GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
Course Curriculum
MARINE AUXILIARY MACHINERY
(Code: 3341804)

Diploma Programme in which this course is offered	Semester in which offered
Marine Engineering	4th Semester

1. RATIONALE

The students have learned about marine diesel engines in the 4th semester marine engineering. It should be noted that the main engine need the support of auxiliary machineries. The engineers are responsible for the repair and maintenance of all auxiliary machineries onboard the ship. Hence a basic knowledge about the working of auxiliary machineries is required.

2. COMPETENCY

At the end of the study of IV Semester the student will be able to

- Understand about the fresh water system, oil water separator deck machinery.
- Know about the working of steering machineries.
- Study about incinerator, sewage plant, pumps and purifiers.
- Acquire broader ideas about refrigeration and air conditioning plants in ships.
- Understand about piping system and vibration.

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	150
3	0	2	5	70	30*	20	30	

Legends: L -Lecture; **T -**Tutorial/Teacher Guided Student Activity; **P -**Practical; **C -** Credit; **ESE**-End Semester Examination; **PA -**Progressive Assessment.

* 30 marks of Theory PA include two assignments each of 5 marks. First assignment must have total 12 numerical from Unit number I,II and III. Second assignment must be of 10 numerical from Unit number IV and V and report on student activities performed. Each numerical of each assignment must have different parameters for each student, that is each student will get total 22 numerical with same problem but with varied parameters. (Values of temperature, pressure, volume, etc may be different for each student.).

4. COURSE DETAILS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I **Fresh Water System, oily bilge separators, Deck Machinery**	1.a Fresh water systems. 1.b Oily water separator. 1.c Deck machinery.	1.1 Evaporators: Construction and operation of boiling type and flash type evaporators - fresh water generator and Domestic water treatment plant. 1.2 Pollution prevention oily bilge separators their construction and operation – oil content monitoring system-Bilge level maintenance-bilge pump (gear with reciprocating). 1.3 Type of deck machinery used in ships - winch – windlass - derricks - cranes, their requirements operation and maintenance.
Unit – II **Blowers and Compressors, Steering System and Valves**	2.a Construction & operations of blowers and compressors. 2.b Steering systems. 2.c Types of valves.	2.1 Construction and operation of Blowers and compressors used on board ships - uses of compressed air. 2.2 Steering gears - Construction and operation of 2-RAM steering system ,4-RAM steering system , rotary vane steering system - Emergency steering arrangement - under water fittings - propellers, rudder, bow thrusters - maintenance of hull. 2.3 Valves – screw valve – gate valve – globe valve – quick closing valve.
Unit – III **Ship board equipments , Pumps and Purifiers**	3.a Testing of Equipments. 3.b Maintenance of Equipments. 3.c Pumps & purifiers.	3.1 Auxiliary engines (power generators). 3.2 Incinerators- chemical sewage treatment plant – biological sewage treatment plant - Engine room crane- Different types of ship stabilizer - Different types of bearings used for marine machineries. 3.3 Pumps used in ships-centrifugal pump –reciprocating pump - gear pumps – screw pump- axial flow pump – purifiers.

Unit – IV **Marine** **Refrigeration,** **Ventilation,** **Heat exchangers**	4.a Operation of refrigeration cycle. 4.b Air conditioning plants. 4.c Heat exchangers & types.	4.1 Vapour compression system - vapour absorption system- Refrigerants used in marine practice and their justification. 4.2 Properties of refrigerant- Control of temperature in various rooms in Cargo or domestic plants, Ventilation necessity – International requirements for ventilation- control in Humidity in Air Conditioning plants, operation and maintenance of Air Conditioning plants - control and safety equipments. 4.3 Heat exchangers (shell & tube and plate type)
Unit – V **Piping system and Vibration**	5a. Piping system. 5b. Vibration & sourses.	5.1 Piping Systems – fire main systems – fixed Carbon dioxide system - fresh water systems – sea water systems - fuel oil systems - lubricating oil systems – main steam systems – Bilge systems – overflow arrangement and vents. 5.2 Vibration - source of vibration - various modes of vibration - forced, damped, transverse, longitudinal and torsional vibration. Noise – noise suppression techniques – noise level measurement.

5. SUGGESTED SPECIFICATIONTABLE WITH HOURS & MARKS(THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	**Fresh water system, Oily bilge separators, Deck machinery.**	06	04	03	03	10
II	**Blowers, Compressors, Steering systems & Valves.**	06	03	03	04	10
III	**Shipboard equipments, Pumps & purifiers.**	10	04	06	06	16
IV	**.Marine Refrigeration, Ventilation, Heat exchangers.**	10	04	07	05	16
V	**Piping system & Vibrations.**	10	04	06	08	18
Total		**42**	**19**	**25**	**26**	**70**

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

Notes:

1. This specification table shall be treated as a general guideline for students and Teachers. The actual distribution of marks in the question paper may slightly vary from above Table.
2. If mid sem test is part of continuous evaluation, unit numbers I, II and unit III up to 3.4 are to be considered.
3. Ask the questions from each topic as per marks weightage. Numerical questions are to be asked only if it is specified. Optional questions must be asked from the same topic.

6. SUGGESTED LIST OF PRACTICAL/EXERCISES

LIST OF EXPERIMENTS :

1. Dismantling and assembling of winch.

2. Dismantling and assembling of oil-water separator.

3. Dismantling and assembling of centrifugal pump.

4. Dismantling and assembling of reciprocating pump.

5. Dismantling and assembling of gear with reciprocating pump.

6. Dismantling and assembling of purifier.

7. Study about corrosion. Practice of chipping and painting of corroded parts.

8. Dismantling and assembling of compressor.

7. SUGGESTED LIST OF STUDENT ACTIVITIES

Perform the tasks mentioned in above Practical/Exercise.

8. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

Sr. No.	Unit Title	Strategies
1	**Fresh water system, Oily bilge separators, Deck machinery.**	Real life examples. Demonstration of real systems. Movies/Animations. Numerical.
2	**Blowers, Compressors, Steering systems & Valves.**	
3	**Shipboard equipment's, Pumps & purifiers.**	
4	**.Marine Refrigeration, Ventilation, Heat exchangers.**	
5	**Piping system & Vibrations.**	

9. SUGGESTED LEARNING RESOURCES

(A) List of Books:

Text Book :
Marine Auxiliary Machinery by Mc. George

Reference Book :
Marine Auxiliary Machinery by Smith

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE

FACULTY MEMBERS FROM POLYTECHNIC

- **Prof Nair Gopikrishnan**
  (Lecturer in Marine engineering Govt Polytechnic Diu)

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