Fluid Mechanics

6 Credits

3 hours per week

Course overview: At the end of the semester, students would be able to

1. To understand the behavior, properties, and definition of a fluid. The key concepts to be acquired include density, viscosity, specific gravity, pressure, shear stress, and fluid forces.
2. To be able to define the different types of fluid flow (laminar, turbulent, and transition) and the appropriate discharge model for each.
3. To be able to describe and distinguish between pressurized and free surface flow and model each with an appropriate theoretical or empirical equation.
4. To understand the application of the continuity expression for engineering hydraulics problems for both steady-state and transient systems. To be able to express this relationship both in narrative form and symbolic form.
5. To understand the momentum equation for force calculations in both pressurized and free surface flow systems. To be able to correctly apply this equation for solution of forces on pipe elements (bends, reducers, nozzles, etc.) and for solution of internal forces generated in a hydraulic jump.
6. To understand the derivation of the energy equation (Bernoulli equation) and its application to pressurized flow and open channel flow systems. To be able to solve for losses in energy head due to friction and minor losses.
7. To understand the definition of and distinction between parallel and series hydraulic elements, and to be able to solve for the flow distribution and total head loss for such elements.
8. To be able to solve for the fluid forces acting on submerged bodies in a static fluid system. To understand and be able to apply the different approaches used for horizontal, inclined, and curved surfaces.
9. To understand the operation of manometers for the measurement of fluid pressure and total energy head. To become familiar with and become competent in the use of various measurement devices for the determination of fluid velocity and discharge.

Student's obligation:

• Attendance: Students are required to attend lectures. The course consists of primarily of theory lectures and tutorial lectures. Regular attendance is necessary to maintain pace with the lectures. Maximum allowed absence is 10%.

Requirements for credit points: For the award of credit points, it is necessary to pass the module exam.

The module exam contains:

A mid-term exam, class room activities, quizzes, home works and final exam on January. So, the final grade will be based upon the following criteria:

Seminar	10 %
Activities and Quizzes	10 %
Assignment	10%
Midterm Exam	20%
Final Exam	50%
Total	100%

Course Content:

Chapter One: Introduction, Fluid properties

Chapter Two: Fluid Statics, Forces on submerged plant and Bouncy & flotation.

Chapter Three: Fluid Kinematics, Fluid dynamic, Conservation of Mass, Conservation of Energy, Conservation of Momentum,

Chapter Four: Flow through closed conduits and

Chapter Five: Open channel Flow.

References:

• Streeter Wylie Bedford “Fluid Mechanics”, McGraw-Hill, 2007. **(Text Book)**
• Victor L. Streeter & E. Benjamin Wylie “Fluid Mechanics”, First SI Metric edition.
• Frank M. White, “Fluid Mechanics”, seventh edition. 2011

- Munson, Young, and Okiishi "Fundamentals of Fluid Mechanics" publisher, John Wiley & Sons, 2009
- John K. Vennard and Robert L. Street, “Elementary fluid mechanics” 7th Edition
- Bansal R. K. “A Text Book of Fluid Mechanics“, 1st Edition 2005.
- K. Subramanya “Fluid Mechanics and Hydraulic Machines: Problems and Solutions” Tata McGraw-Hill Education Pvt. Ltd.
- Douglas J. F. and Matthews R. D. “Solving Problems in Fluid Mechanics” vol. 1 3rd edition.
- Merle C. Potter, David C. Wiggert, BassemH. Ramadan” Mechanics of Fluids” 4thedition.2012
- Jack B. Evett And Cheng liu ” 2500 Solved Problems In Fluid Mechanics and Hydraulics ”