Academic Course Description

BHARATH UNIVERSITY
Faculty of Engineering and Technology
Department of Civil Engineering

BCE304 – FLUID MECHANICS

Third Semester, 2017-18 (Odd Semester)

Course (catalog) description
To understand the basic properties of the fluid, fluid kinematics, fluid dynamics and to analyze and appreciate the complexities involved in solving the fluid flow problems. To introduce the basics of hydrostatic forces involved in fluid mechanics and also to acquaint the students to learn about the theorems on Pascal's law and buoyancy. To understand the various types of fluid flow and to practice the problems based on Bernoullis equations and its applications
Compulsory/Elective course : Compulsory for Civil students

Credit/Contact hours : 3 credits/45hours

Course Coordinator : Ms. Aarthi Harini T, Assistant Professor, Department of Civil Engineering

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
Ms.Aswathy M	Second year Civil	Civil Block		aswathym026@gmail.com	9.00 - 9.50 AM
Ms. Aarthi Harini T	Second year Civil	Civil Block		aarthiharini.t@gmail.com	12.45 - 1.15 PM

Relationship to other courses:

Pre –requisites : BPH201 Engineering physics – II, BME202 Engineering Mechanics
Assumed knowledge : Basic knowledge about the Properties Of The Fluid
Following courses : BCE502 Applied Hydraulic Engineering

Syllabus Contents

UNIT I DEFINITIONS &FLUID PROPERTIES **9 hours**
Definitions – Fluid and Fluid Mechanics – Dimensions and units – Fluid properties continuum Concept of system and control volume.

UNIT II FLUID STATICS **9 hours**
Pascal's law and hydrostatic equation – Forces on plane and curved surfaces – Buoyancy-Pressure measurement.

UNIT III FLUID DYNAMICS & KINEMATICS **9 hours**
Fluid Kinematics - Stream, steak and path lines, Classification of flows-continuity equation, Stream and Potential functions, Flow nets, Velocity measurement. Euler and Bernoulli's equations- Application of Bernoulli's equation-Discharge measurement-laminar flows through pipes and between plates – Hagen Poisuille equation – Turbulent flow, Dancy Weisbach formula - moody Diagram – Momentum PrincipleImpact of jets on plane and curved plates.

UNIT IV BOUNDARY LAYER AND FLOW THROUGH PIPES **9 hours**
Definition of boundary layer – Thickness and classification - Displacement and momentum thickness. Development of laminar and Turbulent flows in circular pipes, Major and Minor losses of Flow in Pipes in series and in parallel pipe network.

UNIT V SIMILITUDE AND MODEL STUDY **9 hours**
Dimensional analysis – Rayleigh's method – Buckingham PI-Theorem- Similitude and Models – Scale effect and distorted models.

TEXT BOOKS:
1. Kumar K.L "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd., New Delhi.

REFERENCE:

1 Streeter, Victor, L, and Benjamin., "Fluid Mechanics", McGraw-Hill Ltd., 1998
2. Natarajan M.K. "Principles of Fluid Mechanics", Agencies, Vidayal Karuppur, Kumbakonam, 1995.
3. Fox Robert W. and McDonald. Man T., Introduction Fluid Mechanics", John Wiley & Sons,1995

Computer usage: Nil

Professional component

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

Broad area : fluid kinematics I fluid dynamics I buoyancy I hydrostatic forces

Test Schedule

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

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

Mapping of Instructional Objectives with Program Outcome

To provide basic ideas on the boundary layer theorem and its classification along with problems underlying the subjects. To develops similitude and model studies for the basics of fluid mechanics with buckinghum pi theorem as the basic concept.	Correlates to program outcome		
	H	**M**	**L**
1.To learn about the basics of fluid mechanics and various properties of fluids	a	d	j
2.To learn about the various forces on plane and curved surfaces and the concepts of buoyancy	f	k	h
3.To have a clear understanding about fluid kinematics and dynamics	d	i	
4.To study the basics of boundary layer flow and flow through pipes	i	f	j
5.To study about various models like distorted models and various dimensionless numbers		e	

Draft Lecture Schedule

Session	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I DEFINITIONS &FLUID PROPERTIES			
1.	Definitions	No	[T1, R3]
2.	Fluid	No	
3.	Fluid Mechanics	No	
4.	Dimensions and units	No	
5.	Fluid properties continuum Concept of system	No	
6.	continuum Concept of system	yes	
7.	control volume	No	
8.	control volume	yes	
UNIT II FLUID STATICS			
9.	Pascal's law	No	[T1, R1]
10.	Problems of Pascal's law	yes	
11.	hydrostatic equation	No	
12.	hydrostatic equation	yes	
13.	Forces on plane	No	
14.	curved surfaces	No	
15.	Buoyancy	No	
16.	Buoyancy	yes	
17.	Pressure measurement	No	
18.	Pressure measurement	yes	
UNIT III FLUID DYNAMICS & KINEMATICS			
19.	Fluid Kinematics	No	[T1,R2]
20.	Stream, steak and path lines	No	
21.	Classification of flows	No	
22.	continuity equation	Yes	
23.	Stream and Potential functions	yes	
24.	Flow nets	yes	
25.	Velocity measurement	yes	
26.	Euler equations	yes	
27.	Bernoulli's equations	yes	
28.	Application of Bernoulli's equation	No	
29.	Discharge measurement-laminar flows through pipes and between plates	Yes	
30.	Hagen Poisuille equation	Yes	
31.	Turbulent flow, Dancy Weisbach formula	Yes	
32.	moody Diagram	Yes	
33.	Momentum Principle Impact of jets on plane and curved plates	yes	
UNIT IV BOUNDARY LAYER AND FLOW THROUGH PIPES			
34.	Definition of boundary layer	No	[T1,R2]
35.	Thickness and classification	No	
36.	Displacement and momentum thickness	yes	
37.	Development of laminar and Turbulent flows in circular pipes	yes	
38.	Major and Minor losses of Flow in Pipes in series	yes	
39.	Major and Minor losses of Flow in parallel pipe network.	yes	
UNIT V SIMILITUDE AND MODEL STUDY			
40.	Dimensional analysis	No	[T1, R2]
41.	Rayleigh's method	yes	
42.	Buckingham PI-Theorem	yes	
43.	Similitude and Models	No	
44.	Scale effect	No	
45.	distorted models	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%

Prepared by: Ms. Aarthi Harini T Assistant Professor , Department of Civil **Dated :**

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.

Course Teacher	Signature
Ms.Aswathy M	
Ms. Aarthi Harini T	

Course Coordinator **HOD/CIVIL**