Academic Course Description

BHARATH UNIVERSITY
Faculty of Engineering and Technology
Department of Mechanical Engineering
BME 304 FLUID MECHANICS AND MACHINERY
Third Semester, 2015-16 (odd Semester)

Course (catalog) description

To understand the concept of basic engineering mechanism

Compulsory/Elective course : COMPULSARY

Credit & contact hours : 4&60 hrs

Course Coordinator : Mr.G.ANBAZHAGAN

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
Mr.G.ANBAZHAGAN	II B	MECHANICAL	-	.mech@ bharathuniv.ac.in	9 to 9.50 am
Mr.V.Arun Rejus Kumar	A	MECHANICAL	-	.mech@ bharathuniv.ac.in	11.40.am to 12.30 pm
Mr.D.Ravi	C	MECHANICAL		ravi.mech@ bharathuniv.ac.in	2.20.pm to 3.30 pm

Relationship to other courses: Computational Fluid Dynamics

Pre –requisites **:** black board, projector.

Assumed knowledge : By understanding about various flow analyses, it will be helpful for the student to design and pump maintenance in his/her organization

Following courses :

Syllabus Contents

UNIT I FLUID PROPERTIES AND FLUID STATICS 12

Fluid properties –continuity equation-Hydrostatic law-pressure variation in static fluid-hydrostatic force on a submerged plane and curved surface-location of hydrostatic force, manometry, single tube and differential manometers, Buoyancy-Metacentric height.

UNIT II FLUID KINEMATICS AND FLUID DYNAMICS 12

Classification of fluid flow, fluid flow lines, stream lines, streak line and path line, vortex flow, Euler's momentum equation, Bernoulli's equation-application of Bernoulli's equation-Flow measurement, pitot tube, venturimeter**.**

UNIT III FLOW OF A REAL FLUID &FLOW THROUGH PIPES **12**

Laminar and turbulent flow, Laminar boundary conditions, Boundary layer thickness, Navier-Stokes equation(statement only),Flow through pipes, Reynolds experiments, Darcy Weisbach equation, pipes in series ,pipes in parallel, siphon losses-Power transmission, Water hammer.

UNIT IV DIMENSIONAL ANALYSIS &PUMPS **12**

Principle of dimensional Analysis-Buckingham's Π theorem-Important dimensionless numbers applicable to fluid mechanics-Centrifugal pumps, Pump outlet and efficiencies-Cavitations, pump characteristics, multistage pumps, axial flowpumps-characteristics, construction details,Non-dimesnsional parametersEfficiencies-reciprocating pumps, Indicator diagram-Rotary pumps –Classifications, Working

UNIT V HYDRAULIC TURBINES **12**

Classification of hydraulic turbines-pelton turbines, velocity triangle-Efficiency, working, Principle of Pelton wheel, Francis and Kaplan turbines-velocity triangles-Hydraulic turbine characteristics.

Total : 60

Computer usage:

Professional component

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

Broad area:

THERMAL SCIENCES.

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	10.08.2017	Session 1 to 14	2 Periods
2	Cycle Test-2	3.09.2017	Session 15 to 28	2 Periods
3	Model Test	18.10.2017	Session 1 to 45	3 Hrs
4	University Examination	NOVEMBER 2ND WEEK	All sessions / Units	3 Hrs.

Mapping of Instructional Objectives with Program Outcome

	Correlates to program outcome		
	H	**M**	**L**
1. Upon completion of this course, the students can able to apply mathematical knowledge to predict the properties and characteristics of a fluid		M	
2. Can critically analyze the performance of pumps and turbines	H	M	
3. Can understand different types of flow.	H	M	
4. Learn Fluid Dynamics		M	L
5. Learn fluid kinematics	H		
6. Understand dimensional analysis		M	

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

Draft Lecture Schedule.

S.NO	Topics	Problem solving (Yes/No)	Text / Chapter
	1 Introduction to Fluid Mechanics Difference between solid and fluid, Units and dimensions	No	FLUID PROPERTIES AND FLUID STATICS
1.	Properties of fluids: Density, specific gravity, specific weight, specific volume, temperature-Problems	YES	
2.	Properties of fluids-Viscosity –Definition & Derivation Problems	YES	
3.	Properties of fluids-Compressibility, vapour pressure Capillarity and surface tension -Problems	No	
4.	Flow characteristics: concepts of system and control volume. Application of control volume to continuity equation,	YES	
5.	Application of Bernoullis Equation and problems	YES	
6.	Energy equation , Euler's equation and Bernoullis Equation	YES	
7.	Momentum equation and its application	YES	
8.	Tutorial	YES	
9.	Tutorial	YES	
10.	Tutorial	YES	
11.	Tutorial	YES	
12.	Laminar flow though circular conduits and circular annuli.	YES	FLUID KINEMATICS AND FLUID DYNAMICS
13.	Tutorial in Flow through pipes	YES	
14.	Boundary layer concepts. Boundary layer thicknessDisplacement, momentum and energy	YES	
15.	Tutorial	YES	
16.	Hydraulic and energy gradient Lines and related problems	YES	
17.	Tutorial on HGL and EGL	YES	
18.	Darcy – Weisbach equation. Friction factor and Moody diagram	YES	
19.	Tutorial – Pressure drop in pipelines	YES	
20.	Minor losses. Flow though pipes in series and in parallel.	YES	
21.	Tutorial	YES	
22.	Tutorial	YES	
23.	Tutorial	YES	
24.	Dimension and units	YES	FLOW OF A REAL FLUID &FLOW THROUGH PIPES
25.	Different system of Dimensioning	YES	
26.	Buckingham's Π theorem	YES	
27.	Buckingham's Π theorem - Continued	YES	
28.	Tutorial on Buckingham's Π theorem	YES	
29.	Discussion on dimensionless parameters Black Board	YES	
30.	Models and similitude. Applications of dimensionless parameters	YES	
31.	Tutorial	YES	
32.	Tutorial	YES	

33.	Tutorial	YES	
34.	Tutorial	YES	
35.	Tutorial	YES	
36.	Homologues units. Specific speed.	YES	DIMENSIONAL ANALYSIS &PUMPS
37.	Elementary cascade theory. Theory of turbo machines.	YES	
38.	Euler's equation. Hydraulic efficiency	YES	
39.	Tutorial	YES	
40.	Velocity components at the entry and exit of the rotor for turbomachines	YES	
41.	Velocity components at the entry and exit of the rotor for radial machines	YES	
42.	Tutorial	YES	
43.	Tutorial	YES	
44.	Centrifugal pumps , performance curves for pumps and turbines.	YES	
45.	Turbines	YES	
46.	Tutorial	YES	
47.	tutorial	YES	
48.	Introduction of Positive Displacement Classification of hydraulic turbines-pelton turbines,	YES	HYDRAULIC TURBINES
49.	Recriprocating pumps	YES	
50.	velocity triangle-Efficiency, working, ,.	YES	
51.	Principle of Pelton wheel	YES	
52.	pump	YES	
53.	Rotory pumps	YES	
54.	Classification. Working and performance curves.	YES	
55.	Hydraulic turbine	YES	
56.	Francis turbines-velocity triangles- characteristics	YES	
57.	Kaplan turbines velocity triangles- characteristics	YES	
58.	tutorial	YES	
60	Tutorial	YES	

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	-	10%
Assignment / Seminar / Online Test / Quiz	-	5%
Attendance	-	5%
Final exam	-	70%

Prepared by Mr.G.ANBAZHAGAN

Addendum

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

a) The ability to apply knowledge of mathematics, science, and engineering fundamentals.

b) The ability to identify, formulate and solve engineering problems.

c) The ability to design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

d) The ability to design and conduct experiments, as well as to analyze and interpret data

e) The ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

f) The ability to apply reasoning informed by the knowledge of contemporary issues.

g) The ability to broaden the education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

h) The ability to understand professional and ethical responsibility and apply them in engineering practices.

i) The ability to function on multidisciplinary teams.

j) The ability to communicate effectively with the engineering community and with society at large.

k) The ability in understanding of the engineering and management principles and apply them in project and finance management as a leader and a member in a team.

l) The ability to recognize the need for, and an ability to engage in life-long learning.

Program Educational Objectives

PEO1: PREPARATION:
Mechanical Engineering graduatesare enthusiastic to provide strong foundation in mathematical, scientific and engineering fundamentals necessary to analyze, formulate and solve engineering problems in the field of Mechanical Engineering.

PEO2: CORE COMPETENCE:
Mechanical Engineering graduates have competence to enhance the skills and experience in defining problems in the field of Mechanical Engineering and Technology design and implement, analyzing the experimental evaluations, and finally making appropriate decisions.

PEO3: PROFESSIONALISM:
Mechanical Engineering graduates made competence to enhance their skills and embrace new thrust areas through self-directed professional development and post-graduate training or education.

PEO4: PROFICIENCY:
Mechanical Engineering graduates became skilled to afford training 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:
Mechanical Engineering graduates are morally merged to apply the ethical and social aspects of modern Engineering and Technology innovations to the design, development, and usage of new products, machines, gadgets, devices, etc.

Course Teacher	Signature
Mr.G.ANBAZHAGAN	
Mr.V.ARUN REJUS KUMAR	

Course Coordinator **HOD/MECH**
Mr.G.ANBAZHAGAN