Darbhanga College of Engineering



Course File

of

HYDRAULIC ENGINEERING (PCC-CE302)

Faculty Name:

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Assistant Professor

Department of Civil Engineering



विज्ञान एवं प्रावैधिकी विभाग Department of Science and Technology Government of Bihar

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Department of Civil Engineering

Darbhanga College of Engineering Darbhanga

Vision of Department

To bring forth competent engineers to serve national & multi-national industries and society and, encouraging them towards higher studies.

Mission of Department

- M1. To nurture graduates into competent and technologically capable professionals through motivated teaching-learning ambience and by collaborating with relevant industries.
- M2. To encourage graduates towards research and innovation in the field of civil engineering.

M3. To inculcate humanitarian ethical values in graduates through various socialcultural activities.

Program Educational Objectives (PEOs)

PEO1. The graduates will be able to demonstrate knowledge and skills of civil engineering to solve engineering problems related to structural design.

PEO2. The graduates will be able to function in the evolving research and development as design consultant in the relevant industry using modern software tools.

PEO3. The graduates will be able to showcase professional skills encompassing societal and ethical values.

Program Outcomes (POs):

PO1	Engineering knowledge : An ability to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to get the solution of the engineering problems.
PO2	Problem analysis: Ability to Identify, formulates, review research literature, and analyze complex engineering problems.
PO3	Design/development of solutions: Ability to design solutions for complex engineering problems by considering social, economical and environmental aspects.
PO4	Conduct investigations of complex problems: Use research-based knowledge to design, conduct analyse experiments to get valid conclusion.
PO5	Modern tool usage: ability to create, select, and apply appropriate techniques, and to model complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Ability to apply knowledge by considering social health,

	safety, legal and cultural issues.
PO7	Environment and sustainability: Understanding of the impact of the adopted engineering solutions in social and environmental contexts.
PO8	Ethics : Understanding of the ethical issues of the civil engineering and applying ethical principles in engineering practices.
PO9	Individual and teamwork: Ability to work effectively as an individual or in team, as a member or as a leader.
PO10	Communication: An ability to communicate clearly and effectively through different modes of communication.
PO11	Project management and finance: Ability to handle project and to manage finance related issue
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning.

Course Objectives

To introduce the students about various hydraulic engineering problems like open channel flows and hydraulic machines. At the completion of this course the students will be able to relate the theory and practical problems in hydraulic engineering.

Course Outcomes (Students will be able to)

- 1. Understand the boundary layer analysis and their separation.
- 2. Analyze the flow occurring in open channel and velocity distribution.
- 3. Evaluate energy equation and momentum equation with respect to uniform flow.
- 4. Understand characteristics of surface profile by graphical and numerical approach in non-uniform flow.
- 5. Create models related to hydraulic jump and web based modeling in water resource engineering.

CO-PO MAPPING

Cos	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	PSO1	PSO2
CO1	2	1	1	0	1	2	1	2	2	0	0	3	1	2
CO2	2	0	0	1	0	3	0	1	1	3	0	2	3	3
CO3	1	0	0	1	0	2	0	3	2	3	0	2	2	1
CO4	1	0	0	1	0	2	0	3	3	3	0	2	3	2
CO5	2	1	1	0	1	2	1	2	2	0	0	3	1	2

Syllabus:

PCC-CE302 Hydraulic Engineering	2L:0T:2P	3 credits
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Objectives:

To introduce the students to various hydraulic engineering problems like open channel flows and hydraulic machines. At the completion of the course, the student should be able to relate the theory and practice of problems in hydraulic engineering

Module 1: Boundary Layer Analysis-Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and Turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control.

Module 2: Introduction to Open Channel Flow-Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution of channel section.

Module 3: Uniform Flow-Continuity Equation, Energy Equation and Momentum Equation, Characteristics of uniform flow, Chezy's formula, Manning's formula. Factors affecting Manning's Roughness Coefficient "n .Most economical section of channel. Computation of Uniform flow, Normal depth.

Module 4: Non-Uniform Flow- Specific energy, Specific energy curve, critical flow, discharge curve Specific force Specific depth, and Critical depth. Channel Transitions. Measurement of Discharge and Velocity – Venturi Flume, Standing Wave Flume, Parshall Flume, Broad Crested Weir. Measurement of Velocity- Current meter, Floats, Hot-wire anemometer. Gradually Varied Flow-Dynamic Equation of Gradually Varied Flow, Classification of channel bottom slopes, Classification of surface profile, Characteristics of surface profile. Computation of water surface profile by graphical, numerical and analytical approaches. Direct Step method, Graphical Integration method and Direct integration method.

Module 5:Hydraulic Jump- Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel, length and height of jump, location of jump, Types, applications and location of hydraulic jump. Energy dissipation and other uses, surge as a moving hydraulic jump. Positive and negative surges.

Module 6: Computational Fluid Dynamics: Basic equations of fluid dynamics, Grid generation, Introduction to in viscid incompressible flow, Boundary layer flow as applicable to C.F.D. Hydro informatics: Concept of hydro informatics –scope of internet and web based modeling in water resources engineering.

Practical Work:

- 1. Flow Visualization
- 2. Studies in Wind Tunnel
- 3. Boundary Layer

- 4. Flow around an Aerofoil / circular cylinder
- 5. Uniform Flow
- 6. Velocity Distribution in Open channel flow
- 7. Venturi Flume
- 8. Standing Wave Flume
- 9. Gradually Varied Flow
- 10. Hydraulic Jump
- 11. Flow under Sluice Gate
- 12. Flow through pipes
- 13. Turbulent flow through pipes
- 14. Flow visualization
- 15. Laminar flow through pipes
- 16. Major losses / Minor losses in pipe

Text/Reference Books:

- 1. Hydraulics and Fluid Mechanics, P.M. Modi and S.M. Seth, Standard Book House
- 2. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.
- 3. Open channel Flow, K. Subramanya, Tata McGraw Hill.
- 4. Open Channel Hydraulics, Ven Te Chow, Tata McGraw Hill.
- 5. Burnside, C.D., "Electromagnetic Distance Measurement," Beekman Publishers, 1971.

		5th Se	emester	w.e.f:	
DAY	Dept	. 09:00-11:00	11:00-01:00	01:00-02:0	02.02.2.2
	EEE	CS	PS-I	01.00-02.0	02:00-5:00
MONDA	Y CE	EE-1	MOM	-	V. PE Lab
	CSE	REMIDAL CLASSES	DBMS		V. HE LAB
	ME	HT	F M/C		IVIOUC
	EEE	V. CS Lab	ADC		Interaction
TUESDAY	CE	H & WRE	HE	-	M Goo Test Lat
	CSE	AI	DBMS		REMIDAL CLASSE
	ME	MP	V.REMIDAL LAB	-	ALIVIIDAL CLASSE
	EEE	PE	CS	1	V/ DS LLab
WEDNESDA	AY CE	ADCS	MOM	1	V. FS-ILdD
	CSE	SWE	AI		V. DRMS Lab
	ME	HT	EIKT	1	C C DIVIS LaD
	ELE	REMIDAL CLASSES	PS-I	LUNCH	V. CSIah
THURSDAY	CE	GEO TECH-1	TRE	1	V FE-1LAP
	CSE	V. DBMS Lab	SWE	1	V. LE-I LAB
	ME	KOM	V. REMIDAL LAB		Jennar
	EEE	V. PE Lab	PE		N/ ADC lab
FRIDAY	CE	COI	ADCS	1	GEO TECH I
	LSE	PS	FLAT		Interchin
	IVIE	MP	F M/C	1	intership
	ELL	Intership	ADC	1	REMIDAL CLASSES
SATURDAY	CE	EE-1	TRE		V. H& W/RELAD
	LSE	PS	FLAT		MC 501
	I ME	КОМ	V. REMIDAL LAB		WIC JUL
	EEE	(5th Sem)			
SN	Subject	Faculty		ME (5th Se	m)
1	PS-1	Mr. Tabish Shanu	SN.	Subject	Faculty
2	CS	Mr. Saniay Kumar	1	HT	Mr. Madhav Ram
3	PE	Mr. Abhishek Sharma	2	F M/C	Mr. Prabhakar Kumar
4	ADC	Dr Ravi Ranjan	3	MP	Mr. Rajat Gupta
5	Intership	All Faculty	4	KOM	Mr. Prashant Kr. Singh
6	MOOC	All Faculty	3	EIKT	Mr. Prashant Kr. Singh
	CE (5th Sem)	0	MOOC	Mr. Vikash Kumar
SN.	Subject	Faculty	ex: 1	CSE (5th Ser	n)
1	MOM	Mr. Ravi Ranjan Kumar	SN.	Subject	Faculty
2	HE	Mr. Loknath Kumar	2	DBMS	Mr. Akhilesh Kumar
3	ADCS	Mr. S. S. Chhoudhary	2	SWE	Mr. Sunil Kumar Sahu
4	Geo Tech -I	Mr. Ahsan Rabbani	3	Al	Mr. Dhirendra Kumar
5	H & WRE	Mr. Prashant Kumar	4	FLAT	Mr. Ajit Kumar Gupta
6	EE-1	Mr. Jitendra Kumar	5	PS	
7	TE	Mr. Aditya Kumar	7	MOOC	Anand Kamal
8	COI	Mr. Loknath Kumar	0	Intership M	Mr. Sunil Kumar Sahu
19	Intership	All Faculty	0	MOOC N	Vir Anand Kamal
Torla	120				

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DCE Stanga

List of Students: Attached Lecture Notes: Attached Result: Awaited