



# HYDRAULIC ENGINEERING

## **PROF. MOHAMMAD SAUD AFZAL**

Department of Civil Engineering

IIT Kharagpur

**PRE-REQUISITES** : Basic Fluid Mechanics

**INTENDED AUDIENCE** : Civil Engineering, Mechanical Engineering, Ocean Engineering

## **COURSE OUTLINE :**

Hydraulic engineering, as a sub-discipline of civil engineering, is concerned with the flow and conveyance of fluids. This course consists of the topic like viscous fluid flow, laminar and turbulent flow, boundary layer analysis, dimensional analysis, open channel flows, flow through pipes, and computational fluid dynamics. The objective of this course is to introduce various hydraulic engineering problems like open channel flows and hydraulic machines. In addition this course is a compulsory part of AICTE Civil Engineering curricula

## **ABOUT INSTRUCTOR :**

Prof. Mohammad Saud Afzal is an assistant professor in Department of Civil engineering, Indian Institute of Technology, Kharagpur. He is an established researcher in the field of Hydraulics and water resources. His research area focuses on Computational Fluid Dynamics, Hydraulics of sediment transport, Coastal Engineering and machine learning and artificial intelligence in Hydraulics. He is an alumnus of IIT Kanpur, Tu- Delft and Norwegian university of science and Technology (NTNU). He is known for his numerical analysis technique in the field of hydraulics and sediment transport.

## **COURSE PLAN :**

**Week 1:** Basics of Fluid Mechanics 1

**Week 2:** Basics of Fluid Mechanics 2

**Week 3:** Laminar and Turbulent Fluid Flow

**Week 4:** Boundary Layer Analysis

**Week 5:** Dimensional Analysis and Hydraulic Similitude

**Week 6:** Introduction to Open Channel Flow and Uniform Flow

**Week 7:** Non-Uniform Flow and Hydraulic Jump

**Week 8:** Pipe flow

**Week 9:** Pipe Networks

**Week 10:** Viscous Fluid Flow

**Week 11:** Computational Fluid Dynamics

**Week 12:** Introduction to Wave Mechanics ( Inviscid Flow)