

Course Name: Mechanical and Production Engineering/Production Technology **Course Code :** ME/PT/PG/MH

Semester: Fourth

Subject Title : Fluid Mechanics & Machinery

Subject Code: 9054

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme						
TH	TU	PR	Paper Hrs	TH	TEST	PR	OR	TW	Total
04	-	02	03	80	20	-	25#	25@	150

Rationale:

Knowledge of fluid flow & related machinery is essential in all fields of engineering. Hydraulic machines have important role in power generation, water supply and irrigation and also in most of engineering segments.

This subject requires knowledge of basic engineering sciences, applied mechanics, mathematics etc.

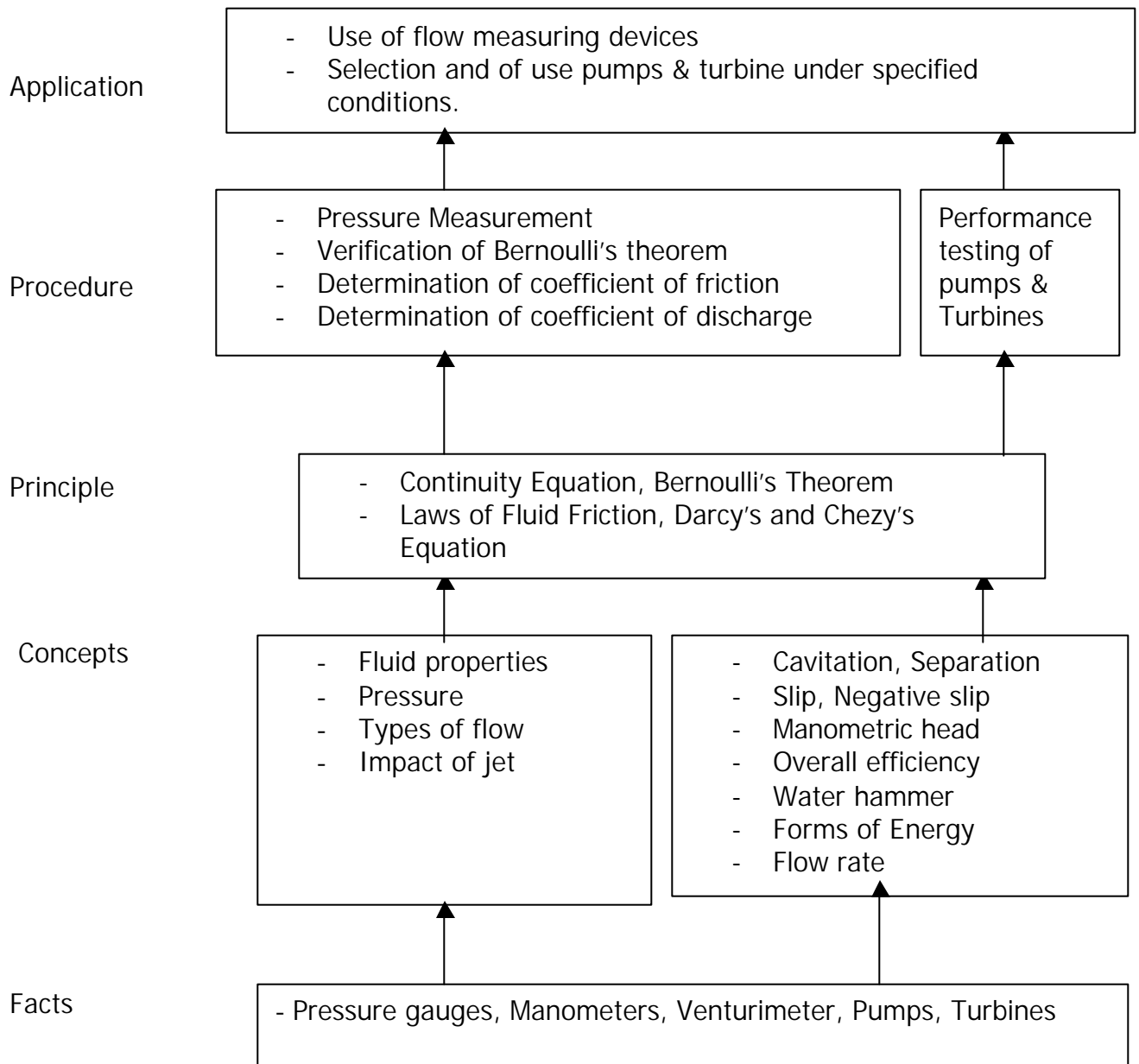
The fundamentals of this subject are essential for the subject " Industrial Fluid Power" in sixth semester.

Objectives:

The student will be able to

- 1) Measure various properties such as pressure, velocity, flow rate using various instruments.
- 2) Calculate different parameters such as co-efficient of friction, power, efficiency etc of various systems.
- 3) Describe the construction and working of turbines and pumps.
- 4) Test the performance of turbines and pumps .
- 5) Plot characteristics curves of turbines and pumps .

Learning Structure:



Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	Properties of fluid 1.1 Density, Specific gravity, Specific Weight, Specific Volume 1.2 Dynamic Viscosity, Kinematic Viscosity, Surface tension, Capillarity 1.3 Vapour Pressure, Compressibility	04	04
02	Fluid Pressure & Pressure Measurement 2.1 Fluid pressure, Pressure head, Pressure intensity 2.2 Concept of absolute vacuum, gauge pressure, atmospheric pressure, absolute pressure. 2.3 Simple and differential manometers, Bourden pressure gauge. 2.4 Concept of Total pressure on immersed bodies, center of pressure. Note: Numericals on Manometers, Total Pressure & Centre of pressure	09	12
03	Fluid Flow 3.1 Types of fluid flows 3.2 Continuity equation 3.3 Bernoulli's theorem 3.4 Venturimeter – Construction, principle of working, Coefficient of discharge, Derivation for discharge through venturimeter. 3.5 Orifice meter – Construction, Principle of working, hydraulic coefficients, Derivation for discharge through Orifice meter 3.6 Pitot tube – Construction, Principle of Working Note :- Numericals on Venturimeter, orifice meter, pitot tube	09	12
04	Flow Through Pipes 5.1 Laws of fluid friction (Laminar and turbulent) 5.2 Darcy's equation and Chezy's equation for frictional losses. 5.3 Minor losses in pipes 5.4 Hydraulic gradient and total gradient line. 5.5 Hydraulic power transmission through pipe Note: Numericals to estimate major and minor losses	05	08
05	Impact of jet 4.1 Impact of jet on fixed vertical, moving vertical flat plates.	09	10

	<p>4.2 Impact of jet on curved vanes with special reference to turbines & pumps</p> <p>Note - Simple Numericals on work done and efficiency</p>		
06	<p>Hydraulic Turbines</p> <p>6.1 Layout of hydroelectric power plant.</p> <p>6.2 Features of Hydroelectric power plant.</p> <p>6.3 Classification of hydraulic turbines.</p> <p>6.4 Selection of turbine on the basis of head and discharge available</p> <p>6.5 Construction and working principle of Pelton wheel, Francis and Kaplan turbine.</p> <p>6.6 Draft tubes – types and construction, Concept of cavitation in turbines</p> <p>6.7 Calculation of Work done, Power, efficiency of turbine.</p>	10	14
07	<p>A] Centrifugal Pumps</p> <p>7.1 Construction , principle of working and applications</p> <p>7.2 Types of casings and impellers.</p> <p>7.3 Concept of multistage</p> <p>7.4 Priming and its methods, Cavitation</p> <p>7.5 Manometric head, Work done, Manometric efficiency, Overall efficiency, NPSH</p> <p>7.6 Performance Characteristics of Centrifugal pumps</p> <p>7.7 Trouble Shooting</p> <p>7.8 Construction, working and applications of submersible, jet pump</p> <p>Note :- Numericals on calculations of overall efficiency and power required to drive pumps.</p> <p>B] Reciprocating Pump</p> <p>7.9 Construction ,working principle and applications of single and double acting reciprocating pumps</p> <p>7.10 Concept of Slip, Negative slip, Cavitation and separation</p> <p>7.11 Use of Air Vessel</p> <p>7.11 Indicator diagram with effect of acceleration head & frictional head</p> <p>Note:- No Derivations and Numericals on reciprocating pumps.</p>	10	12
		08	08
Total		64	80

Practical:

Skills to be developed:

Intellectual Skills:

- 1) Select and use appropriate flow measuring device.
- 2) Select and use appropriate pressure measuring device.
- 3) Analyze the performance of pumps and turbines

Motor Skills:

- 1) Use flow measuring device.
- 2) Use pressure measuring device.
- 3) Operate pumps and turbines.

List of Practical:

01. Calibration of Bourden pressure gauge with the help of Dead Weight Pressure gauge.
02. Verification of Bernoulli's Theorem.
03. Determination of Coefficient of Discharge of Venturimeter.
04. Determination of Coefficient of Discharge, coefficient of contraction and coefficient of velocity of orifice meter.
05. Determination of coefficient of friction of flow through pipes.
06. Trial on Pelton wheel to determine overall efficiency.
07. Trial on centrifugal pump to determine overall efficiency.
08. Trial on reciprocating pump to determine overall efficiency.

Learning Resources:

Books:

Sr. No.	Author	Title	Publication
01	Ramamrutham S.	Hydraulic, fluid mechanics & fluid machines	Dhanpat Rai and Sons New Delhi
02	Modi P. N. and Seth S. M.	Hydraulics and fluid mechanics including Hydraulic machines	Standard Book House. New Delhi
03	Streeter Victor, Bedford K.W., Wylie E.B	Fluid Mechanics	McGraw Hill Int.
04	K. Subramanya	One Thousand Solved Problems in Fluid Mechanics	Tata McGraw Hill
05	Pump manufactures' catalogs such as Kirloskar Brothers, KSB, Kishor pumps etc.		