RK UNIVERSITY

SYLLABUS

Course Title	FLUID MECHANICS	
Course Code	ME408	
Course Credit	Theory	:03
	Practical	:01
	Tutorial	:00
	Credits	:04

Course Learning Outcomes:

After Successful completion of the above course, students will be able to:

- **Classify** the different types of fluid flow.
- **Apply** the fundamentals of mathematics for solution of fluid flow problems.
- **Demonstrate** the fluid flow patterns and **illustrate** the same on the laboratory scale equipments.
- **Evaluate** fluid flow laws and **perform** calculations for the same.
- **Develop** laboratory scale model using the fundamentals in the course.

Detailed Syllabus

Sr. No.	Name of chapter & details	Hours Allotted
	SECTION-I	
1.	**Fluids and Their Properties:** Fluids, shear stress in moving fluid, difference between solid and fluid, liquids and gases, Newtonian and non-Newtonian fluids, the continuum concepts and properties of fluids like density, viscosity, capillarity, surface tension, compressibility, bulk modulus, cavitation and vapor pressure.	3
2.	**Pressure and Head:** Statics of a fluid system, Pascal's law, variation and equality of pressure, Hydrostatic paradox and measurement of pressure using Manometers.	6
3.	**Dimensional Analysis and Similarities:** Dimensions of physical quantities, dimensional homogeneity, dimensional analysis using Rayleigh's and Buckingham's Pi theorem method, significance of model study and model laws, performing model study using dimensionless numbers.	6

4.	**Kinematics of Fluid Flow:** Fluid flow, different types of fluid flow, real and ideal fluids, analyzing fluid flow using continuity equations, methods of fluid flow analysis, determination of velocity and acceleration of a fluid flow.	**4**
5.	**Two-dimensional Ideal Fluid Flow:** Rotational and irrotational flow, vortex flow, lines of fluid flow, stream function and velocity potential function, analysis of fluid flow using stream function and velocity potential function.	**2**
	Total	**21**
	SECTION-II	
6.	**Energy Equation and Its Application:** Momentum and fluid flow, momentum and Euler's equation of motion along a stream line, Bernoulli's theorem, pitot tube, venturimenter, orifice meter, measurement of flow rate using above equipments, flow over notches and weirs, pressure gradient and change of total energy.	**6**
7.	**Static Forces On Surface and Bouyancy:** Resultant force and centre of pressure in an object immersed in fluid, forces on curved surface, buoyancy and equilibrium of floating bodies, stability of submerged body, metacentre and determination of metacentric height of a floating body.	**5**
8.	**Viscous Flow:** Reynolds no. and its significance, Hagen-Poiseville law and flow of viscous fluid in circular pipe, flow of viscous fluid between two parallel plates, Power absorbed in bearings.	**5**
9.	**Compressible Flow:** Basic equations of compressible flow, Pressure wave propagation and sound velocity, significance of Mach no. for high velocity objects, stagnation properties.	**3**
10.	**Turbulent Flow:** Loss of head in a fluid flow, Expression of coefficient of friction using Darcy-Weisbach equation, importance of Moody diagram.	**2**
	Total	**21**

Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory. Minimum two internal exams will be conducted and average of two will be considered as a part of overall evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Seminar/Tutorials will be conducted.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures. Minimum eight experiments shall be there in the laboratory related to course contents.

Reference Books:

1. D.S. Kumar," Fluid Mechanics and Fluid Power Engineering", S.K.Kataria & Sons.
2. R.K. Bansal, "Fluid Mechanics and Hydraulic Machines", Laxmi Prakashan.
3. R.K. Rajput, "Fluid Mechanics and Hydraulic Machines", S.Chand & Co.
4. K.Subramanya, "Theory and Applications of Fluid Mechanics", TMH outline series, Tata McGraw Hill Publishing Company Ltd.
5. Frank .M. White, "Fluid Mechanics", McGraw Hill Publishing Company Ltd.
6. Shames, "Mechanics of Fluids", McGraw Hill Publishing Company Ltd.
7. Yunus Cengel, "Text Book of Fluid Mechanics", McGraw Hill Publishing Company Ltd.

Additional Resources

http://nptel.ac.in/courses/112105171/
http://web.mit.edu/hml/ncfmf.html
http://www.learnerstv.com/Free-engineering-Video-lectures-ltv078-Page1.htm