



Birla Institute of Technology & Science, Pilani
Hyderabad Campus

FIRST SEMESTER 2020-2021
Course Handout Part II

17/08/2020

In addition to Part I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No : **CE F231**
Course Title : Fluid Mechanics
Instructor-in-charge : Komaragiri Srinivasa Raju
Chamber No. : D-107

Scope and Objective of the Course:

This course is an introduction to the field of fluid mechanics. The study covers basic fundamentals of fluid transport which would include our understanding of governing laws of conservation of mass, energy and momentum. The emphasis in this course will be to stress more on the above governing laws and their various applications. The unified approach will enable students to tackle the real life problems in more comprehensive manner and provide a broader view on the subject. Another learning curve in the course is acquainting the students to MATLAB.

Course Level Outcomes:

On completion of the course

1. Student will be able to explain the properties of fluids, concepts of fluid statics as well as buoyancy
2. Student will be able compare various methods of flow measurement.
3. Student will be able to analyze fluid flow through pipes
4. Student will able to derive expressions of non-dimensional parameters in model analysis
5. Student will be able to analyze fluid mechanics in MATLAB perspective

Student Learning Outcomes (SLOs) assessed in this course – **(a), (b), (c), and (k)**

Text Book:

- T1. K. Srinivasa Raju and D. Nagesh Kumar (2020) Fluid Mechanics: Problem solving using MATLAB, Prentice Hall of India (PHI), New Delhi, ISBN-978-93-89347-63-0

Reference Books:



- R1. Modi, P.N. and Seth, S.M., Hydraulics and Fluid Mechanics including Hydraulic Machines, Standard Book House, New Delhi, 2017
- R2. NPTEL Introduction to Fluid Mechanics, Department of Mechanical Engineering, IIT Kharagpur (<https://nptel.ac.in/courses/112/105/112105269/>) (Accessed on 2.8.2020)
- R3. NPTEL Fluid Mechanics, Department of Chemical Engineering, IIT Kanpur (<https://nptel.ac.in/courses/103/104/103104043/#>) (Accessed on 2.8.2020)
- R4. NPTEL Fluid Mechanics, Department of Mechanical Engineering, IIT Kanpur (<https://nptel.ac.in/courses/112/104/112104118/>) (Accessed on 2.8.2020)
- R5. Introduction to Fluid Mechanics and Fluid Engineering, Department of Mechanical Engineering, IIT Kharagpur (<https://nptel.ac.in/courses/112/105/112105183/>) (Accessed on 2.8.2020)
- R6. NPTEL Advanced Fluid Mechanics, Department of Mechanical Engineering, IIT Kharagpur (<https://nptel.ac.in/courses/112/105/112105218/>) (Accessed on 2.8.2020)
- R7. Getting Started with MATLAB (<https://www.mathworks.com/help/matlab/getting-started-with-matlab.html>) (Accessed on 2.8.2020)

Course Plan:

Lecture No	Learning Objectives	Topics to be covered	Chapter in the Text Book*	SLO*
1-3	List the properties of fluids Relate salient properties of fluids	Mass density, Specific weight, Viscosity, Surface Tension, Compressibility and Capillarity, Introduction to MATLAB	Ch-1(T1) Ch-1(R1)	a
4-6	Discuss fluid pressure at point and variation of pressure Relate absolute gauge and vacuum pressure Categorize devices for measurement of pressure	Pascal's law, Manometer and its Variations	Ch-2(T1) Ch-2(R1)	a, b
7-10	Compare the total pressure on plane and curved surface Draw pressure diagram for horizontal, vertical and inclined surfaces Stability of floating bodies	Computation of pressure force, Center of pressure on various surfaces, Metacentric height, Stability Analysis	Ch-3,4(T1) Ch-3,4(R1)	a, b
11-13	State and differentiate five major categories of fluid flow	Study of various flow pattern, Rigid body motion, Stream line, Path line, Streak line, Stream function, Velocity	Ch-5(T1) Ch-6(R1)	a, b



	Describe the flow pattern in streamline, path lines and streak lines Outline three basic principles of fluid flow	Potential, Flownet		
14-17	Describe salient points of Euler's and Bernoulli's equation. Apply Bernoulli's equation in measurement of fluid flow List of devices used for measurement of flow	Bernoulli's Equation and its Applications i.e., Venturimeter, Orifice meter, Pitot tube etc.	Ch-6(T1) Ch-7(R1)	a, b
18-19	Solve forces on pipe bends using Impulse momentum equation.	Momentum principle, pipe bends etc.	Ch-7(T1) Ch-8(R1)	a, b
20-22	Classify orifices and Mouth pieces Compare and contrast the flow patterns through orifices and mouthpieces	Various types of orifices and mouthpieces	Ch-8(T1) Ch-9(R1)	b, k
23-25	Categorize notches and weirs Describe flow pattern over notches and weirs	Various types of notches and weirs	Ch-9(T1) Ch-10(R1)	b, k
26-31	Apply laws of fluid friction in flow through pipes. Compare major and minor losses in pipes Assess flow through pipes in parallel, series and branched networks.	Darcy-Weisbach equation, Pipes in series, Parallel, Branching of pipes etc.	Ch-10(T1) Ch-11(R1)	a, b, k
32-35	Compare laminar through circular pipes, inclined pipes and parallel plates	Hagen-Poiseuille Law for circular pipes flows between two parallel plates.	Ch-11(T1) Ch-13(R1)	a, b
36-42	Classify and explain two methods of Dimensional Analysis	Buckingham pie method, Model analysis	Ch-16(T1) Ch-17(R1)	a, b, e

*Supplementary material will be provided wherever required.

Evaluation Scheme:

Component number	Evaluation Component	Duration (min)	Weightage (%)	Date & Time	Remarks
1	Test-1	30	15	September 10 – September 20 (During scheduled class hour)	OB
2	Test-2	30	15	October 09 –October	OB



				20 (During scheduled class hour)	
3	Test-3	30	10	November 10 – November 20 (During scheduled class hour)	OB
4	Assignments (4)	-	15	Continuous Evaluation	OB
5	Project		15	Continuous Evaluation	OB
7	Comprehensive Examination	120	30	As announced in Time Table	OB

*** Student Learning Outcomes (SLOs) :**

SLOs are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program.

- (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 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.

Chamber Consultation Hour: Monday 5-6 p.m

Notices: All notices concerning the course will be displayed on CMS

Make-up Policy: Make-ups will not be granted under any circumstances.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

INSTRUCTOR-IN-CHARGE

CE F231

