Maulana Abul Kalam Azad University of Technology, West Bengal

(Formerly West Bengal University of Technology)

SYLLABUS FOR BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING

(Effective from academic session 2018-19)

Subject Code: C	**Category:** Professional Elective Courses
Subject Name: Turbo Machinery	**Semester**: Sixth
L-T-P: **3-0-0**	**Credit: 3**
Pre-Requisites: Fluid Mechanics and Fluid Machinery	

Course Objective:

To know about the basic characteristics of compressible and incompressible flow machines.
To learn about deriving dimensionless numbers through dimensional analysis.
To know about system of testing and performance analysis of turbo machines.

Course Content:

Module No.	Description of Topic	Contact Hours
1	**Introduction:** Classification: Incompressible and compressible flow machines; Radial, axial and mixed flow machines; Turbines vs pumps, fans and compressors. Applications: Water supply, ventilation, power generation, propulsion.	2
2	**Incompressible- Flow Machines:** i) Hydraulic Turbines: Headrace, penstock, nozzle, runner, draft tube and tail race; Gross head and net head; Velocity diagrams for impulse and reaction turbines; Discharge, head, power and efficiencies.	8
3	ii) Pumps: Reservoir, foot valve, suction line, pump, delivery line and overhead tank; Static head and losses; Velocity diagrams; Discharge, head, power and efficiencies.	8
4	**Compressible-Flow Machines:** Static and stagnation states; Isentropic and adiabatic expansion and compression processes; Nozzle, diffuser and rows of stationary and moving blades; Efficiencies.	8
5	**Dimensional Analysis:** Similarity laws, volume-flow, mass-flow head and power coefficients, pressure ratio, enthalpy ratio, Reynolds number, Mach number; Specific speed and machine selection.	4
6	**Testing and Performance Analysis:** Measurement devices; affinity laws and unit quantities. Set up and operating characteristics of pumps, turbines; fans and turbo-compressors. Cavitation– cause of cavitation and definition of Thoma's cavitation parameter, surge and choking.	6

Course Outcomes:

After completing this course, the students will

1. know basic characteristics of compressible and incompressible flow machines.
2. learn how to derive dimensionless numbers using dimensional analysis.
3. know about the method of testing and performance analysis of turbo machines.

Learning Resources:

1. S.M. Yahya, Turbine, Compressors and Fans, 4th Edition, McGraw Hill Education, 2017.
2. J. Lal, Hydraulic Machines, Metropolitan Book Co., New Delhi, 6th Edition, 2016.
3. S.K. Som, G. Biswas and S. Chakraborty, Introduction to Fluid Mechanics & Fluid Machines, McGraw Hill, 2017.
4. M.M. Das, Fluid Mechanics & Turbo Machines, PHI, 2010.
5. R.K. Bansal, Fluid Mechanics & Machinery, Laxmi Publications, 2018.
6. C. Ratnam, A.V. Kothapalli, Fluid Mechanics & Machinery, I.K. International Publishing House Ltd, 2010.
7. C.S.P. Ojha, R. Berndtsson and P.N. Chandramouli, Fluid Mechanics & Machinery, Oxford University Press, 2008.
8. S.C. Gupta, Fluid Mechanics and Hydraulic Machines, Pearson Publication, 2006.
9. A.T. Sayers, Hydraulic and Compressible Flow Turbomachines, McGraw-Hill, 1990.
10. R.K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications, 2018.
11. S.S. Rattan, Fluid Mechanics and Hydraulic Machines, Khanna Book Publications, 2016.
12. I.J. Karassic, J.P. Messina, P. Cooper and C.C. Heald, Pump Handbook, McGraw-Hill,New York, 2001.
13. V.M. Cherkassky, Pumps, Fans and Compressors, MIR Publication, Moscow, 1985.