



# PRINCIPLE OF HYDRAULIC MACHINES AND SYSTEM DESIGN

## PROF. PRANAB K. MONDAL

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### COURSE OUTLINE :

Principle of operation of hydraulic machines and their system design is important from the perspective of their huge applications in different industries. Present course introduces the students to the fundamentals of hydraulic machines. Starting from the operational principle, students will be gradually familiarized with different concepts like velocity triangle, net head developed, finally leading to the design of their system. Important topics such as design of pumping system of two dissimilar pumps, which find practical relevance as well, will also be discussed.

### ABOUT INSTRUCTOR :

Prof. Pranab K. Mondal is an Associate Professor in the department of Mechanical Engineering at Indian Institute of Technology Guwahati since May 2015. He received his undergraduate and postgraduate degree from Jadavpur University, Kolkata, and completed his Ph.D. from Indian Institute of Technology Kharagpur in 2015. He worked as a Research Associate at IIT Khargpur for nearly one year before joining IIT Guwahati. He has taught several courses, including Fluid Mechanics, Applied Thermodynamics, Thermodynamics, Fundamentals of Microfluidics, Experimental Methods in Fluid Mechanics to both undergraduate and post graduate students at IIT Guwahati. Among His principal research interest, encompassing the broad area of Microfluidics has covered various facets of microscale multiphase transport, electrokinetics, microscale transport of heat and experimental microfluidics. He is currently working on droplet-based microfluidics, magnetofluidics, experimental investigations of capillary filling of bio-fluids. He has co-authored more than 140 referred journal and conference publications. He is a regular reviewer of many reputed international journals and also associated with several sponsored projects pertaining to microscale phenomena.

### COURSE PLAN :

**Week-1:** Principle of operation of hydraulic machines

**Week-2:** Radial and axial flow pumps

**Week-3:** Cavitation in radial flow pump

**Week-4:** Radial flow pump operational issues

**Week-5:** Pump Design: Degrees of reaction

**Week-6:** Pump characteristics and system design

**Week-7:** Numerical problems of pumps (Radial and Axial flow)

**Week-8:** Positive displacement pump

**Week-9:** Hydraulic Turbine: Impulse Turbine

**Week-10:** Hydraulic Turbine: Reaction Turbine

**Week-11:** Cavitation in hydraulic reaction turbines

**Week-12:** Numerical problems of Turbines (Impulse and Reaction)