

## 20CE3403-HYDRAULICS & HYDRAULIC MACHINES

<b>Offering Branches</b>	CE		
Course Category:	Professional Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20BS1101- Calculus and Linear Algebra 20BS1201- Differential Equations and Vector Calculus 20BS1304-Applied Mechanics 20CE3301 - Mechanics of Fluids	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

### Course Outcomes

Upon successful completion of the course, the student will be able to:

<b>CO1</b>	Understand, and apply the Specific energy concepts to <b>analyse</b> the Open channel flow	K4
<b>CO2</b>	Apply uniform and non-uniform flow concepts and design the most Economical sections	K3
<b>CO3</b>	Calculate the force exerted by a jet of water on various plates using impulse momentum principle	K3
<b>CO4</b>	Apply the concept of impulse momentum principle on turbines to analyse and select turbines.	K3
<b>CO5</b>	Apply the concept of impulse momentum principle on pumps to analyse the performance of pumps	K3

### Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
<b>CO1</b>	2	2	2	2	2	3	3					3	2	
<b>CO2</b>	2	2	2	2	2	2	2					2	2	
<b>CO3</b>	3	3	3	3	3	2	2					2	3	
<b>CO4</b>	2	2	2	2	2	2	2					2	2	
<b>CO5</b>	2	2	2	2	2	2	2					2	2	
<b>Avg.</b>	2	2	2	2	2	2	2					2	2	

1- Low

2-Medium

3-High

### Course Content

<b>UNIT-1</b>	<b>OPEN CHANNEL FLOW</b> Open channel flow – Types of flow – Velocity distribution in open channel – Energy Momentum correction factors – specific energy – Critical flow, Critical depth and its computation.	CO1
<b>UNIT-2</b>	<b>UNIFORM AND NON-UNIFORM FLOW</b> Uniform flow – Velocity measurement – Manning’s and Chezy’s formula –Most economical rectangular and trapezoidal sections-Rapidly varied flow- Hydraulic Jumps Energy dissipation. Gradually varied flow –dynamic equation of G.V.F	CO2
<b>UNIT-3</b>	<b>IMPULSE MOMENTUM PRINCIPLE</b> Application of momentum principle – Introduction to impact of jets on vanes – Stationary and moving, flat, inclined, curved vanes. velocity triangles.	CO3
<b>UNIT-4</b>	<b>HYDRAULIC TURBINES</b> Turbines – classification – Impulse and Reaction turbines – draft tube and cavitations – performance of turbines. Unit quantities, specific speed of turbines	CO4
<b>UNIT-5</b>	<b>CENTRIFUGAL PUMPS</b> Centrifugal pump Installation details-work done- manometric head-minimum starting speed, Multistage pumps-pumps in parallel-Specific speed of pumps.	CO5

### Learning Resources

<b>Text Books</b>	<ol style="list-style-type: none"> <li>1. P.N. Modi and S.M. Seth, Hydraulics and Fluid Mechanics and Hydraulic Machines,20/e, Standard Book House,2015.</li> <li>2. A.K. Jain, Fluid Mechanics, 12/e, Khanna publishers,2014.</li> <li>3. Dr.R.K.Bansal, A text of Fluid Mechanics and Hydraulic Machines</li> </ol>
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<b>Reference Books</b>	<ol style="list-style-type: none"><li>1. K. Subramanya, Hydraulic Machines, Tata McGraw Hill,2017.</li><li>2. L. Victor, Streeter and E. Benjamin Wylie, Fluid Mechanics, 9/e, Tata McGrawHill,2013.</li><li>3. M. Franck White, Fluid Mechanics, Tata McGraw Hill,2014.</li></ol>
<b>e-Resources&amp; other digital material</b>	<ol style="list-style-type: none"><li>1. <a href="https://nptel.ac.in/courses/112/104/112104117/">https://nptel.ac.in/courses/112/104/112104117/</a></li><li>2. <a href="https://nptel.ac.in/courses/112/103/112103249/">https://nptel.ac.in/courses/112/103/112103249/</a></li></ol>