Course Code	Course/Subject Name	Credits
MEDLO7033	**Pumps, Compressors and Fans**	**4**

Objectives

1. To study of Different types of Pumps, Compressors & Fans
2. To familiarise design aspects of Pumps, Compressors & Fans

Outcomes: Learner will be able to…

1. Select suitable Pump
2. Design a reciprocating pump and analyse its performance
3. Design a centrifugal pump and analyse its performance
4. Demonstrate basic principles of fans and blowers
5. Design fan/blower and analyse its performance
6. Design a compressor and analyse its performance

Module	Detailed Contents	Hrs.
01	**Introduction to Fluid Machinery:** Introduction to pumps, Introduction to blowers and compressors, Basic equations of energy transfer between fluid and rotor, Performance characteristics, Dimensionless parameters, Specific speed, stage velocity triangles, work and efficiency.	04
02	**Reciprocating Pumps and Centrifugal Pumps:** Introduction: Types, Component and Working of Reciprocating pump and Centrifugal Pumps, Discharge, Work done and power required to drive for single acting and double acting, Coefficient of discharge, slip, Effect of acceleration of piston on velocity and pressure, indicator diagram, Air Vessel, Operating characteristics.	06
03	**Design & Analysis of Pumps:** Design procedure and design optimization of Pumps, selection of pumps, Thermal design- Selection of materials for high temperature and corrosive fluids, Hydraulic design- Selection of impeller and casing dimension using industrial manuals	08
04	**Introduction to Fans, Blowers and Compressors:** Classification of blowers, Basics of stationary and moving air, Eulers characteristics, velocity triangles and operating pressure conditions, Equations for blowers, Losses and hydraulic efficiency, flow through impeller casing, inlet nozzle, Volute, diffusers, leakage, mechanical losses, surge and stall, Applications of blowers and fans **Compressors:** Basic theory, classification and application, Working with enthalpy-entropy diagram	06
05	**Design and Analysis of Fans and Blowers:** Rotor design airfoil theory, vortex theory, cascade effects, degree of reaction, Design procedure for selection and optimization of Blowers. Stage pressure rise, stage parameters and design parameters, Design of impeller and casing dimension in aerodynamic design	06
06	**Design & Analysis of Compressors:** Construction and approximate calculation of centrifugal compressors, impeller flow losses, slip factor, diffuser analysis, performance curves of centrifugal compressors, Basic design features of axial flow compressors; velocity triangles, enthalpy-entropy diagrams, stage losses and efficiency, work done factor, simple stage of axial flow compressors	06

Assessment:

Internal Assessment for 20 marks:

Consisting **Two Compulsory Class Tests**

First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)

End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of total **six questions**, **each carrying 20 marks**
2. **Question 1** will be **compulsory** and should **cover maximum contents of the curriculum**
3. **Remaining questions will be mixed in nature** (for example if Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only **Four questions need to be solved**.

Reference Books:

1. Principles of Turbo machinery by Shepherd, D.G., Macmillan
2. Centrifugal Pump Design by John Tuzson, John Wiley
3. Blowers and Pumps by Stepanff, A.J., John Wiley and Sons Inc.
4. Centrifugal pumps and blowers by Austin H. Chruch, John Wiley and Sons
5. Centrifugal Pumps Design and Applications by Val S.Labanoff and Robert Ross, Jaico P House
6. Pump Hand Book by Igori Karassik, McGraw-Hill International Edition
7. Pumps by G.K.Sahu, New age international
8. Turbine, Compressors and Fans by S.M.Yahya, Tata Mc-Graw Hill Publishing Company
9. Fluid Mechanics and Hydraulic Machines by R. K. Bansal, Laxmi Publication
10. Gas Turbines by V. Ganeshan, Tata Mc-Graw Hill Publishing Company
11. Steam and Gas Turbine by R. Yadav,Central Publishing House, Allahabad