Module (Fluid Mechanics) Catalogue

2022-2023

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	
E-Mail & Mobile NO.	fahid.tofiq@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 is the oldest physical science that deals with both stationary and moving bodies under the influence of forces. The branch of mechanics that deals with bodies at rest is called statics, while the branch that deals with bodies in motion is called dynamics. The subcategory fluid mechanics is defined as the science that deals with the behavior of fluids at rest (fluid statics) or in motion (fluid dynamics), and the interaction of fluids with solids or other fluids at the boundaries. Fluid mechanics is also referred to as fluid dynamics by considering fluids at rest as a special case of motion with zero velocity. Fluid mechanics itself is also divided into several categories. The study of the motion of fluids that are practically incompressible (such as liquids, especially water, and gases at low speeds) is usually referred to as hydrodynamics. A subcategory of hydrodynamics is hydraulics, which deals with liquid flows in pipes and open channels. Gas dynamics deals with the flow of fluids that undergo significant density changes, such as the flow of gases through nozzles at high speeds. The category aerodynamics deals with the flow of gases (especially air) over bodies such as aircraft, rockets, and automobiles at high or low speeds. Some other specialized categories such as meteorology, oceanography, and hydrology deal with naturally occurring flows.
Course objectives	The unit is designed to emphasize topics related to fluid mechanics and hydraulics. This module designed to provide a basic knowledge of fluid mechanics for the second-class civil engineering students. It provides the ability to solve engineering problems of fluid mechanics in open channels and pipes by application of basic hydraulic principles and engineering tools in the process of engineering analysis and design. Also, it provides basic understanding of flow control in open channels and pipes.
Student's obligation	Attending the lecture is a fundamental part of the course. Students are expected to attend every class meeting for the entire class period. Only extreme circumstances should require your missing class. If you do miss class, it is your responsibility to obtain announcements, course documents and assignments. You are responsible for material presented in the lecture whether or not it is discussed in the textbook. You should expect questions on the exams to test your understanding of concepts discussed in the lecture and in the homework assignments. It can be very helpful to study with a group. This type of cooperative learning is encouraged; however, be sure that you have a thorough understanding of the concepts besides the mathematical steps used to solve a problem. You must be able to work through the problems on your own. Students will need to submit the required homework, reports, seminars and/or any other assignments requested by the lecturer in time and in a proper way.

<table>
<tr><td>Required Learning Materials</td><td colspan="5">lecture halls with data show equipment for lecture presentations, white board, overhead projector, posters, and the handouts of lecture notes will be used as forms of teaching. Also, the online lectures and Moodle platform may be used.</td></tr>
<tr><td rowspan="11">Evaluation</td><td colspan="2">Task</td><td>Weight (Marks)</td><td>Due Week</td><td>Relevant Learning Outcome</td></tr>
<tr><td colspan="2">Paper Review</td><td></td><td></td><td></td></tr>
<tr><td rowspan="6">Assignments</td><td>Homework</td><td>10%</td><td>1-12</td><td>All</td></tr>
<tr><td>Class Activity</td><td>2%</td><td>1-12</td><td>All</td></tr>
<tr><td>Report</td><td>8%</td><td>10</td><td>All</td></tr>
<tr><td>Seminar</td><td>8%</td><td>8</td><td>All</td></tr>
<tr><td>Essay</td><td></td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Quiz</td><td>8%</td><td>1-12</td><td>All</td></tr>
<tr><td colspan="2">Lab.</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Midterm Exam</td><td>24%</td><td>8</td><td>All</td></tr>
<tr><td colspan="2">Final Exam</td><td>40%</td><td>14</td><td>All</td></tr>
<tr><td colspan="2">Total</td><td>100%</td><td></td><td></td></tr>
<tr><td>Specific learning outcome:</td><td colspan="5">By the end of the course, students should be able to
1.Define the physical and mathematical fundaments of fluid mechanics,
2.Clarify the basics of pressure forms (atmospheric, absolute, gauge, vacuum, barometric); Pascal’s Law; Archimedes’ principle; and hydrostatic forces.
3. Calculate fluid domain and use the equations of motion.
4. Apply Bernoulli’s theorem, equation, and practical applications. Manage and process flow measurements,
5. Determine the head and energy losses in closed conduits,
6. Design of open channel cross sections.</td></tr>
<tr><td>Course References:</td><td colspan="5">▪ Key references:
1.”Fluid Mechanics” Fundamental and applications by Yunus Cengel and john cimbala
2. “Fluid Mechanics” by Vector L. Streeter
3. “Fluid Mechanics for Engineers” by Maurice l. Albertson, James R. Barton, and Daryl B. Simons.
▪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 Joseph B. Franzini.
▪Magazines and review (internet):
1. www.learnerstv.com/lectures
2. http://www.filecrop.com/fluid-mechanics-r-k-bansal.html</td></tr>
</table>

	3 http://eu.wiley.com/WileyCDA/Section/id-350657.html

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:

Since there is no time in class to include everything in the reference books, it is essential that the book be studied outside of class. Assigned reading should be done before the class in which the topic is covered, and then studied after class in order that the concepts are thoroughly grasped, and you are able to complete the assigned problems. Lecturing will be kept to a level necessary to create greater

understanding of the principles and techniques described in the textbooks. Students will be actively involved in learning during the class. Always bring your calculator and paper.
Because each class builds on previous classes, it is essential to keep up with assignments. Collaboration on homework is allowed for the purpose of improving learning. Any student may be called upon at any time to present a homework solution to the class. Homework will be checked for completion; problem solutions will be returned with the checked homework, so late homework will not be possible.

External Evaluator