COURSE TITLE : FLUID MECHANICS AND MACHINERY
COURSE CODE : 3051
COURSE CATEGORY : B
PERIODS/WEEK : 5
PERIODS/SEMESTER : 75
CREDITS : 5

TIME SCHEDULE

Module	Topic	Periods
1	Understand the importance of Hydraulics	19
2	Know the Principles Kinematics and Dynamics of Fluid Flow	19
3	Appreciate the working of Centrifugal pumps, Reciprocating Pumps ,and other positive Displacement pumps	19
4	Understand Fluid power technology, identify elements in fluid power systems	18
TOTAL		**75**

GENERAL COURSE OUTCOME

Module	G.O	Student will be able to
1	1	Understand the application of Hydraulics
	2	Explain the various properties hydraulic fluid
	3	Solve the problems by using different manometers and pressure ganger.
2	1	Understand the Principles Kinematics and Dynamics of Fluid Flow
	2	Explain the types of fluid flow.
	3	State Bernoull's equation and its applications.
	4	Solve problems related with Bernoull's equation.
	5	Appreciate the flow of fluids through orifices, notches and pipes.
	6	Apply Darcy's and chezy's formula.
3	1	Classify different pumps and explain its working
		Solve the problems in relation with power of discharge of pumps.
		Distinguish Hydraulic actuators.
4	1	Define pascal's law
	2	Identify applications of fluid power
	3	Understand basic concept of pneumatic syatem and its control elements and components.
	4	Draw simple pneumatic circuits.

SPECIFIC COURSE OUTCOME

MODULE I

1.1.0 Understand the importance of Hydraulics

1.1.1 Explain the areas of application of Hydraulics

1.2.0. Appreciate the properties of Hydraulic Fluids

1.2.1 Explain the various properties of commonly used hydraulic fluid

1.2.2 Solve the problems related to density, specific weight, specific volume, and specific gravity.

1.3.0 Understand fluid pressure and the methods to measure it

1.3.1 Explain the terms pressure and pressure head and solve problems on these

1.3.2 State and explain Pascal's law

1.3.3 Explain Absolute, Gauge, Atmospheric and Vacuum pressure and solve simple Problems.

1.3.4 State the fundamental principles of pressure measuring devices balancing by liquid columns

1.3.5 Explain and illustrate the principle of working of piezometer, simple U-tube manometer, differential manometer, inverted differential manometer, Bourdon's tube pressure gauge and solve simple problems on those.

1.3.6 Explain the term total pressure

1.3.7 Solve problems using equations of total pressure on an immersed surface in positions of horizontal, vertical and inclined

MODULE II

2.1.0. Know the Principles Kinematics and Dynamics of Fluid Flow

2.1.1 Explain the term Kinematics

2.1.2 Explain the types of fluid flow – steady and unsteady flow, uniform and non-uniform flow, Laminar and Turbulent flow, compressible and incompressible flow – rotational and Irrotational flow, one dimensional flow, two dimensional flow, and three dimensional flow

2.1.3 Explain Rate of Discharge

2.1.4 Explain the equation for continuity of flow

2.1.5 Solve simple problems on 2.1.3 and 2.1.4

2.1.6 Explain the energies possessed by a liquid particle that is potential, kinetic and pressure

2.1.7 Define total energy and total head

2.1.8 State Bernoulli's equation(No Derivation)

2.1.9 State the limitations of the Bernoulli's theorem

2.1.10 Solve the problems using Bernoulli's equation

2.1.11 Explain the practical applications of Bernoulli's equation, Venturimeter and solve problems

2.1.12 Sketch a pitot tube and explain how it is used to measure the velocity of a flowing liquid

2.2.0 Appreciate the flow of fluids through Orifices Notches and Pipes

2.2.1 Explain the Orifices, types of Orifices, point of vena-contracta and Hydraulic coefficient Cc, Cv and Cd

2.2.2 Solve simple problems of hydraulic coefficients

2.2.3 Explain Notches, types of Notches

2.2.4 Know the equation for discharge over rectangular Notches, Triangular Notches and Trapezoidal Notches.
2.2.5 Mention the advantages of Triangular Notch over a Rectangular Notch
2.2.6 Define coefficient of discharge of a Notch
2.2.7 Solve simple problems on 2.2.4
2.2.8 Explain losses of head in pipes and identify Major losses and Minor losses
2.2.9 Explain the significance of losses of head due to friction in pipe flow
2.2.10 Apply Darcy's formulae and Chezy's formulae for loss of head in pipes and explain the terms hydraulic mean depth and hydraulic gradient
2.2.11 Solve the problems on 2.2.10
2.2.12 Apply the equation of loss of head due to sudden enlargements and loss of head due to s udden contraction loss of at the entrance in a pipe and loss of head at the exit of a pipe
2.2.13 Solve the problems on 2.2.12
2.2.14 Describe the transmission of power though pipes and the equation for power transmitted through a pipe
2.2.15 Solve simple problems on 2.2.14
2.2.16 Explain water hammer

MODULE III

3.1.0 Appreciate the working of Centrifugal pumps, Reciprocating Pumps ,and other positive Displacement pumps

3.1.1 Classify the pumps
3.1.2 Identify Positive displacement pumps
3.1.3 Explain the working principle of Positive displacement pumps
3.1.4 Describe gear pumps, vane pumps, piston pumps
3.1.5 Explain the Type of Hydraulic Actuators – Rotary (Hydraulic motor) – Semi-rotary- linear motion type (Hydraulic cylinders)

MODULE IV

4.1.0 Understand Fluid power technology, identify elements in fluid power systems

4.1.1 Define the Pascal law
4.1.2 Identify the applications of fluid power
4.1.3 Know the essential properties of the fluids such as viscosity index, Oxidation stability, Demulsibility, Lubricity, Rust prevention, Pour point, Flash and fire point, Neutralisation number.

4.2.0 Understand the basic concept of Pneumatic system, identify pneumatic control elements and its components

4.2.1 Compare Pneumatic system with hydraulic system
4.2.2 Identify standard pneumatic symbols
4.2.3 Know the basic component of pneumatic system – air filters, pressure regulator – lubricator – mufflers

4.3.0 Understand pneumatic control elements and components

4.3.1 Explain with sketches pneumatic valves – direction control valves- pressure control valve and flow control valves

4.3.2 Describe the pneumatic actuators – pneumatic cylinders, air motors – types and applications

4.3.3 Draw the simple pneumatic circuit

4.3.4 Describe the principle of power operated holding devices, chuck, mandrel, collect clamping circuits

CONTENT DETAILS

MODULE I

Introduction, Properties of Fluids- Importance of hydraulics. Density – specific weight – specific volume – specific gravity problems – viscosity – kinematic viscosity – Newton's law of viscosity – types of fluids – compressibility – surface tension – capillarity Fluid pressure and its measurement Fluid pressure at a point – pressure head – problems – Pascal's law – absolute, gauge, atmospheric and vacuum pressures – simple problems – measurement of fluid pressure – Piezometer tube – simple manometer – differential manometer – inverted differential manometer – Bourdon's tube pressure gauge – problems – total pressure – total pressure on immersed surface – horizontal – vertical – inclined – problems

MODULE II

1. Kinematics of fluid flow introduction – types of fluid flow – steady and unsteady flow – uniform and non-uniform flow – laminar and turbulent flow – compressible and incompressible flow – rate of flow or discharge – equation of continuity of a liquid flow – simple problems – energy of a liquid in motion – potential energy – kinetic energy – pressure energy – total energy – total head of liquid in motion – Bernoulli's equation – simple problems – practical applications of Bernoulli's equation – venturimeter – 2. Flow through Orifices, Notches& Pipes Orifices – types of orifices – Vena contracta – coefficient of contraction – coefficient of velocity – coefficient of discharge – problems Notches – types of notches – Rectangular notches – triangular notch – trapezoidal notch – discharge over notches – simple problems Simple pipes – loss of head in pipes – major energy losses – minor energy losses – loss of energy due to friction – Darcy's formulae(No derivation) for loss of head in pipes – Chezy's formula (No derivation)for loss of head in pipes – simple problems – water hammer**.**

MODULE III

Pumps Centrifugal pump-Introduction –working —priming , cavitation—efficiencies –discharge—power required to drive –multistage pumps –simple problems. Reciprocating pump Types –comparison of centrifugal and reciprocating pump –discharge—slip—power required air vessels (simple problems) Principles of working of Positive displacement pump – Classifications – Gear pumps, Screw Pump, Vane pumps, Lobe pump, Simple piston pumps

MODULE IV

Fluid Power Introduction – Pascal's laws– Applications of fluid power – properties of fluids such as viscosity index, Oxidation stability, Demulsibility, Lubricity, Rust prevention, Pour point, Flash and fire point, Hydraulic system -Basic elements of hydraulic system – Flow control valves – types – gate, globe, butterfly valves, non return valve, application circuits of control valves – Functions – classifications – Describe the working of pressure control valves such as relief valves - poppet valve – Direction control valves – types – sliding spool type – check valves – 1 way, 2 way, 3 way directional control valves, solenoid control valve. Pneumatic System Comparison of pneumatic system with hydraulic system – identification of standard pneumatic symbols – basic pneumatic system – air filter – pressure regulator – lubricator – mufflers. Air cylinders – types - light, medium, heavy, tandem, duplex, double.

TEXT BOOKS

Hydraulics and pneumatics Srinivasan, Mc Graw Hill publishers
Fluid mechanics and machines N Narayana Pillai, Universities Press

REFERENCE BOOKS

1. R.S. Khurmi - Hydraulics and Fluid mechanics -. (S.Chand &Co)
2. NITTR, Support materials in pneumatics - Chennai
3. Majumdar - Pneumatic Systems Principles and maintenance - (Tata Mc Graw Hill)
4. White - Fluid Mechanics - Universities Press
5. M.R.Thomas &C.K.M.Sagir , Fluid Mechanics and Pneumatics - (M&C Publishers)