Module (Fluid Mechanics) Catalogue

2023-2024

College/ Institute	College of Erbil Technical Engineering	
Department	Civil Engineering	
Module Name	Fluid Mechanics	
Module Code	FLM401	
Degree	Technical Diploma ☐ Bachler ■ High Diploma ☐ Master ☐ PhD ☐	
Semester	4	
Qualification	PhD	
Scientific Title	Lecturer	
ECTS (Credits)	6	
Module type	Prerequisite ☐ Core ■ Assist. ☐	
Weekly hours	4	
Weekly hours (Theory)	(4) hr Class	(162) Total hrs Workload
Weekly hours (Practical)	(0) hr Class	(0) Total hrs Workload
Number of Weeks	15	
Lecturer (Theory)	Dr Fahid Abbas Tofiq, and Dr Arkhawan Jawhar Sharef	
E-Mail & Mobile NO.	fahid.tofiq@epu.edu.iq arkhawan.sharef@epu.edu.iq	
Lecturer (Practical)	N/A	
E-Mail & Mobile NO.	N/A	
Websites	http://staff.epu.edu.iq/public/faculty/fahid.tofiq	

Course Book

Course Description	Mechanics, the oldest branch of physical science, explores the behavior of both stationary and moving objects when subjected to various forces. It can be further divided into two main branches: statics, which focuses on objects at rest, and dynamics, which examines the behavior of objects in motion. Fluid mechanics, a specialized subcategory within mechanics, delves into the study of fluids, whether they are at rest (fluid statics) or in motion (fluid dynamics), as well as their interactions with solids or other fluids at boundaries. Fluid mechanics is sometimes also referred to as fluid dynamics when considering fluids at rest as a special case with zero velocity. Fluid mechanics itself encompasses several distinct categories. Hydrodynamics, for example, concentrates on the motion of nearly incompressible fluids, such as liquids (especially water) and low-speed gases. Within hydrodynamics, there exists a subcategory known as hydraulics, which specifically addresses the flow of liquids in pipes and open channels. Gas dynamics, on the other hand, deals with the flow of fluids that experience substantial density changes, such as the high-speed flow of gases through nozzles. Aerodynamics, yet another category, examines the flow of gases, particularly air, over objects like aircraft, rockets, and automobiles, whether at high or low speeds. Additionally, there are specialized branches such as meteorology, oceanography, and hydrology, which focus on naturally occurring fluid flows in various contexts.
Course objectives	The unit has been structured to place a strong emphasis on subjects pertaining to fluid mechanics and hydraulics. Specifically tailored for second-year civil engineering students, this module aims to furnish them with a fundamental understanding of fluid mechanics. It equips students with the capacity to tackle engineering challenges in open channels and pipelines by employing essential hydraulic principles and engineering tools during the process of engineering analysis and design. Additionally, this module imparts a foundational comprehension of flow control in open channels and pipelines.
Student's obligation	Attendance at lectures constitutes a fundamental aspect of this course. It is expected that students attend each class for the entire duration unless under exceptional circumstances. In cases where you are unable to attend, it becomes your responsibility to acquire any announcements, course materials, and assignments. Your accountability extends to the lecture content, regardless of whether it is covered in the textbook. Expect examination questions to assess your comprehension of concepts introduced during lectures and in homework assignments.

	Collaborative study with peers can prove highly beneficial. Cooperative learning is encouraged; however, it's imperative that you possess a thorough grasp of the concepts beyond the mere mathematical procedures for problem-solving. You should be capable of independently navigating through the assigned problems. Furthermore, students must ensure timely and proper submission of required homework, reports, seminars, and any additional assignments as specified by the lecturer.
Required Learning Materials	Various teaching methods and tools will be employed in the lecture halls. These include data show equipment for presentations, whiteboards, overhead projectors, posters, and distributed lecture notes as instructional aids. Additionally, online lectures and the Moodle platform may also be utilized as part of the teaching approach.

Evaluation

Task		Weight (Marks)	Due Week	Relevant Learning Outcome
Paper Review				
Assignments	Homework	10%	1-12	All
	Class Activity	2%	1-12	All
	Report	8%	10	All
	Seminar	8%	8	All
	Essay			
	Project			
Quiz		8%	1-12	All
Lab.				
Midterm Exam		24%	8	All
Final Exam		40%	14	All
Total		100%		

Specific learning outcome:	Upon completion of the course, students are expected to achieve the following learning outcomes: 1. Establish a comprehensive understanding of the physical and mathematical foundations of fluid mechanics. 2. Explain the fundamental concepts related to pressure, including atmospheric, absolute, gauge, vacuum, barometric pressures; grasp Pascal's Law; comprehend Archimedes' principle; and analyze hydrostatic forces. 3. Demonstrate proficiency in calculating fluid domains and applying equations of motion to fluid dynamics problems.

	4. Utilize Bernoulli's theorem and its equation for practical applications in fluid mechanics; effectively manage and interpret flow measurements. 5. Determine head losses and energy losses in closed conduits, applying appropriate methodologies. 6. Competently design cross-sectional profiles for open channels in hydraulic systems.
Course References:	▪ Key references: 1. Fluid Mechanics, Fundamental and Applications by Yunus A. CENGEL and John M. CIMBALA. 2. Fluid Mechanics, by John F Douglas, Janusz M. Gaslorek, John A. Swaffeld and Lynne B. Jack. 3. Fluid Mechanics by Victor L. Streeter and E. Benjamin Wylie. ・Other useful references: 1. Fluid Mechanics by Franke M. white. 2. Fluid Mechanics by L. D. Landau and E.M. Lifshitz. 3. Fluid Mechanics with Engineering Application "By E. John Finnemore and Joseph B. Franzini. Videos on internet: www.learnerstv.org/lectures

Course topics (Theory)	Week	Learning Outcome
Introduction	1	1
Fluid Statics	2	2
Fluid Statics / Hydrostatic force on plane and curved gates	3	2
Buoyancy and floatation	4	3
Fluid Kinematics	5	3
Fluid Dynamics	6	3
Fluid Dynamics / Bernoulli Equation	7	4
Flow Measurement (in open conduits)	8	4
Flow Measurement (in closed conduits)	9	5
Flow in Closed Conduits (flow through pipes) …Cont.	10	5
Flow in Open Conduits (flow through open channels)	11	6

Flow in Open Conduits (flow through open channels) …Cont.	12	6
Practical Topics	**Week**	**Learning Outcome**
N/A		

Questions Example Design

The exam questions may have similarities with the examples and Homework assignments taught during the course, but it is not necessary to be the same.
For example:
The head of water over a rectangular notch is 900 mm. The discharge is 300 liter/s. Find the length of the notch, when Cd = 0.62.
Ans.
Q = (2/3)*Cd*L*(2g)^0.5 *(H)^1.5 , H=0.9 m, Q =300 l/s = 0.3 m3/s
0.3 = (2/3)*0.62*L*(2*9.81)^0.5*(0.9)^1.5, L = 192 mm = 0.192 m

Extra notes:

As classroom time constraints may limit the coverage of all topics found in the reference books, it is imperative that you engage with the material outside of class. This entails completing assigned readings prior to the corresponding class sessions and revisiting them afterward to ensure a deep understanding of the concepts, which will facilitate your successful completion of assigned problems.

Lectures will be structured to enhance your comprehension of the principles and techniques elucidated in the textbooks. Active participation in the learning process is strongly encouraged, and it is advised that you come prepared with both a calculator and paper.

Given that each class builds upon the foundation of previous sessions, maintaining pace with assignments is crucial. Collaborative homework efforts are permissible to enhance the learning experience. Additionally, please be aware that any student may be called upon at any time to present a homework solution to the class. Homework will be assessed for completion, and problem solutions will be returned along with checked assignments, thus making late submissions unfeasible.

External Evaluator