

## Academic Course Description

<p><b>BHARATH UNIVERSITY</b>  Faculty of Engineering and Technology  Department of Civil Engineering</p> <p><b>BCE502 - APPLIED HYDRAULIC ENGINEERING</b>  <b>Fifth Semester, 2017 – 18 (Odd Semester)</b></p>
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### Course (catalog) description

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.

**Compulsory/Elective course** : Compulsory for Civil students

Credit / Contact hours : 3 credits / 45 hours

Course Coordinator : Mr.S.Rajesh, Assistant Professor

**Instructors** :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@bharathuniv.ac.in)	Consultation
Mr.S.Rajesh	Third year Civil-A& B	Civil Block		kaviyacivil@bharathuniv.ac.in	9.00 - 9.50 AM
Ms.B.Kaviya	Third year Civil-C & D	Civil Block			12.45 - 1.15 PM

### Relationship to other courses:

Pre –requisites : BCE 304 Fluid Mechanics

Assumed knowledge : Basic knowledge in Hydraulic machines

Following courses : BCE 5L2 Fluid Mechanics and Machinery Lab

### Syllabus Contents

#### UNIT I OPEN CHANNEL FLOW

9

Types of flow – State of Flow - Velocity distribution - Specific energy, specific force, critical flow computation - flow measurement. Chezy's and Manning's equation, Computation Uniform flow – Normal depth – Hydraulically best section.

#### UNIT II VARIED FLOW

9

Varied Flow- Rapid & Gradual - Dynamic equation characteristic of flow profiles – Classification of flow – Computation of the flow profiles – Direct step method - Canal transitions – Hydraulic Jump – Type of Jump, Location of Jumps – Energy losses in Jumps – Surges in Canal – Types of Surges.

#### UNIT III TURBINES

9

Rotodynamics Machinery Turbines: Classification of turbines -Work done - Efficiency of Turbines, Pelton Wheel, Francis turbine, Kaplan and propeller turbines. Similarity laws and specific speed. Performance of turbines - impact of free jets.

#### UNIT IV PUMPS

9

Rotodynamic Machinery Pumps: Classification of pumps –Centrifugal Pumps – Casing – Impellor – Work done and Efficiency – Cavitations.

**UNIT V RECIPROCATING PUMPS**

9

Reciprocating pump – Work done – Air Vessel – Indicator Diagram

**TEXT BOOKS:**

Bansal R K., A Text Book of Fluid Mechanics &amp; Hydraulic Machines – Laxmi Publications 2010

**REFERENCE:**

1. Subramanya K., "Flow in Open channels ", Tata McGraw Hill Publishing Company 1986
2. 2. Kumar K.L., "Engineering Fluid Mechanics ", Eurasia Publishing House (P) Ltd. New Delhi, 1992.
3. 3. Rajput R.K, A Text of Fluid Mechanics & Hydraulic machines – S.Chand & Co.P.Ltd, 2009.

**Computer usage:****Professional component**

General	-	0%
Basic Sciences	-	0%
Engineering sciences & Technical arts	-	0%
Professional subject	-	100%

**Broad area:** open channel flow | design of Hydraulic Machines**Test Schedule**

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	August 1 <sup>st</sup> week	Session 1 to 14	2 Periods
2	Cycle Test-2	September 2 <sup>nd</sup> week	Session 15 to 28	2 Periods
3	Model Test	October 2 <sup>nd</sup> week	Session 1 to 45	3 Hrs
4	University Examination	TBA	All sessions / Units	3 Hrs.

**Mapping of Instructional Objectives with Program Outcome**

This Course is to introduce the principles of various surveying methods and applications to Civil Engineering projects.	Correlates to program outcome		
	H	M	L

1. Be able to apply their knowledge of fluid mechanics in addressing problems in open channels.	a,d,e	b	c
2. They will possess the skills to solve problems in uniform, gradually and rapidly varied flows in steady state conditions.	a,d,e	b	c
3. They will have knowledge in hydraulic machineries (Turbines)	a,d,e	b	c
4. Acquire skills in rotodynamic machineries that will help in their day-to-day-life.	a,d,e	b	c
5. Acquire skills in Reciprocal pumps.	a,d,e	b	c

H: high correlation, M: medium correlation, L: low correlation

### Draft Lecture Schedule

Session	Topics	Problem solving (Yes/No)	Text / Chapter
<b>UNIT I OPEN CHANNEL FLOW</b>			
1.	Types of flow	NO	[T1, R2]
2.	State of Flow	NO	
3.	Velocity distribution	NO	
4.	Specific energy	YES	
5.	Specific force	YES	
6.	Critical flow computation	YES	
7.	Flow measurement.	YES	
8.	Chezy's and Manning's equation,	YES	
9.	Computation Uniform flow – Normal depth – Hydraulically best section	YES	
<b>UNIT II VARIED FLOW</b>			
10.	<b>Unit-II</b> Varied Flow- Rapid & Gradual	No	[T1, R1 & R3]
11.	Dynamic equation characteristic of flow profiles	No	
12.	Classification of flow – Computation of the flow profiles	Yes	
13.	Direct step method - Canal transitions	Yes	
14.	Hydraulic Jump, Type of Jump,	Yes	
15.	Location of Jumps ,	NO	
16.	Energy losses in Jumps	NO	
17.	Surges in Canal	NO	
18.	Types of Surges	NO	

Session	Topics	Problem solving (Yes/No)	Text / Chapter
<b>UNIT III TURBINES</b>			
19.	Rotodynamics Machinery Turbines : Classification of turbines	NO	[T1, R1,R2,R3]
20.	Work done	NO	
21.	Efficiency of Turbines	NO	
22.	Pelton Wheel,	YES	
23.	Francis turbine	YES	
24.	Kaplan and propeller turbines.	YES	
25.	Similarity laws	NO	
26.	Specific speed.	YES	
27.	Performance of turbines - impact of free jets	YES	
<b>UNIT IV PUMPS</b>			
28.	Rotodynamic Machinery Pumps	NO	[T1, R1,R2,R3]
29.	Classification of pumps	NO	
30.	Centrifugal Pumps	YES	
31.	Casing	NO	
32.	Impellor	NO	
33.	Work done	YES	
34.	Efficiency	YES	
35.	Efficiency	YES	
36.	Cavitation.	NO	
<b>UNIT V RECIPROCATING PUMPS</b>			
37.	Reciprocating pump	YES	[T1, R1,R2,R3]
38.	Reciprocating pump	YES	
39.	Reciprocating pump	YES	
40.	Work done	YES	
41.	Work done	Yes	
42.	Work done	YES	
43.	Air Vessel	NO	
44.	Air Vessel	YES	
45.	Indicator Diagram.	NO	

### Teaching Strategies

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures
- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.
- Laboratory sessions, which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills.
- Small periodic quizzes, to enable you to assess your understanding of the concepts.

**Evaluation Strategies**

Cycle Test – I	-	5%
Cycle Test – II	-	5%
Model Test	-	5%
Assignment	-	5%
Attendance	-	10%
Final exam	-	70%

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**Prepared by:** Mr.S.Rajesh Assistant Professor , Department of Civil

**Dated :**

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**Addendum****ABET Outcomes expected of graduates of B.Tech / Civil / program by the time that they graduate:**

- a. An ability to apply knowledge of mathematics, science, and engineering
- b. An ability to design and conduct experiments, as well as to analyze and interpret data
- c. An ability to design a hardware and software system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- d. An ability to function on multidisciplinary teams
- e. An ability to identify, formulate, and solve engineering problems
- f. An understanding of professional and ethical responsibility
- g. An ability to communicate effectively
- h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- i. A recognition of the need for, and an ability to engage in life-long learning
- j. A knowledge of contemporary issues
- k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**Program Educational Objectives****PEO1: PREPARATION**

Civil Engineering graduates will have knowledge to apply the fundamental principles for a successful profession and/or for higher education in Civil Engineering based on mathematical, scientific and engineering principles, to solve realistic and field problems that arise in engineering and non engineering sectors

**PEO2: CORE COMPETENCE**

Civil Engineering graduates will adapt to the modern engineering tools and construction methods for planning, design, execution and maintenance of works with sustainable development in their profession.

**PEO3: PROFESSIONALISM**

Civil Engineering Graduates will exhibit professionalism, ethical attitude, communication and managerial skills, successful team work in various private and government organizations both at the national and international level in their profession and adapt to current trends with lifelong learning.

**PEO4: SKILL**

Civil Engineering graduates will be trained for developing soft skills such as proficiency in many languages, technical communication, verbal, logical, analytical, comprehension, team building, inter personal relationship, group discussion and leadership skill to become a better professional.

**PEO5: ETHICS**

Civil Engineering graduates will be installed with ethical feeling, encouraged to make decisions that are safe and environmentally-responsible and also innovative for societal improvement.

<b>Course Teacher</b>	<b>Signature</b>
Mr.S.Rajesh	
Ms.B.Kaviya	

**Course Coordinator**

**HOD/CIVIL**