

Course No.	Course Name	L-T-P-Credits	Year of Introduction
ME206	FLUID MACHINERY	2-1-0-3	2016
Prerequisite: ME203 Mechanics of Fluids			
Course Objectives:			
<ol style="list-style-type: none"> 1. To acquire knowledge on hydraulic machines such as pumps and turbines 2. To understand the working of air compressors and do the analysis 			
Syllabus			
Impact of jets, Hydraulic Turbines, Rotary motion of liquids, Rotodynamic pumps, Positive displacement pumps, , Compressors			
Expected outcome: At the end of the course the students will be able to			
<ol style="list-style-type: none"> 1. Discuss the characteristics of centrifugal pump and reciprocating pumps 2. Calculate forces and work done by a jet on fixed or moving plate and curved plates 3. Know the working of turbines and select the type of turbine for an application. 4. Do the analysis of air compressors and select the suitable one for a specific application 			
Text Books:			
<ol style="list-style-type: none"> 1. Som, Introduction to Fluid Mechanics and Fluid Machines ,McGraw Hill Education India 2011 2. Bansal R. K., A Textbook of Fluid Mechanics and Hydraulic Machines, Laxmi Publications,2005. 			
Reference Books:			
<ol style="list-style-type: none"> 1. Cengel Y. A. and J. M. Cimbala, Fluid Mechanics, Tata McGraw Hill, 2013 2. Yahya S. M, Fans, Blower and Compressor, Tata McGraw Hill, 2005. 3. Shepherd D. G, Principles of Turbo Machinery, Macmillan, 1969. 4. Stepanoff A. J, Centrifugal and Axial Flow Pumps, John Wiley & Sons, 1991. 5. Rajput R. K, Fluid Mechanics and Hydraulic Machines, S. Chand & Co.,2006. 6. Subramanya, Fluid mechanics and hydraulic machines, 1e McGraw Hill Education India,2010 			

Estd.

2014

Course Plan			
Module	Contents	Hours	Sem. Exam Marks
I	Impact of jets: Introduction to hydrodynamic thrust of jet on a fixed and moving surface (flat and curve),– Series of vanes - work done and efficiency Hydraulic Turbines : Impulse and Reaction Turbines – Degree of reaction – Pelton Wheel – Constructional features - Velocity triangles – Euler’s equation – Speed ratio, jet ratio and work done , losses and efficiencies, design of Pelton wheel – Inward and outward flow reaction turbines- Francis Turbine – Constructional features – Velocity triangles, work done and efficiencies.	7	15%
II	Axial flow turbine (Kaplan) Constructional features – Velocity triangles- work done and efficiencies – Characteristic curves of turbines – theory of draft tubes – surge tanks – Cavitation in turbines – Governing of turbines – Specific speed of turbine , Type Number– Characteristic curves, scale Laws – Unit speed – Unit discharge and unit power.	7	15%
FIRST INTERNAL EXAM			
III	Rotary motion of liquids – free, forced and spiral vortex flows Rotodynamic pumps- centrifugal pump impeller types,-velocity triangles-manometric head- work, efficiency and losses, H-Q characteristic, typical flow system characteristics, operating point of a pump. Cavitation in centrifugal pumps- NPSH required and available- Type number-Pumps in series and parallel operations. Performance characteristics- Specific speed-Shape numbers – Impeller shapes based on shape numbers.	7	15%
IV	Positive displacement pumps- reciprocating pump – Single acting and double acting- slip, negative slip and work required and efficiency- indicator diagram- acceleration head - effect of acceleration and friction on indicator diagram – speed calculation- Air vessels and their purposes, saving in work done to air vessels multi cylinder pumps. Multistage pumps-selection of pumps-pumping devices-hydraulic ram, Accumulator, Intensifier, Jet pumps, gear pumps, vane pump and lobe pump.	7	15%
SECOND INTERNAL EXAM			
V	Compressors: classification of compressors, reciprocating compressor-single stage compressor, equation for work with and without clearance volume, efficiencies, multistage compressor, intercooler, free air delivered (FAD)	7	20%
VI	Centrifugal compressor-working, velocity diagram, work done, power required, width of blades of impeller and diffuser, isentropic efficiency, slip factor and pressure coefficient, surging and chocking. Axial flow compressors:- working, velocity diagram, degree of reaction, performance. Roots blower, vane compressor, screw compressor.	7	20%
END SEMESTER EXAM			

Question Paper Pattern

Total marks: 100, Time: 3 hrs

The question paper should consist of three parts

Part A

4 questions uniformly covering modules I and II. Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B

4 questions uniformly covering modules III and IV. Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C

6 questions uniformly covering modules V and VI. Each question carries 10 marks

Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: In all parts, each question can have a maximum of four sub questions, if needed.

