Department of Civil Engineering

College of Engineering

Salahaddin University- Erbil

Subject: Fluid Mechanics second semester

Course Book

Lecturer's name: Assistant Lecturer Evan O. Slewa

Academic Year: 2019/2020

Course Book

1. Course name	**Fluid Mechanics**
2. Lecturer in charge	**Evan O. Slewa**
3. Department/ College	**Civil Department – College of Engineering**
4. Contact	**e-mail: evanslewa74@gmail.com**
5. Time (in hours) per week	**For example Theory: 3** **Practical: 1**
6. Office hours	**Email & 4 days office availability**
7. Course code	
8. Teacher's academic profile	**B.sc in Civil Engineering 1996** **M.sc in Hydraulic Civil Engineering 2002** **Assistant Lecturer 2004** **Teaching the following subject:** • Building material and tests (1st stage) • Water supply practical (4th stage) • Engineering Hydrology (3rd stage) • Hydraulic structure (4th stage) • Fluid mechanics and tests (2nd stage)
9. Keywords	Fluid mechanics, Fluid Properties , static fluid, Fluid Kinematics, Conservation of Mass, Conservation of Energy, Conservation of Momentum, Dimensional analysis and similitude, Flow of an Ideal fluid, Flow of a real fluid, Flow through closed conduits, Flow in open channel.

10. Course overview:

· The course will introduce fluid mechanics and establish its relevance in civil engineering.

· Develop the fundamental principles underlying the subject.

· Demonstrate how these are used for the design of simple hydraulic components.

11. Course objective:

What is the purpose for studying fluid mechanics on a Civil Engineering course? The provisions of adequate water services such as the supply of potable water, drainage, sewerage are essential for the development of industrial society. It is these services which civil engineers provide.

Fluid mechanics is involved in nearly all areas of Civil Engineering either directly or

indirectly. Some examples of direct involvement are those where we are concerned with manipulating the fluid:

· Sea and river (flood) protection;

· Water distribution / sewerage (sanitation) systems;

· Hydraulic design of water/sewage treatment works;

· Dams;

· Irrigation;

· Pumps and Turbines;

· Water retaining structures.

12. Student's obligation

Attendance: Students should attend the lectures; the allowable absence during the year is 10% of total hours.

The course is 3hours per a week, 2hours as theory and 1hours as practice.

13. Forms of teaching To achieve the objectives of the course following forms and techniques will be followed during teaching process:

1- Power point presentation for parts of the course as required.

2-White board will be used to explain theories, equations, solve problems and draw the structures in the class.

3- Real images will be used to simplify the shape of structures for the students

4- Examples will be solved in the class through team work.

5- Notes about chapters will be handled to the students at the beginning of each chapter to facilitate easier understanding of books but they will not replace the use of books.

14. Assessment scheme

1- Exams:

The student must provide the following exams, quizzes and homework's:

- First semester Exam	15/50
- Second Semester Exam	15/50
- Quizzes and H. W	10/50
- Practical	10/50

- Final Exam (Theo.) 40/50

- Final Exam (Prac.) 10/50

At the end of each chapter students should prepare detail design drawings for each structure as homework, minimum four home works should be submitted during the year.

Eight quizzes are required during the year.

15. Student learning outcome:

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.
10. To become familiar with and become competent in the use of various measurement devices for the determination of fluid velocity and discharge.

16. Course Reading List and References:

The following books help the student better understanding of the subject materials, the books may available in the college library as well as in the department library.

Text Book

- Streeter Wylie Bedford **"Fluid Mechanics"**, McGraw-Hill, 2007.
- Victor L. Streeter & E. Benjamin Wylie **"Fluid Mechanics",** First SI Metric edition.

References:

- **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 "**

17. The Topics:	**Lecturer's name**
The following table shows the chapters and structures which will be covered and designed through the year and required duration for each one:	
• Introduction to Fluid Kinematics	1 week
• Conservation of Mass & Applications	1 week
• Conservation of Energy & Applications	3 weeks
• Conservation of Momentum & Applications	2 weeks
• Dimensional analysis and similitude	2 weeks
• Flow of an Ideal fluid & real fluid	2 weeks
• Flow through closed conduits	2 weeks
• Flow in open channel	2 weeks
18. Practical Topics (If there is any)	
The following testes will be covered during this year:	
• Reynolds number.	2 weeks
• Total head equation.	2 weeks
• Fluid flow through an orifice.	2 weeks
• Venturi Meter.	2 weeks
• V notch weir & Sluice gate	2 weeks
• Impact of jet.	2 weeks
• Friction in pipe	2 weeks
• Ogee type, Sharp and Broad crest weir.	2 weeks