. and George Newnes

Welding handbook Vol-V, American Welding Society

CLASS: BE (Marine Engineering)		Semester- VIII	
SUBJECT: 04-07- Advance Fluid Mechanics, Elective, Group VII			
Periods per week 1 Period of 60 min.	Lecture	03	
	Practical	02	
	Tutorial	-	
Evaluation System	Theory Examination	Hours 03	Marks 100
	Practical	--	---
	Oral Examination	--	25
	Term Work	--	25

Sr. No.	Details	Hrs.
Module 01	Hydraulic Transmission of Power. Hydraulic pumps, gear, screw, vane pumps of fixed and variable displacement types, axial piston pumps of fixed and variable displacement types – swasplate and bent axis design, radial piston pump.	07
Module 02	Hydraulic Accumulators. Various types – weight, spring or gas pressure loaded, different principles – piston, bladder or diaphragm type. Change of condition of the fluid in a loaded accumulator – adiabatic, isothermic, poly-tropic. Flow graph, Sizing, pressure setting and the economics.	07
Module 03	Hydraulic Rotary Motors Fixed or variable displacement type, axial piston unit of swash plate and bent axis design, fixed displacement, axial piston unit of wobble plate design, vane type.	07
Module 04	Roto dynamic Transmisson Fluid coupling, hydraulic torque converter and their characteristics, Hydraulic rotary actuator of parallel piston type and Piston type with rack and pinion, crank lever mechanism.	07
Module 05	Different Control Systems Principles of pressure control valve, direct operated and pilot operated relief valves, Pressure reducing valve, sequence valve, Principle of flow control valve, meter in circuit, meter out circuits, flow through restrictor, Principles of direction control by two way two position, two way three position.	07
Module 06	Pneumatic Circuits: Speed regulating methods used in Pneumatics, Basic Pneumatic Circuits, Selection of Components.	07

Experiments:

- Study of variable displacement types hydraulic pumps.
- Study of various types of hydraulic accumulators and study of their operating principles.
- Study of hydraulic rotary motors.
- Study of root-dynamic transmission systems like coupling, torque converter.
- Study of power packs, intensifiers.
- Study or Experiments on Pneumatic Circuits.

Examination:

Question paper will comprise of total seven questions, each of 20 Marks

Only five questions need to be solved.

Question one will be compulsory and based on maximum part of syllabus.

Remaining questions will be mixed in nature (for example suppose Q.2 has part (a) from module 1

then part (b) will be from any module other than module 3)

In question paper weightage of each module will be proportional to number of respective lecture

hours as mentioned in the syllabus.

Examination

will be based on one experiment performed from the list of experiment given in the

and the oral will based on the same experiment.

Work:

work shall consist of minimum 04 experiments, assignments and written test. The distribution of

term work shall be as follows:

Laboratory work (experiments/assignments): 15 Marks.

Test (at least one): 10 Marks.

TOTAL: 25 Marks.

Books:

1. Introduction to Fluid Mechanics and Fluid Machines, Som & Biswas, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
2. A test book of Fluid Mechanics and Hydraulic Machines, Dr.R.K. Bansal, Laxmi Publication, (P) Ltd., New Delhi.
3. Fluid Mechanics and Machinery, Agarwal, Tata McGraw Hill Publishing Company Ltd., New Delhi.
4. A Test book of Hydraulics, R.K. Rajput, Sultan Chand and Sons, New Delhi.

References:

1. Fluid Power with Application, Esposito, Prentice Hall Inc.
2. Oil Hydraulics in the service of Industry, Lal Anthony, Allied Publishers.

CLASS: B. E. (Marine Engineering.			Semester-VIII	
SUBJECT: - (05) Humanity and Marine Management Science				
Periods per week 1Period of 60 min.	Lecture	5		
	Practical	-		
	Tutorial	-		
Evaluation System	Theory Examination	3	Marks	
	Practical	----	100	
	Oral Examination	----	---	
	Term Work		25	
				25
			150	
Sr. No.	Details			Hrs.
Module 01	Fundamental Concepts of Economics Basic Economic Concepts and Terms. Demand Analysis. Supply Analysis. Elasticity of demand. Elasticity of supply. Factors of Production. Production function. Law of Return. Type of Market. Pricing under perfect competition. Monopoly - Oligopoly.			06
Module 02	Trade : Trade Theories. Difference between Domestic trade and Foreign trade. Free trade Vs. Protection. IMF World Bank . W. T. O. Various world currencies and their relationship.			06
	Trade Routes: Land Routes. Sea Routes . Market. Importance of commercial shipping in growth of international trade. Analysis of relationship between international trade and international shipping.			06
Module 03	Commercial History : Comparative Commercial History of major maritime nations of the world post world war II Analysis of possible future trends 2010 -2035			06
	Society: . Definition. Characteristics, Norms, Social Group, Communities, Customs , Race, caste, Class, and conflicts. Social Institution. Individual and State. Types of Government. Rise of Democracy. Impact of Industrial Revolution. Globalisation. Impact of Globalisation on trade and politics of major countries. Role of U. N.			06
Module 04	Management : & Theory Brief description of Classical and Modern theories of management . How modern very large multinational companies were formed and how they function. Social responsibility of individual professional and Corporates..			08
Module 05	Shipping Organisation: Organisation Structure of a large shipping company. Role of ship owners vis-à-vis ship manager. I.M.O., I.T.F., I.S.F , BIMCO, INTER TANKO, INTER CARGO, Role and scope of trade. Unionism in international shipping,			08

Shipping Contracts :

Charter Party :: Bill of lading , Warranty of sea worthiness, Hamburg Rule York-Antwerp Rules, Rotterdam Rules. Right and obligations of owners and those of cargo interest.

08

Marine Insurance:

H & M insurance. Standard clauses, Salvage, Scope. P&I cover, Territorial waters, Exclusive Economic zones. Contiguous Zone, Jurisdiction Conflict resolution, Arbitration and litigation.

08

Voyage Planning :

Passage Plan, Weather, Bunker, Security. Rights and Responsibilities of owners and charters, in port and at sea.

08

Experiments: (Any Five)

Compare theories of Adam Smith with those of Karl Marx and give your preference with your justification. Write an original essay in 3000 words tracing impact of Industrialisation on Globalization over the period of last 200 years.

Is Democracy the best option for a country like India. Discuss in detail. 3000 words.

What is the role of ethics in a modern economy. Is there any obvious lessons to learn from the economic slump 2007-2009. Is it desirable that Sovereign Governments give financial support to commercial banks and institutions to save them from collapsing.

Make a detailed voyage plan for a 9 year old 60000 DWT bulk carriers loading iron ore from Goa for Yabata Port in Japan. Lay/Can 25th July 09/15th Aug. 09 Cargo 55000 MT 5 pct MOLO

Describe Piracy, through last few centuries. Why has it become so virulent exactly now. Quoting provision of ISPS Code, advise if measures taken and proposed measures, are adequate to protect. Merchant shipping

Experiments:

No experiments are prescribed.

Examination:

Question paper will comprise of total seven questions, each of 20 Marks

Only five question need to be solved.

Question one will be compulsory and based on maximum part of syllabus.

Remaining questions will be mixed in nature (for example suppose Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)

In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Examination

Examination will be based on modules given in the syllabus.

Work:

Work shall consist of minimum 05 experiments, assignments and written test. The distribution of marks for term shall be as follows:

Laboratory work (experiments/assignments):15
Test (at least one):10
TOTAL:25

Marks.

Marks.

Marks.

Books:

Primary Principles of Sociology
Micro Economics
Monetary Economics

C N.Sankara Rao
H. L. Ahuja
Sruj Gupta

More Books :

Business and Economics -
Macro & Micro Economics -
Economics -
Dynamics of Modern Society -
Maritime History of the World.

Chaturvedi, Gupta & Pal
Dornbusch & Fisher
Paul Samuelson.
Goode William J.

CLASS: B. E. (Marine Engineering)

Semester-VIII

SUBJECT: - 06: Marine Fire Prevention and Control

Periods per week Period of 60 min.	Lecture	3	
	Practical	2	
	Tutorial	-	
Evaluation System	Theory Examination	3	Marks
	Practical	--	100
	Oral Examination	--	--
	Term Work	---	25
			25

Sr. No.	Details	Hrs.
Module 01	Theory of Fire- Fire hazard on Board Ships. Theory of Fire, Fire triangle, fire tetrahedron, fire chemistry, methods of extinguishing fires- Starvation, smothering, cooling and flame inhibition. Classes of fire (A,B,C, and D) including agents for each class. Spontaneous combustion, definition of explosion, explosive prone areas of ships, limits of flammability. Different fire fighting mediums (agents) and their suitability for ships use, including vaporizing fluids.	05
	Legislation on Fire Prevention, Suppression and Control. Appraisal of Risk Assessment based approach of Regulations on Fire. Salient features of Chapter II -2 of SOLAS 74 Convention with Fire Test Procedure (FTP) code and Fire Safety Systems (FSS) Code. Relevant part of National and Classification Society Rules on fire. Relevant portion on Fire Prevention, Suppression and control as per BC, IBC and IGC Codes. Requirements of carriage of Dangerous goods, Reg. 19 of chapter II-2.	05
Module 02	Advanced Training in Fire Fighting -- IMO Model Course 2.03 Familiarization of following competences :- 1. Control fire fighting operations aboard ship 2. Organize and train fire parties 3. Inspect and Service fire detection and extinguishing systems and equipment 4. Investigate and compile reports on incidents in involving fire.	04
	Control fire fighting operations aboard ship: Areas of fire hazards- action required and technique adopted in machinery spaces, accommodation, galley, ship's flammable store, cargo in holds, containers in holds and on deck. Fire fighting techniques in port, in dry deck, and at sea.	03
Module 03	Organize and Train Fire Parties and Operational Requirements: Fire organization on ships for fire fighting and associated emergencies. Fire signal and muster, Rescue operations from affected compartment, Means of escape, First aid. Preparation of contingency plans. Compositions and allocation of personnel to fire parties. Fire fighting operational requirements. Maintenance, Testing and Inspection. On Board training and drills, Training manuals. Fire control plans. Fire safety operational booklets.	06
	Prevention of Fire and explosion Arrangements for fuel oil, lubrication oil and other flammable oils. Items of ignition sources such as electric radiators, waste receptacles. Cargo areas of tankers, separation of cargo tanks, restriction on boundary openings,	04

	cargo tank venting, ventilation system in cargo pump rooms. Inert gas systems, inerting, purging and gas freeing. Gas measurement.	
	Fire growth potential control of air supply and flammable liquids to spaces, closing appliances and stopping device of ventilation in cargo spaces.	
	Plans of control (closing appliances) in machinery spaces, skylight, stopping ventilation fans, stopping forced and induced draught fans, vent flaps, stopping oil transfer pumps and unit pumps, closing of quick closing valves.	
	Remote Fire Detection System. Types of Detectors – heat, smoke, combustion, flame types. Selection of fire detectors and alarm system and their operational limits. Description of various detection systems fitted on ships. Commissioning and periodic testing of sensors and detection system. Method I C, method II C and Method III C-protection by fixed detectors or automatic sprinkler or internal divisional bulkheads in accommodation spaces of cargo ships	05
Module 05	Containment of fire by insulation and fire division bulkheads and decks. Requirements in respect of materials of construction and design of ships class "A" "B" and "C" types bulkheads and decks. Fire doors openings in "A" class division, penetration of pipes and ventilation ducts in class "A" and "B" divisions fire zones, fire integrity of bulkheads and decks for passenger ships, cargo ships and tankers.	04
Module 06	Fire fighting equipments including personnel protection. Fire main, fire pumps including emergency fire pump, hydrants and hoses, couplings, nozzles, isolating valves, relief valves and cross over valves, international shore connection. Fire fighting water supply systems in machinery space, accommodation and on deck. Construction, operation, merits and use of different types of portable, fire extinguishers, non portable fire extinguishers, fixed local application for Engine Room. Different types of fixed fire extinguishing installations in machinery spaces, control stations, accommodation and service spaces, galleys, cargo spaces including 3 types of tankers, cargo pump rooms and space containing flammable liquids like paint lockers. Different types of fixed installation shall include, fixed gas (CO ₂ or equivalent equipment) fixed high expansion foam, fixed pressure water spraying and mist, fixed Sprinkler, fixed dry powder, fixed foam for deck of tankers, Alcohol resistant Fixed foam installation for Chemical Tankers. Sample extraction smoke detection system. Fire fighting outfits- personal equipment and Breathing apparatus, emergency escape berthing devices (EEBD).	06

Experiments: (any five)

1. Marking of location and Sketch of A, B and C types of bulkheads, indicating the position of fire doors in main and upper decks of an accommodation of a ship. Sketch a sectional view of A type bulkhead.
 2. Carry out tests of all types of fire detectors provided in accommodation and Engine Room, of a ship. Sketch and describe any type of fire detector. Write a report on testing.
 3. Draw and list out the escape routes, Closing appliances, Sky-light, quick closing valves, stopping forced and induced draught fans, vent flaps, shutting of fuel pumps of an Engine Room.
 4. Prepare and make dimensioned sketches with labeling of any 3 types of portable extinguishers extensively used in Engine Room (E.R.) and accommodation fires. Describe operations, refilling and periodic maintenance of these extinguishers.
 5. Marking of the fixed CO₂ installation for E.R. of a ship. Make suitable sketch showing releasing arrangements. The quantity of CO₂ is ascertained.
- operation, use and function of:
- a. S.C.B.A.
 - b. Bellow type breathing apparatus
 - c. Fireman's outfit
- Make labeled sketches for S.C.B.A.
- Make dimensioned sketches with labeling for fire hydrants, couplings, nozzles and international shore connection

- 8 Study and write an essay on the safe-guards provided for fire hazard in electrical installations.

Theory Examination:

46. Question paper will comprise of total seven questions, each of 20 Marks
47. Only five questions need to be solved.
48. Question one will be compulsory and based on maximum part of syllabus.
49. Remaining questions will be mixed in nature (for example suppose Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
50. In question paper weightage of each module will be proportional to number of respective lecture hours mentioned in the syllabus.

Oral Examination

Oral examination will be based on one experiment

Term Work:

Term work shall consist of minimum 5 experiments, assignments and a written test. The distribution of marks for term work shall be as follows:

- | | | |
|--|----|--------|
| • Laboratory work (experiments/assignments): | 15 | Marks. |
| • Test (at least one): | 10 | Marks. |

TOTAL:25 Marks.

Text Books:

1. IMO Model course on Basic Fire Fighting.
2. IMO Model course on Advance Fire Fighting.
3. The Running and Maintenance of Marine Machinery, Cowley, Institute of Marine Engineers, London. (Fire Prevention and Fighting)
4. Marine Engineering practice booklets, 1 to 20 parts in 3 volumes, Institute of Marine Engineers. (Relevant parts on Fire prevention and fighting – Vol. 1 part 5)

References:

1. SOLAS 74, Chapter II-2 on Fire Prevention and fighting
2. BC, IBC and IGC Codes of IMO, (on Fire Prevention and fighting.)
3. Tanker Safety Guide - INTERTANKO
4. Fire Aboard – Rush brook