☐ **Category-1:** Nil (for TEQIP Institutions)

☐ **Category-2:** ₹ 500.00 (for IIT Kharagpur Students)

☐ **Category-3:** ₹ 5000.00 (For Industry / Self Sponsored)

Payment should be made via demand draft drawn in favour of "**CEP-STC, IIT Kharagpur**", payable at Kharagpur

DEMAND DRAFT DETAILS	
Amount ₹	
Bank Name	
Place	
Branch Code	
DD No. & Date	

Declaration

The information provided is true to the best of my knowledge. If selected, I agree to abide by the rules and regulations of the course and shall attend the course for the entire duration without any failure.

Place _____

Date _____

_____

Signature of applicant

Please complete the details above and mail alongwith registration fee to:

Dr. Prashanth Reddy Hanmaiahgari
Department of Civil Engineering
IIT Kharagpur - 721302
Email: hpr@civil.iitkgp.ernet.in

About IIT Kharagpur

History

First in the chain of IITs to be set up by the Government of India, Indian Institute of Technology, Kharagpur started in 1951 in the erstwhile Hijli Detention Camp. It has now blossomed into one of the finest technical institutions in the world, with 585 faculty members in 19 Departments, 9 Centres, and 12 Schools offering 6 M.Sc. programmes, 5 Joint M.Sc. -Ph.D. programmes, 15 B.Tech (Hons.) programmes, 49 joint M.Tech. - Ph.D programmes, 2 M.Tech. programmes (in video-conferencing mode), 1 Master of City Planning programme, 1 Master of Medical Science and Technology programme, 1 LL.B. in Intellectual Property Rights programme, 34 Dual-Degree (both B.Tech and M.Tech) programmes, and 2 Management programmes. It also has MS, Ph.D, and D.Sc. programmes.

Location

Kharagpur is known world over for two landmarks. One, the longest railway platform, and the other, the Indian Institute of Technology, more commonly known as IIT. Situated about 120 km west of Kolkata, Kharagpur can be reached in about 2 hours by train from Howrah railway station of Kolkata or 3 hours by car from Kolkata Airport. Kharagpur is also connected by direct train services to most major cities of the country. The Institute is about 10 minutes drive (5 km) from the Kharagpur railway station. Private taxi, auto-rickshaw or cycle-rickshaw can be hired to reach the Institute.

Weather

Winter (October to February) is moderate and pleasant (10 to 25°C) in Kharagpur. Summer (March to June) is hot (25 to 40°C) and sometimes humid. Rains are normally confined to the months of June to September.

HYDRAULIC TRANSIENTS IN WATER CONVEYANCE SYSTEMS

Overview

Hydraulic transient is a pressure surge or wave resulting when a liquid or gas in motion is forced to change its momentum suddenly. Hydraulic transients occur in long liquid pipelines, pumping stations, hydropower stations and cooling water systems in thermal power plants. Hydraulic transient commonly occurs when a valve is closed suddenly or during a pump trip and a pressure wave propagates upstream and downstream in the pipe. The pressure wave can cause major problems, from noise and vibration to pipe bursting/buckling. It is possible to mitigate the effects of the hydraulic transients with air vessels, surge tanks, different types of valves and proper selection of pipe material. Hydraulic transients are analyzed by either lumped system which ignores compressibility of the fluid and elasticity of the pipe material, or by a distributed system modeling. The approximate sudden pressure rise or sudden pressure decrease can also be obtained by Joukowsky equation. Hydraulic transients have caused catastrophic accidents and as well as require costly repairs. An engineer must always investigate risk of potential severe hydraulic transients in liquid pipelines and try to eliminate them. The old saying "Prevention is better than cure" perfectly applies to hydraulic transients.

Course Schedule and Methods

October 7 – 9, 2015

10 AM – 12 AM and 1 PM – 5 PM with 1-hour lunch break in each day. 2-hour classes each in morning and afternoon. There is only one class from 10 AM to 12 AM on the last day. The course would consist of lecture sessions and discussions.

Important Dates

Last date for receiving application: September 24, 2015
Intimation to the applicants: September 27, 2015
Course duration: October 07 – 09, 2015

Goals and Objectives

- Exposing the participants to the fundamentals of hydraulic transients, strengths of pipes and pipe fittings, conservation of mass and momentum equations.
- To teach participants to solve basic equations by using different finite difference methods.
- To expose the participants to potential pressure transients to be initiated in pumping stations when stopping or starting of pumps and power failures.
- Providing exposure to participants on controlling transients using surge protection devices, such as air vessel, Surge relief valves, Volumetric tanks, and different types of non-return valves.
- To update the participants knowledge on types of non-return valves, valve characteristics, response of a check valve and proper choice of a check valve.
- The purpose of the lectures is to assist in learning the surge protection design process and the intricacies of design rather than provide step by step approach to design.

Venue

IIT Kharagpur and its extension centers at Bhubaneswar and Kolkata through online video lecture. All video-conferencing enabled classrooms at Kharagpur, Kolkata and Bhubaneswar are equipped with high definition video-conferencing system. Each of these acoustic treated air-conditioned video enabled classrooms with multiple HD cameras, document viewers and large display monitors permit teachers to conduct LIVE interactive sessions from Kharagpur with multiple remote classrooms at Kolkata and Bhubaneswar. 8 Mbps leased line connectivity of Kolkata and Bhubaneswar centers with Kharagpur ensure uninterrupted bi-directional lossless audio video transmission.

hpr@civil.iitkgp.ernet.in

Course Contents

1 Introduction to Hydraulic Transient Analysis

Permitted pressures in pipes; Maximum and minimum pressures; Pipe materials: Rigid and flexible pipes; Pipe linings; Causes of transients; Wave propagation and reflection; Requirement of water hammer analysis; Derivation of basic equations.

2 Method of Characteristics

Interpretation of wave velocity; Development of characteristics equations; Stability and convergence; Boundary conditions; Implicit finite difference methods; Use of variable wave speed method; Effect of pipeline elevation; Pipeline corrosion and resistance; Unsteady friction.

3 Unsteady flow analysis in pumping systems

Pump operations; Pump characteristics; Types of pumps; Power failure; Starting of multi pump operations; Fly wheels.

4 Transients Control

Air vessels; Surge tanks; Air valves; Surge relief valves; Volumetrictanks; Optimal transient control.

5 Valve Dynamics

Valve closures; Non-return valves, Terminal valves, Inline valves, automatic control valves; Consequences of unsuitable non-return valves; Different types of non-return valves; Surge pressures upstream of non-return valve; Non-return valve in a pumping station, Cavitation at valve and resulting transient; Non-return valves at different locations; Valve behavior.

Eligibility

Category -1 (AICTE Sponsored / TEQIP Sponsored):
Faculty from AICTE approved Colleges / Institutions / Universities.

Category – 2 (Student / Industry / others):
Executives, Engineers, Researchers from Industries, Govt. Organizations and R&D laboratories and Students at all levels (BTech / MTech / PhD) in Civil Engineering.

The Faculty

Dr. Prashanth Reddy Hanmaiahgari is an Assistant Professor in the Department of Civil Engineering, Indian Institute of Technology Kharagpur. His research interests include experimental and numerical modeling of flow in open channels and closed conduits, turbulence, sediment transport and river morphology. He is actively working on mitigating pressure surges in liquid pipelines with single phase and two phase (air and liquid) flows. A couple of research papers were already published and few are at review stage.

Registration Fees

Category-1: Nil (for TEQIP Institutions)

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To confirm participation please send the scanned copy of the Demand Draft to hpr@civil.iitkgp.ernet.in by 24th September, 2015 positively.

Accommodation

Outstation participants will be provided accommodation at IIT Kharagpur on self-payment basis as per availability on prior request.

Course Co-Ordinator

Dr. Prashanth Reddy Hanmaiahgari, PhD
Assistant Professor
Department of Civil Engineering
IIT Kharagpur, 721302
West Bengal, India
Phone: +91-3222-282420 (O)
Mobile: +91 943-420-0227
Email: hpr@civil.iitkgp.ernet.in

REGISTRATION FORM

KNOWLEDGE DISSEMINATION PROGRAMME

HYDRAULIC TRANSIENTS IN WATER CONVEYANCE SYSTEMS

October 7 – 9, 2015

Name .....

Date of Birth .....

Gender ☐ Male ☐ Female

Category ☐ Academic ☐ Student ☐ Professional
(Please enclose a bonafide certificate from your parent institution)

Organization .....

Address for Correspondence .....

.....

.....

Preferred location for attending .....

Phone .....

E-mail .....

Highest Academic Qualification .....

Experience (in years) .....

.....

.....

Accommodation Required (at IIT Kharagpur) ☐ Yes ☐ No