JECRC Foundation

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTER

Class – B.Tech Civil (IV SEM)
Subject –Hydraulics Engineeging
Unit – 1
Presented by – Ashish Boraida (Assistant Professor)

VISION AND MISSION OF INSTITUTE

VISION OF INSTITUTE

To became a renowned centre of outcome based learning and work towards academic professional ,cultural and social enrichment of the lives of indivisuals and communities

MISSION OF INSTITUTE

Focus on evaluation of learining ,outcomes and motivate students to research apptitude by project based learning.

- Identify based on informed perception of indian ,regional and global needs ,the area of focus and provide plateform to gain knowledge and solutions.
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- Offer oppurtunites for interaction between academic and industry .
- Develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders may emerge.

VISION AND MISSION OF DEPARTMENT

Vision

To become a role model in the field of Civil Engineering for the sustainable development of the society.

Mission

1)To provide outcome base education.

2)To create a learning environment conducive for achieving academic excellence.

3)To prepare civil engineers for the society with high ethical values.

Introduction, Objective and Outcome of Fluid Mechanics

Objective:

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The primary purpose of the study of Fluid mechanics is to develop the capacity to understand important basic terms used in fluid mechanics, understand hydrostatics and buoyancy with practice of solving problems. Student could be able to understand Kinematics of flow and fluid dynamics, Bernoulli's equation and laminar flow with practice of solving problems in practical life for the benefit of society and mankind.

Outcomes

- Student will be able to understand Dimensional, Model Analysis and Turbulent Flow with problems.
- Student will be able to understand variable Flow in open channels , Gradually and Rapidly Varied Flow.
- Student will be able to understand Impact of Jets and hydraulic machines
- Student will be able to understand Hydrology, Ground water and Canal Hydraulics.

CONTENTS

- Introduction
- Methods of Dimensional Analysis

Hydraulics Engineering

The branch of physical science that deals the study of fluids at rest or in motion.

- It has traditionally been applied in such areas as the design of canal, and dam systems.

- The aerodynamics of automobiles and sub- and supersonic airplanes;
and the development of many different flow measurement devices such as gas pump meters

Method of dimensional analysis:

Two methods are very important for dimensional analysis.

(1).Rayleigh`s method

(2).Buckingham`s π- theorem.

➢ *Rayleigh's Method*

- ***In this method, the expression for the variables in form of exponential equation and dimensionally homogeneous.***
- ***Let, Y is a variable, which depends on*** x_1, x_2 $, x_3$..... ***variables, then functional relationship may be written as:***

$$Y = f(x_1, x_2, x_3, ...)$$

- ***Where , Y=dependent variable,***

  x_1, x_2, x_3..... ***=independent variables, f=function.***

- ***This method is used for determining expressions for a variables which depends upon maximum three or four variables only..***

- ***If the number of independent variables becomes more than four, then it is very difficulty to find expression for the dependent variables.***

➢Method involves the following steps

- ***(1).Gather all the independent variables which govern variation of dependent variables.***
- ***(2).write the functional relationship with the given data***

$$Y = f\left(x_1, x_2, x_3, \ldots\ldots\right)$$

- ***(3).write the equation in terms of a constant with exponents(power) a,b,c.....***

$$Y = K\left(x_1^{\,a}, x_2^{\,b}, x_3^{\,c}, \ldots\ldots\right).$$

K is a dimensionless co- efficient and a,b,c....are the arbitrary powers.

- *(4).Apply principal of dimensional homogeneity, and put the dimensions(M,L,T) of variables on both sides of equation.*

- *(5).find out the values of exponents (a,b,c,...) by obtaining simultaneous equation.*

(6).put the value of exponents (a,b,c...) in the main equation and form the
dimensionless parameter by
grouping the variables with similar exponents..

➢ *Buckingham's π-Theorem*

- ***This method is minimized difficulties of Rayleigh's theorem....***
- ***It states, "If there are n numbers of variables (dependent and independent variables) in the physical phenomenon and if these variables m numbers of fundamental dimensions (M,L,T), then the variables may be grouped into (n-m) dimensionless terms"***

- ***This dimensionless term is known as π.***

- ***Let us consider a variable*** x_1 ***depends upon independent variables*** $x_2, x_3, \ldots\ldots X_n$

then the functional equation can be written as

$$x_1 = k\,(x_2, x_3, \ldots\ldots, x_n)$$

- ***The equation may be written in general form as***

$$f\,(x_1, x_2, x_3, \ldots\ldots, x_n) = c$$

➢*Procedure for selection of Repeating variables:*

- ***Number of repeating variables= no . of fundamental dimensions=m***
- ***The repeating variables should not be dependent variable.***
- ***It should not be dimensionless.***
- ***No two variables should have the same dimensions.***

- ***The repeating variables together must have the dimensions as MLT.***
- ***The repeating variables should be selected in such a way that***

(1).one variables contains geometric property as length, diameter, height, width, etc.

(2).other variables contains flow property as velocity ,acceleration etc.

(3).Third variables contains fluid property as dynamic viscosity, density, etc.

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Thank you!

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