

COURSE NAME : DIPLOMA IN MECHANICAL ENGINEERING

COURSE CODE : ME/PT/PG/MH/MI/FE

SEMESTER/YEAR : SIXTH

SUBJECT TITLE : INDUSTRIAL FLUID POWER

SUBJECT CODE :

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
4	--	2	3	100	---	25#	25@	150

- External

@ - Internal

* On Line Examination

TH- Theory, PR- Practical, OR- Oral, TW- Term work

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 100 and to be entered in mark sheet under the head Sessional Work. (SW)**

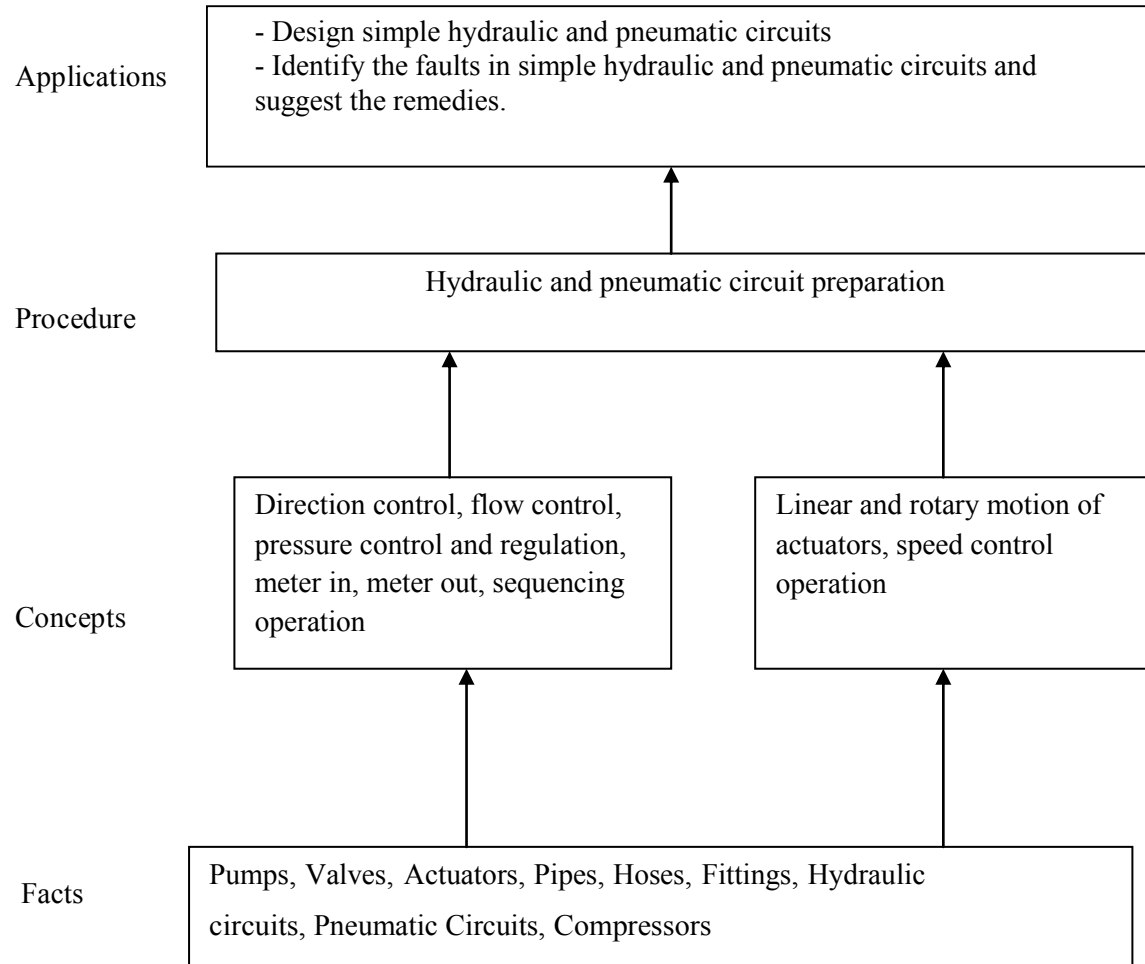
Rationale:

Oil hydraulic systems & pneumatic systems are widely used in all fields of engineering as clean source of motive power. Low cost automation systems with the use of pneumatics have become popular as manufacturing aids. Diploma engineers come across such systems in all the segments of industries. This subject will give the students, the basic skills and knowledge of oil hydraulics and pneumatics which will be directly needed in the industrial environment.

General Objectives: The student will be able to

- 1) identify various components of hydraulic & pneumatic systems.
- 2) know the working principle of various components used in hydraulic & pneumatic systems.
- 3) select appropriate components required for simple hydraulic and pneumatic circuits.
- 4) list the probable causes of faults or defects in the hydraulic & pneumatic circuits.

Learning Structure:



Theory:

Topic and Contents	Hours	Marks
<p>1. Basics of oil hydraulic systems</p> <p style="text-align: right;">24 marks</p> <p>Specific Objectives:</p> <ul style="list-style-type: none">➤ Identify various components in simple oil hydraulic circuits.➤ List the types of various components in simple oil hydraulic circuits.➤ Explain the construction and working principle of various components in simple oil hydraulic circuits. <p>Contents</p> <ul style="list-style-type: none">• General layout, Applications, Merits and limitations of oil hydraulic systems• Overview of essential properties of oils used in oil hydraulic circuits• Construction, working principle, applications and symbols of Vane pump, gear pump, Gerotor pump, screw pump, piston pump	18	24

<p>2. Hydraulic valves, actuators and accessories 24 Marks</p> <p>➤ Select valves, actuators and accessories for the given application of hydraulic circuit.</p> <ul style="list-style-type: none"> • Valves Construction, principle of working and symbols of Pressure control valves – pressure relief valve -direct, pilot operated , pressure reducing, pressure unloading, Sequence valves, counter balancing Direction control valves – Poppet valve, spool valve, 2/2, 3/2, 4/2, 5/3, methods of actuation. Types of different center positions. check valves, pilot operated check valves Flow control valves – pressure compensated, non pressure compensated flow control valve, • Actuators Classification of actuators Construction, working principle and symbols of Rotary Actuators - Hydraulic motors Linear Actuators – Cylinders - single acting, double acting, and their subtypes. Different mounting methods. • Accessories Construction, working principle and symbols of Pipes, Hoses, Fittings, Oil filters, Seals and gaskets, Accumulators 	18	24
<p>3. Oil hydraulic Circuits 16 marks</p> <p>Specific Objectives:</p> <p>➤ Draw layout of oil hydraulic circuits.</p> <p>➤ Explain working of oil hydraulic circuits.</p> <p>➤ Develop oil hydraulic circuit for different applications.</p>	08	12

<p>Contents:</p> <ul style="list-style-type: none"> • ‘Meter in’ , ‘Meter out’ , ‘Bleed off’ , Unloading , two cylinder synchronizing, regenerative, counterbalance , dual pump unloading circuits. • Sequencing circuit – time dependent and pressure dependent • Oil hydraulic circuits for milling machine, shaper machine, 		
<p>3. Introduction to and components of pneumatic systems 12 marks</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Identify various components in simple pneumatic circuits. ➤ List the types of various components in simple pneumatic circuits. ➤ Explain the construction and working principle of various components in simple pneumatic circuits. <p>Contents:</p> <ul style="list-style-type: none"> • Applications of pneumatic systems • General layout, merits and limitations of pneumatic systems • Selection of air compressors for pneumatic circuits • Valves <ul style="list-style-type: none"> • Construction, principle of working and symbols of • Pressure regulating valves, Direction control valves, Flow control valves • Actuators <ul style="list-style-type: none"> • Construction, working and symbols of • Rotary Actuators - Pneumatic motors • Linear Actuators – Cylinders - single acting, double acting. • Accessories <ul style="list-style-type: none"> ○ Construction, working and symbols of Pipes, Hoses, fittings, FRL unit 	14	24

4. Pneumatic Circuits	12 marks		
Specific Objectives:			
➤ Draw layout of simple pneumatic circuits.			
Contents:			
<ul style="list-style-type: none"> • Speed control circuits for double acting cylinder and bidirectional air motor • Sequencing circuits - Position based sequencing circuit and time delay circuit 		08	16
Total		64	100

Practical:

Skills to be developed:

Intellectual Skills:

1. Prepare simple oil hydraulic & pneumatic circuits.
2. Compare the performance of oil hydraulic & pneumatic systems.
3. Identify the faults & suggest remedies in oil hydraulic & pneumatic circuits.
4. Select proper circuit for given application.

Motor Skills:

1. Connect different components in oil hydraulic or pneumatic circuit as per given drawing.
2. Perform repairing and / or replacement of defective components in the oil hydraulic or pneumatic circuit.
3. Draw the oil hydraulic and pneumatic circuits using symbols.

List of Practicals:

- 1) Assemble meter in and meter out oil hydraulic circuits and compare its working.
- 2) Assemble sequencing circuit and list its applications.
- 3) Assemble quick return mechanism oil hydraulic circuit for shaper machine.
- 4) Assemble pneumatic circuit for speed control of double acting cylinders.
- 5) Assemble pneumatic circuit for speed control of pneumatic motor and measure the speed of motor.
- 6) Study of trouble shooting procedures of various hydraulic and pneumatic circuits.
- 7) Selection of circuit components for simple oil hydraulic circuits such as circuits used for

milling machine, shaper machine.

[Note – For practical no 1 – 5, the practical batch shall be divided in two groups.]

Assignments -

- 1) Market survey of oils used for oil hydraulic circuits - collection of name of manufacturers, detailed technical specifications, trade names, costs, packing sizes
- 2) Study of any one mobile hydraulic system such as in earth moving equipments or any one stationary hydraulic system such as in any machine tool and its detailed report.
- 3) Study of any pneumatic circuit such as circuits used in special purpose machines, low cost automation systems, material handling systems. and its detailed report.

[Assignments to be completed in a group of (max.) four students.]

Learning Resources:

1. Books:

Sr. No.	Author	Title	Publisher
01	Majumdar S.R	Oil Hydraulic system- Principles and maintenance	Tata McGraw Hill
02	Majumdar S.R	Pneumatics Systems Principles and Maintenance	Tata McGraw Hill
03	Joji B.	Pneumatic Controls	Wiley India Pub.
04	Stewart	Hydraulics and Pneumatics	Taraporewala Publication

2. Catalogues:

Various system components' manufacturers' catalogues.

3. CDs:

CDs developed by various system components' manufacturers.