3020 - ELEMENTS OF HEAT ENGINES

Teaching Schedule Per Week			Progressive Assessment		Examination Schedule (Marks)			
Lectures	Practical	Credits			Theory		Practical Ex.	Total
2	2	4	25	25	3Hrs	100	50/or	200

Pre-requisite	Source
Nil	EXM

Semester	Theory	Test	Total	TW	PR	Gr Total

RATIONALE: - In today's fast developing marine mechanical field, more and more emphasis is laid on machines for power generation and transmission. Machines like steam boiler, diesel engines, steam turbines and refrigeration plants are extensively used in this field. Therefore it becomes essential for a student of diploma in Electronics (Marine) to get him acquainted with the basic operations and functions of various machines. In view of this, the subject "Elements to Heat Engines" has been introduced in their course. OBJECTIVES: -After studying this subject, the students will be able to: Understand the basics of operation of various machines used on board the ship. Understand the function of different components of these machines.

COURSE CONTENTS	Hrs	Mks
1. INTERNAL COMBUSTION ENGINES Introduction to Internal Combustion Engines. Classification of I.C. Engines. Different components of I.C. Engines and their functions. Comparison of SI and CI Engines. Working principle of petrol and diesel engines. Working of two stroke and four stroke cycle engines. Different systems of I.C. engines: -Fuel system, cooling system, lubrication system, starting system, exhaust system, electrical system, ignition system.. Methods of governing of I.C. Engines, supercharging and turbo-charging.	7	24
2. STEAM BOILERS Principle of steam generation. Classification of boilers. Study of marine boilers (any two). Study of boiler draughts and classification of draughts. Boiler mountings and their functions: -Safety valves, water level indicator, pressure gauge, steam stop valve, blow off cock, fusible plug, feed check valve. Boiler accessories and their functions: -Economizer, air pre-heater, super heater, steam injector, feed water pump. (Reciprocating type)	6	20
3. STEAM TURBINES Principle of operation. Classification of steam turbines: -Impulse, Reaction, Impulse-Reaction. Method of governing of steam turbines: -Throttle governing, nozzle control governing, by-pass governing.	4	10
4. GAS TURBINES Introduction, operating principle, classification, open cycle gas turbine and closed cycle gas turbine. Applications.	4	10
5. REFRIGERATION PLANTS Basic principles of refrigeration: -Units of refrigeration and performance. Basic cycle of refrigeration. Flow diagram of refrigeration plant. Study of basic components of refrigeration plant: -Compressor, expansion device, condenser and evaporator. Refrigerants, types and their properties. Capacity control of compressor. Safety precautions.	7	20
6. PNEUMATICS TRANSMISSION ELEMENTS Energy supply source: -Compressor, receiver, pressure and regulators. Input elements: -Directional control valves, limit switches, push buttons and proximity	2	8

sensors.
Processors: - Directional control valves, logic elements and pressure control valves.
Final control element: -Directional control valves.
Actuating devices: -Pneumatics cylinders.

7. HYDRAULIC TRANSMISSION ELEMENTS Basic hydraulic systems: -Pumps, actuators, valves, flow control, valves and accumulators	2	8
Total	32	100

PRACTICAL

1. Study of two stroke cycle diesel engine (1 turn)
2. Study of four stroke cycle diesel engine (1 turn)
3. Study of different component of diesel engines (1 turn)
4. Study of different systems of diesel engines (1 turn)
5. Study of medium pressure marine boiler 2 turns)
6. Study of boiler mountings (any four) (2 turns)
7. Study of boiler accessories(any four) (2 turns)
8. Study of elements of pneumatic transmission systems (2 turns)
9. Study of elements of hydraulic transmission system (2 turns)
10. Trial on Refrigeration tutor. (1 turn)

REFERENCE BOOKS

1. Elements of Heat Engine Volume 1 and 2 -- Patel and Karamachandani
2. Heat Engines -- Pandya and Shah
3. Basic Mechanical Engineering -- T.S. Rajan
4. Refrigeration and Air Conditioning -- Domkundavar and Arora
5. Industrial Hydraulic -- Richard W Vockroth
6. Industrial pneumatics -- Mujumdar
7. Introduction to Marine Engineering. -- D.A. Taylor