Department of Water resources Engineering

Faculty of Engineering

University of Salahaddin

Subject: Hydraulic Engineering

Course Book –Year 2

Lecturer's name: Yaseen Wsu Aziz

Academic Year: 2023/2024

Course Book

1. Course name	**Hydraulic Engineering**
2. Lecturer in charge	**Yaseen Wsu Aziz**
3. Department/ College	**Civil Engineering**
4. Contact	**e-mail: yaseen90aziz@gmail.com** **Tel: +964 (750) 424 3121**
5. Time (in hours) per week	**Theory: 3** **Tutorial: 1**
6. Office hours	**Wednesday 12: 0-1:0 pm and by appointment**
7. Course code	
8. Teacher's academic profile	https://www.linkedin.com/in/yaseen-aziz-82661593/
9. Keywords	

10. Course overview:

Hydraulic engineering is the application of the principles of fluid mechanics to problems dealing with the collection, storage, control, transport, regulation, measurement, and use of water. Thus, **Hydraulic engineering** is involved in problems deals with Rivers; Dams, Reservoirs, Water retaining structures, Water distribution network; Sewerage (sanitation) networks Irrigation; Drainage; Pumps and Turbines; Offshore structures; Ground-water flow; etc.

This course covers the fundamentals of hydraulics and includes the topics open channel flows, dimension analysis, closed conduit flow and hydraulic machinery.

11. Course objective:

- Understand the basic concepts of hydraulic engineering and its application in practice
- Apply the concept of dimensional analysis in hydraulic engineering.
- Understand the fundamental of open channel flow and its applications.
- Understand the fundamental of closed-conduit flow and its applications.
- Model hydraulic engineering problems using dimensional analysis.

12. Student's obligation

- There will be weekly homework assignments. Each homework is scored out of 20 points. Homework handed in late will have the following penalties: Up to 1 class late: 5 points; up to 3 classes late: 10 points; more than 3 classes late: no credit.

13. Forms of teaching

- Data show
- White board
- Grouping knowledge into “concepts or principles”
- Delayed Recall (i.e. quizzes/self quizzes)

14. Assessment scheme

- Assignments/Quizzes and class participations : 20%
- Mid-term exam: 30%
- Final Exam/Project: 50% each

15. Student learning outcome:

By the end of this course students will be able to:

- ✓ Recall the basic concept of the fluid mechanics.
- ✓ Understand the concept of hydraulic gradient and energy line.
- ✓ Ability to classify flow
- ✓ Distinguish between open and closed-conduit flow.
- ✓ Calculate the hydraulic gradient line in open channel flow.
- ✓ Calculate the hydraulic gradient line in closed-conduit flow.
- ✓ Use Manning’s equation in open channel flow related problems.
- ✓ Describe the uniform and non-uniform flow cases.
- ✓ Apply the concept of specific energy in open channel flow.
- ✓ Understand the hydraulic jump phenomenon.
- ✓ Use Hazen-Williams Formula in pipe flow related problems.
- ✓ Describe the laminar and turbulent flow
- ✓ Analysis the pipe in parallel, series and pipe networks.
- ✓ use the dimensional analysis and derive the dimensionless numbers.
- ✓ Familiar with pumps and turbines used in civil engineering.

16. Course Reading List and References:

1. John Cimbala and Yungus A. Cengel, **Fluid Mechanics: Fundamentals and Applications**, December 2004, McGraw-Hill Education. (Text Book)

2. Subramanya, K., 2009. ***Flow in Open Channels****, 3e*. Tata McGraw-Hill Education.

17. The Topics:	Time
1. •**Introduction and Review of Fluid Mechanics**	1st week
2. •**Open Channel Flow**: Introduction, Types of Open Channel, Uniform flow Uniform flow equations, Channels of efficient cross sections, Specific energy, Flow in channel transitions, and The hydraulic jump	2nd – 5TH week
3. • **Dimensional Analysis and Similitude:** Dimensional homogeneity, The Buckingham π theorem, and Similitude; Model Studies.	6TH week
4. • **Closed conduit flow:** Pipe-friction formula, laminar and turbulent flow, Pipes in series, parallel and branching pipes, Network of pipes, and Introduction to Water Hammer Analysis	7th - 10th week
5. • **Hydraulic Machinery** Introduction to pump types, Hydraulic ram pumps, Centrifugal Pumps, Pump Performance, and Turbines	11th - 12th week
18. Practical Topics (If there is any)	
N/A	

19. Examinations:

All exams include quizzes are in class and open books. Questions will be on the form of trues and false, multiple choices, sentence completion, and comprehensive design and analysis.

20. Extra notes:

Cell Phone should be turned off prior to coming to class. Texting and the use of mobile devices (e.g., Laptop, IPad/Tablet PC, IPod, etc.) during the class shall not be allowed.

21. Peer review