Module (Course Syllabus) Catalogue

2023-2024

College/ Institute	**Erbil Technical Engineering College**	
Department	**Mechanical and Energy Engineering Techniques**	
Module Name	**Fluid Mechanics 1**	
Module Code	**FLM301**	
Degree	**Technical Diploma** ☐ **Bachler** ■ **High Diploma** ☐ **Master** ☐ **PhD** ☐	
Semester	**3rd**	
Qualification	**Ph.D.**	
Scientific Title	**Assistant Professor**	
ECTS (Credits)	**7**	
Module type	**Prerequisite** ☐ **Core** ■ **Assist.** ☐	
Weekly hours	**5 hours**	
Weekly hours (Theory)	**(3)hr Class**	**(40)Total hrs Workload**
Weekly hours (Practical)	**(2)hr Class**	**(27)Total hrs Workload**
Number of Weeks	**12**	
Lecturer (Theory)	**Dr. Banipal N. Yaqob**	
E-Mail & Mobile NO.	**banipal.yaqob@epu.edu.iq**	
Lecturer (Practical)		
E-Mail & Mobile NO.		
Websites	**https://moodle.epu.edu.iq/course/view.php?id=3729**	

Course Book

Course Description	The course begins with the material properties of fluids. This is followed by studying fluid statics including pressure measurement, hydrostatics and buoyancy. Then studying the principles of fluid motion including mass conservation (continuity equation) and energy conservation (Bernoulli's equation). This is followed by sections on the energy equation and flow of viscose fluid applied to a range of problems in mechanical engineering, including steady flow in pipes, design of pump and turbine-pipeline systems, series-parallel piping systems, cavitation, …etc.
Course objectives	The course objective is to provide students with the fundamental physical and analytical principles of fluid mechanics through the understanding of the: conservation of mass, conservation of energy, and the conservation of momentum equations. It is expected that the students will gain a fundamental physical and mathematical understanding of this topic rather than memorizing the equations and situations. By this, it is implied that the student will be able to correctly apply the course content (given in the course overview above) to new situations so as to evaluate potential industrial applications of fluid theory through both physical induction and mathematical analysis/computation. Such inductive and analytical reasoning will be taught through classroom examples and homework, while it will be tested on examinations.
Student's obligation	In this course students are expected to: • Attend all classes. In the event you miss a class, you are responsible for the assignments and announcements made during your absence. • Participate actively in discussions and group exercises. • Prepare for class sessions by reading text assignments. • Attendance at all exams is required. Makeup exams will be given only in emergency cases (proof required). Vacation arrangements are not emergencies. Students who have unexcused absences will receive the grade of zero ("0") for all tests, quizzes, and/or lab experiments missed. Feel free to raise questions (even if you suspect you are the only one who does not know the answer) to ensure that you thoroughly understand and are able to apply the theory in real engineering applications.
Required Learning Materials	• Data show, white board and PowerPoint are used throughout the lecture, Testing in department's Laboratory. • Publish all lecture notes in college website before the lecture day.

<table>
<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>5%</td><td></td><td></td></tr>
<tr><td>Class Activity</td><td>2%</td><td></td><td></td></tr>
<tr><td>Report</td><td rowspan="4">10%</td><td></td><td></td></tr>
<tr><td>Seminar</td><td></td><td></td></tr>
<tr><td>Essay</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td></td></tr>
<tr><td colspan="2">Quiz</td><td>8%</td><td></td><td></td></tr>
<tr><td colspan="2">Lab.</td><td>10%</td><td></td><td></td></tr>
<tr><td colspan="2">Midterm Exam</td><td>25%</td><td></td><td></td></tr>
<tr><td colspan="2">Final Exam</td><td>40%</td><td></td><td></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">On successful completion of this course, student should be able to:
• Be familiar with the terminology associated with fluid mechanics
• Be able to use fluid properties correctly to solve problems
• Explain and describe how fluid shear stresses resist forces such as gravity and momentum
• Understand the principals of flow rates and velocity measurement
• Be able to determine pressure drops for pipe systems and choose appropriate pumps and turbines depending on the application
• Ability to derive the equation for viscous flow, including laminar flow and turbulent flow
• Interpret experimental and test results and present these in an appropriate engineering report format
• Collaborate with others in a team project environment to conduct engineering investigations and produce engineering reports</td></tr>
<tr><td>Course References:</td><td colspan="5">▪ Key references:
• "Fluid Mechanics with Applications" Anthony Esposito, Pearson Education, 1997.
• "Engineering Fluid Mechanics" John A. Roberson, Clayton T. Crowe, Donald F. Elger, and Barbara C. Williams, 9th Ed., John Wiley & Sons, 2009.
• "Fluid Mechanics, Fundamentals and Applications" Y. A. Cengel, J. M. Cimbala, 2nd Ed., McGraw-Hill, 2009.
• "Introduction to Fluid Mechanics" ROBER T W. FOX, and</td></tr>
</table>

	ALAN T. MCDONALD, 6th Ed., John Wiley & Sons, 2004. • *"**Fluid Mechanics**" Frank M. White, 4th Ed., McGraw-Hill, 1998.* • *"**Fundamentals of Fluid Mechanics**" 5th Ed., by Munson, Young, and Okiishi, Wiley 2005.* ▪ **Useful references**: • *"**Fluid Mechanics with Engineering Applications**" Joseph Franzini, E John Finnemore, 10th. Ed., McGraw-Hill, 2001.* • *"**Fluid Mechanics**" Victor L. Streeter, K.W. Bedford, Wylie E. Benjamin, 9th Revised edition, McGraw-Hill, 1998.* • *"**Fluid Mechanics and Hydraulic Machines**", 3rd edition, S. Chand and Company Ltd, New Delhi, 2006.*

Course topics (Theory)	**Week**	**Learning Outcome**
Fluid Properties	1-2	
Fluid in static	3	
Pressure change in fluids	4	
Pressure measurements	5	
Hydrostatic force on immersed body	6	
Buoyancy force.	7	
Fluid kinematics.	8	
Fluid dynamics. The Bernoulli equation, the continuity equation	9	
Applications of Bernoulli's equation	10	
The energy equation	11	
Applications on the energy equation	12	
Practical Topics	**Week**	**Learning Outcome**
Calibration of Rotameter	1-2	
Calibration of Bourdon Gauge	3-4	
Pressure Measurement Bench	5-6	
Centre of pressure	7-8	

Questions Example Design

Q1/ A 400 mm diameter shaft is rotating at 200 r.p.m. in a bearing of length 120 mm. if the thickness of oil film is 1.5 mm and the dynamic viscosity of the oil is 0.7 N.s/m2, determine:

(i) Torque required to overcome friction in bearing,

(ii) Power utilized in overcoming viscous resistance.

Assume a linear velocity profile.

Q2/ Find the force ***P*** needed to hold the 2-m-wide gate shown in figure in the position shown if the water height is 1.2 m.

Q3/ The velocity vector in a fluid flow is given as,

$$V = 4x^3 i - 10x^2 yj + 2tk$$

Find the velocity and acceleration of a fluid particle at (2, 1, 3) at time t = 1.

Extra notes: No extra notes

External Evaluator

I confirm that the contents of this syllabus are sufficient and cover all the requirements of Fluid mechanics (I) subject.

Prof. Dr. Ahmed Mohammed Adham

01/10/2023