Program Description

Course Name	**Single-Phase Pipe Sizing & Pipe Networks**
Course Name as on Certificate	**Certification in Single-Phase Pipe Sizing & Pipe Networks**
Certificate Type	Certificate of Completion by IITM Pravartak and L&T EduTech
Certificate Issued by	IIT MADRAS and L&T EduTech
Course Objectives	**Course Overview:** This specific course entitled "Single-Phase Pipe Sizing & Pipe Networks" is intended to predict the pipe diameter based on the given process requirement when a single-path or multiple-path piping system is subjected to a single-phase fluid flow such as liquid or gas. The necessary concepts of single-phase fluid flow through pipes, pipe fittings, and valves are covered, and mathematical expressions are derived to understand the intricacy of the single-phase phenomena in piping systems for both steady and transient including surge and water hammer. Demonstrated the single-phase piping phenomena and optimum pipe diameter prediction by solving practical problems. **Course Objectives:** Enables the learner: • To Identify the single-phase flow regimes and determine the pressure drop in a straight pipe and pipe fittings using friction factor correlations as well as the Moody diagram. • To explain the various types of piping networks, pressure drop calculations in piping networks, headers, and branching pipelines, and predict the pressure drop in them. • To explain and analyze the transient and oscillatory fluid flow, surge, water hammer, steam hammer, and liquid flow through inclined pipes under gravity, predict the propagation time, and surge or water hammer and design the inclined pipe operates under gravity.
Eligibility	Students pursuing Diploma / UG / PG Programs in Mechanical/Chemical/Petro-Chemical/Petroleum/Instrumentation Engineering
Pre-Requisites	**Fluid Mechanics**
Target Segment	Students pursuing Diploma/ UG / PG Programs in Mechanical/Chemical/Petro-Chemical/Petroleum/Instrumentation Engineering, Faculties / Working Professionals in the above domain & other aspiring learners
Course Content	**See Enclosed Progamme details – as Annexure 1**

Pedagogy	Online Self-Paced E-Learning Content		
Assessment	One Final Assessment		
Programme Faculty	**Dr. Nakka Muralidhara Rao, Subject Matter Expert – L&T EduTech** As an alumni from IIT Kharagpur, Dr. Nakka Muralidhara Rao has nearly 3 decades of experience in the fields of thermal power plants, heat and mass transfer, fluid modeling and pipe design analysis. While serving as the Head of Rolta Academy, he was instrumental in its establishment as a world-class institution. Spearheaded the Project Control, Proposal & Estimation department. He also led the design and analysis of the Flame Deflector Plate for the Dissipation of Flume Gases in a Semi-Cryo Engine Test Facility, collaborating with ISRO for the Test Facility Centre in Mahendragiri, Tamil Nadu, while utilizing CFD (Computational Fluid Dynamics) analysis techniques.		
Duration	Units: 4 Hours: 9		
Class Schedule	Self-Paced		
Programme Highlights/USPs	**Single-Phase:** | Flow Regimes | Pressure Drop | Pressure Drop in Piping Components | Pressure Drop in Piping Network | Pressure Drop in Header & Branching Pipes | Transient Fluid Flow Analysis | Surge | Water Hammer | Gravity Flow of Liquids |		
Total Fees		**Total Fees (Rs.)**	
	Total Programme Fee	Rs.1,900 /- inclusive of Tax	

ANNEXURE 1

Proposed Course outline / programme / plan - Unit wise syllabus details:

Unit I - Single Phase: Flow Regimes & Pressure Drop
Flow Regimes: Single Phase: Laminar Flow, Single Phase: Turbulent Flow, Hydraulic Radius, Reynold's Number, Flow Regime Identification of Single Phase **Pressure Drop:** Bernoulli's Equation, Single Phase Pressure Drop in Pipe, Friction Factors Correlations **Problem Solving:** Problem Solving on Single-phase Fluid Flow Through Pipes, Moody Diagram, Problem Solving on Friction factor, Pressure drop & Pump power
Unit II- Single Phase: Pressure Drop through Piping Components & Problem Solving
Pressure Drop through Piping Components: Pressure Drop due to Sudden Enlargement, Pressure Drop due to Sudden Contraction, Pressure Drop through a Sharp-Edged Orifice, Pressure Drop through a Nozzle, Pressure Drop through a Venturi, Pressure Drop at Exit and Entry of Pipeline, Pressure Drop in Valves **Problem Solving:** Problem Solving on Pressure Drop of a Piping System Using **Crane** Method, and Pressure Drop in Fittings, Problem Solving on Major losses & Minor Losses
Unit III - Single-Phase Pressure Drop in Piping Networks and Header & Branching Pipes
Pressure Drop in Piping Network: Pressure Drop Calculation when Pipes are Parallel, Problem Solving - Calculating flow rate by using continuity equation, Problem Solving - Calculating flow rate by using modified Bernoulli equation, Pressure Drop Calculation when Pipes are in Series. **Problem Solving:** Problem Solving on Elevation head difference to maintain the flow rate, and Determination of Flow Rate in Pipe Network, Problem Solving on Pipe network using HCM **Pressure Drop in Header & Branching Pipes:** Pressure Drop calculation in Header Pipe, Problem Solving 0n Head loss in Headers, Pressure Drop in Branching Pipes **Problem Solving:** Problem Solving on Flow rate & Elevations in Network

Unit IV - Transient Analysis, Water & Steam Hammer, Gravity Flow
Transient Fluid Flow Analysis: Fluid Flow Analysis: Transient & Oscillatory **Water Hammer:** Introduction, Transient - Liquid Propagative Flow **Problem Solving:** Problem Solving on Types of Transient, Transient - Water Hammer, Problem Solving on Influence of the Water Hammer, Transient - Single to Two-Phase, Steam Hammer **Gravity Flow of Liquids:** Flow Rate in Fully Filled Sloped Pipe, Flow Rate in Partly Filled Sloped Pipe **Problem Solving:** Problem Solving on Gravity Driven Flows