HWRM-203: INTRODUCTORY FLUID MECHANICS (THEORY) (02 Credit hrs)

PRE-REQUISITE: F.Sc. or equivalent

LEARNING OUTCOMES:

- This course will provide an introduction to the fluids, and fluid mechanics.
- The students will learn about the concepts of fluid at rest and fluid properties
- They will have the knowledge about the governing laws of fluid flows
- The students will get used to the concepts of dimensional analysis, dimensionless numbers and hydraulic similitude.
- They will become conversant with working principles and design of various hydraulic machines.

CONTENTS

This course introduces the fluid properties, basic laws and their application. This course will also provide introduction to dimensional analyses, flow of compressible fluids, and fluid machinery and their applications.

THEORY

Unit-I: Introduction:

1.1 Introduction to fluid mechanics
1.2 Applications of fluid mechanics
1.3 Branches of fluid mechanics

Unit-II: Fluid statics:

2.1. Properties of fluids
2.2. Mano meters
2.3. Forces on immersed surfaces, buoyancy & flotation
2.4. Hydrostatic forces acting on dam
2.5. Forces of submerged plane areas and curved areas

Unit-III: Fundamentals of fluid flow

3.1. Basic laws (continuity equation,
3.2. Momentum equation, energy equation, application of basic laws to engineering problems).
3.3. Flow in closed conduits,
3.4. Pipeline network system.
3.5. Flow in open channels. (uniform flow, Chezy and Manning equations, best hydraulic section, normal depth and its computations)

Unit-IV: Dimensional Analysis:

4.1. Principles of Similarity and Dimensional Analysis,
4.2. Reynolds Number
4.3. Euler Number
4.4. Froude Number
4.5. Mach numbers Number

Unit-V: Flow of Compressible Fluids:

5.1. Governing equations for flow in compressible fluids
5.2. One-dimensional, two- dimensional compressible flow
5.3. Flow characteristics in convergent-divergent ducts

Unit-VI: Hydraulic Machinery:

6.1. Introduction to hydraulic machinery
6.2. Elementary pump theory
6.3. Centrifugal/axial-flow pumps
6.4. Turbines and its types

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

Sr. No.	Elements	Weightage	Details
1.	Mid Term Assessment	35%	It takes place at the mid-point of the semester
2.	Formative Assessment	25%	It is continuous assessment. It includes: classroom participation, attendance, assignments and presentation, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Panton, Ronald L. (2013). *Incompressible Flow*. 4th ed. Wiley, ISBN: 9781118013434.
2. Kundu, Pijush K., and Ira M. Cohen. (2015) *Fluid Mechanics*. 6th ed. Academic Press, ISBN:9780124059351.
3. Tritton, D. J., *(2013). Fluid Dynamics*. Springer, ISBN: 9780442301323.9780124059351
4. Homsy, G. M., ed. (2011). *Multimedia Fluid Mechanics*. 2nd ed. Cengage Learning, ISBN: 9780521721691.
5. Smits, A. J. (1999). *A Physical Introduction to Fluid Mechanics*. New York, NY: John Wiley & Sons, ISBN: 9780471253495.
6. Roache, Patrick J. (1998). *Fundamentals of Computational Fluid Dynamics*. Hermosa Publishers, ISBN: 9780913478097.
7. Chung, T. J., (2010). *Computational Fluid Dynamics*. 2nd ed. Cambridge University Press, ISBN: 9780521769693.

HWRM-203:INTRODUCTORY FLUID MECHANICS (LAB) (01 Credit hr)

PRE-REQUISITE: F.Sc. or Equivalent

LEARNING OUTCOMES:

- This course will provide practical aspects of measuring fluid properties
- The students will learn about the types and characteristic of flow
- They will have the knowledge about the measuring principles of headless in pipe flow
- The students will get knowledge about the practical applications of dimensionless numbers

CONTENTS

This course provides an introduction practical aspects and measurements fluid properties, flow characteristics and flow conditions. This course also includes calculation of headless in pipe flows.

PRACTICAL

Unit-I: Properties of Fluids

1.1 Measurement of Specific Weight
1.2 Specific Volume
1.3 Specific Gravity and Density
1.4 Stability of a Floating Body

Unit-II: Flow Characteristic

2.1. Verification of Bernoulli's Theorem.
2.2. Flow Through a venturi meter and Orifice
2.3. Head Loss Due to Friction and pipe fittings
2.4. Verification of Reynold's Number.
2.5. Flow Condition by Reynold's Number.

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

Sr. No.	Elements	Weightage	Details
1.	Mid Term Assessment	35%	It takes place at the mid-point of the semester
2.	Formative Assessment	25%	It is continuous assessment. It includes: classroom participation, attendance, assignments and presentation, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
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