4040 - FLUID MACHINERY										
Teaching Schedule Per Week			Progressive Assessment		Examination Schedule (Marks)					
Lectures	Practical	Credits			Theory		Practical Ex.		Total	
3	2	5	25	25	3 hrs.	100	25 oral		175	
Pre-requisite		Source	Semester		Theory	Test	Total	TW	PR	Gr Total
~~4038~~ 4025		MEC			75	25	100	25	50	175

RATIONALE: - Hydraulic Machinery plays an important role in the conversion of hydraulic energy to Mechanical energy and vice –versa. Hydraulic turbines are used for meeting our day to day power demands. Also different types of pumps are essential equipment in all the industries. Hydraulic systems have a wide range of application is in machine tools, mobile applications, material handling, marine, mining, metal processing and a host of other fields. Similarly pneumatic control is extensively used as an effective method of automation technique.

COURSE CONTENT	Hrs	Mks
MPACT OF JET 1. Introduction. 2. Generation of forces on flat plate held normal to jet when plates is (a) Stationery (b) Moving 3. Force exerted on a curved vane when the vane is (a) Stationery, (b) moving 4. Jet striking a moving curved vane tangentially at one tip and leaving at the other	3	4
2. WATER – TURBINES 1. Classification of water-turbines, Impulse turbines – Pelton wheel, Construction and working of pelton wheel, Work done and efficiency of a pelton wheel, Definition of heads and efficiencies, Design aspects of pelton wheel. 2. Reaction Turbines, 1 Francis Turbine, .2 Work done & efficiency of a Francis Turbine, .3 Design of a Francis Turbine runner, .4 Advantages & disadvantages of Francis Turbine over a Pelton wheel. 4. Propeller and kaplan turbines-Axial flow reaction turbines, Work done and efficiency of a kaplan turbine, Kaplan versus Francis turbine, Specific speed, 5. Performance characteristics of Hydraulic Turbines, Main or constant head characteristic curves, Operating or constant speed characteristic curves Constant efficiency or used efficiency or Muschel curves 7. Governing of hydraulic turbines. 8. Governing of impulse turbines, governing of reaction turbines, . 9. Cavitation:-1. Selection of turbines, 2. surge tanks	16	30
3. CENTRIFUGAL PUMPS 1. Introduction, Classification of pumps. 2. Components parts of a centrifugal pump, Types of casings, Types of impellers., Working of a centrifugal pump, Work done by the impellers, Heads of a pump. Losses and efficiencies of a centrifugal pump, Minimum speed for starting a centrifugal pump. 3. Multistage centrifugal pumps, Pumps in series, Pumps in parallel, Specific speed. Characteristics of centrifugal pumps, Net positive section head (NPSH) Cavitation in centrifugal pumps, Priming of a centrifugal pump. Selection of pumps, Operational difficulties in centrifugal pumps.	9	20
4. RECIPROCATING PUMPS 1. Introduction, Classification of reciprocating pumps. 2. Main components and working of a reciprocating pump, Discharge, work done and powers required to drive reciprocating pump. Single acting reciprocating pump,	9	20

Double acting reciprocating pump. Co-efficient of Discharge and slip of reciprocating pump, Effect of acceleration of piston on velocity and pressure in the suction and delivery pipes. Indicator diagrams, Ideal indicator diagram
3. Effect of friction in suction and delivery pipes in indicator diagram.
4. Effect of friction and acceleration in section and delivery pipes on indicates diagram.
5. Air vessels, Functions of air vessels. Saving in work done by using air vessels.

5. MISCELLANEOUS PUMPS 3 8

1. Construction, working and application of rotary vane pump.
2. Construction, working and application of screw pump.
3. Construction, working & application of gear pumps. a) External gear pump (b) Internal gear pump.
4. Construction, working and application of variable delivery pump.
5. Construction, working application of vacuum pumps.

6. PNEUMATIC CONTROL SYSTEMS 4 9

1 FRL unit, 2. Pneumatic controls, 3. Direction control valves, types and actuation, 4 Flow control valves – types and actuation, 5 Quick exhurt valve.
6. Shuttle valves, 7. Non return valve, 8. Safety valve,
9. Lines actuators: a) Single acting cylinder, b) Double acting cylinder
Aspects of working, maintenance and circuit symbols are to be covered for all.

7. HYDRAULIC CONTROL SYSTEMS 4 9

1. Hydraulic cylinders – general classification, Hydraulic valves, (Aspects of working maintenance and circuit symbols are to be covered.)
2. Pressure control valves, Relief valves, Unloading valve, Sequence valve, Pressure reducing valve, Flow control valve. Direction control valves, Check valve, Rotary valve, Spool valve,
3. Oil seals- Types,
4. Basic hydraulic circuits - (a) Sequential circuits,. (b) Counter balance circuits, (c) Regenerative circuits,. (d) Meter in, (e) Meter out, (f) Bleed off.

Total	48	100

PRACTICAL

1. Study & trial of Pelton wheel.
2. Study & trial of Francis turbine.
3. Study & trial of centrifugal pump.
4. Study and trial of reciprocating pump.
5. Construction of single hydraulic & pneumatic control circuits.
6. Study of construction, working of following miscellaneous pumps
7. Rotary vane pump.
8. Internal gear pump
9. External gear pump.
10. Screw pump.
11. Variable delivery pump
12. Vaccum pump.

REFERENCE BOOKS

1. Fluid Mechanics and hydraulic Machines, by R. K. Rajput.
2. Hydraulics and fluid mechanics, by P.N. Modi & S. M. Seth.
3. Hydraulics, fluid Mechanics and fluid Mechanics, by S. Ramamrutham.
4. Fluid Mechanics, Hydraulics and hydraulic mechanics, by K.R. Arora.
5. Industrial Hydraulics, by Richard W. Vockroth.
6. Hydraulic systems Handbook by Utility Publications Ltd.
7. Pneumatic Systems Principles & Maintenance, by S. R. Majumdar.
8. Hydraulics and Hydraulic Machines, by Jagdish Lal.
9. Hydraulics and Hydraulic Machines, by R. S. Khurmi.