

B.E Semester: VIII
Automobile Engineering

Subject Name: Elective-II: Automotive hydraulics and pneumatics (AE805D)

Course Objective:

- To present a problem oriented in depth knowledge of automotive hydraulics and pneumatics.
- To address the underlying concepts and methods behind automotive hydraulics and pneumatics.

Teaching / Examination Scheme:

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
		L	T	P	Total		THEORY		IE	CIA	PR. / VIVA	
CODE	NAME	Hrs	Hrs	Hrs	Hrs	Hrs	Marks	Marks	Marks	Marks	Marks	
AE805D	Elective-II: automotive hydraulics and pneumatics	4	0	0	4	4	3	70	30	20	-	120

Detailed Syllabus:

Topic no	Details
1	Introduction to fluid power: Types of hydraulic fluids , functions of hydraulic fluids, specification of oil as per iso, lubrication capability, demulsibility, additives in hydraulic fluids, factors influencing the selection of a fluid, advantages of a fluid power system, basic components of a hydraulic system, basic components of a pneumatic system, comparison of different power systems, effect of temperature on fluids. Governing principles and laws: Pascal's law, force power and force displacement relations , practical applications of pascal's law and evaluate the parameters ,types, properties, selection. additives, effect of temperature and pressure on hydraulic fluid. seals, sealing materials, compatibility of seal with fluids. types of pipes, hoses, material, quick acting couplings. pressure drop in hoses/pipes. fluid conditioning through filters, strainers, sources of contamination and contamination control, heat exchangers.
2	Distribution of fluid power and hydraulic power: Selection of hydraulic conductors , burst pressure and working pressure, common types of fittings used in fluid power , hoses used in fluid power , the use of rotary joints and quick couplings , Typical specification of a hydraulic pipe, flared fitting and compression fitting, factors influencing the selection of hoses. Classification of Pumps based on- displacement , delivery and motion , Differences between positive displacement pumps and non-positive displacement with Performance curves, working and construction of gear, vane and piston pumps, mechanical, volumetric and overall efficiency of pumps (numerical treatment), performance parameters of gear, vane and piston pumps.
3	Hydraulic actuators: Classification, types of hydraulic cylinders - single-acting cylinders, gravity-return single-acting cylinder, spring-return single-acting cylinder, double-acting cylinder,

	telescopic cylinder, tandem cylinder, graphical symbols of different linear actuators, classification of dcvs based fluid path, classification of dcvs based on the control method, classification of dcvs based on the construction of internal moving parts of check valves. shuttle valves, two-way valves, three-way valves. Four-way valves. Advantages of a poppet valve and Disadvantages, graphic symbols for various types of direction control valves, and its applications, working principle of solenoid-actuated valves.
4	Hydraulics circuit: Control of a Single-Acting and Double-Acting Hydraulic Cylinder Hydraulic Cylinder, Regenerative Cylinder Circuit, Load-Carrying Capacity During Extension, Pump-Unloading Circuit, Double-Pump Hydraulic System, Counterbalance Valve Application, Hydraulic Cylinder Sequencing Circuits, Locked Cylinder Using Pilot Check Valves, Cylinder Synchronizing Circuits, Speed Control of a Hydraulic Cylinder
5	Pneumatics: Principle of Pneumatics: Laws of compression, types of compressors, selection of compressors, Comparison of Pneumatics with Hydraulic power transmissions, Types of filters, regulators, lubricators, mufflers, dryers, Pressure regulating valves, Direction control valves, two way, three way, four way valves. Solenoid operated valves, push button, Pneumatic actuators-rotary, reciprocating. Air motors- radial piston, vane, axial piston ,Basic pneumatic circuit, Direct and indirect control of single and double acting cylinder.
6	Typical automotive applications: Hydraulic tipping mechanism, power steering, fork lift hydraulic gear, hydro-pneumatic suspension (Air suspension), Clutch actuating System, Pneumatic circuit to control the door of vehicle, air brake and maintenance and trouble shooting of pneumatic circuits Accumulators: Types, applications of accumulators. Accumulator as a hydraulic shock absorber

Lesson Planning:

Sr. No.	Date/Week	Unit No.	% Weightage	Topic No
1	1 st ,2 rd ,3 rd	Unit 1	20 % .	1
2	4 th ,5 th ,6 th	Unit 2	20 %	2
3	7 th ,8 th ,9 th	Unit 3	20 %	3
4	10 th ,11 th ,12 th	Unit 4	20 %	4
5	13 th ,14 th ,15 th	Unit 5	20 %	5,6

Instructional Method & Pedagogy:

- At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
- Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
- One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.

- Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
- Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.

Students Learning Outcomes

- The student can identify different areas of automotive hydraulics and pneumatics.
- Can find the applications of all the areas in day to day life.

Recommended Study Materials

Text & Reference Books:

1. Pneumatic Systems, S. R. Majumdar, Tata McGraw Hill 1996.
2. Oil Hydraulics- Principle and Maintenance, S. R Majumdar, Tata McGraw Hill 2002.
3. Industrial Hydraulics, J. J. Pipenger, McGraw Hill
4. Industrial Fluid Power, Pinches, Prentice hall
5. Basic Fluid Power, D. A. Pease, Prentice hall
6. Hydraulics and Pneumatics, H. L. Stewart, Industrial Press

