Module(Course Syllabus)Catalogue

2022-2023

College/ Institute	Erbil Technology College	
Department	Automotive Engineering technology	
Module Name	Fluid Mechanics	
Module Code		
Degree	Technical Diploma [ ] Bachelor [*] High Diploma [ ] Master [ ] PhD [ ]	
Semester	5th Semester	
Qualification	Ph.D. in Mechanical Engineering	
Scientific Title	Lecturer	
ECTS (Credits)	6	
Module type	Prerequisite [ ] Core [*] Assist. [ ]	
Weekly hours	4	
Weekly hours (Theory)	(2)hr Class	(162)Total hrs Workload
Weekly hours (Practical)	(2)hr Class	(162)Total hrs Workload
Number of Weeks	12	
Lecturer (Theory)	Dr. Lizan Mahmood Zangana	
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Lecturer (Practical)	Dr. Lizan Mahmood Zangana	
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Websites		

Course Description	Fluid mechanics is the study of fluids at rest and in motion. A fluid is defined as a material that continuously deforms under a constant load. There are five relationships that are most useful in fluid mechanics problems: kinematic, stress, conservation, regulating, and constitutive. The analysis of fluid mechanics problems can be altered depending on the choice of the system of interest and the volume of interest, which govern the simplification of vector quantities. By assuming that a fluid is a continuum, we make the assumption that there are no in homogeneities within the fluid. Viscosity relates the shear rate to the shear stress. Definition of a fluid as Newtonian depends on whether the viscosity is constant at various shear rates. Newtonian fluids have constant viscosities, whereas non-Newtonian fluids have a non-constant viscosity. For most bio fluid applications, we will assume that the fluid is Newtonian.
Course objectives	▪ Aspects of fluid flow behaviour. ▪ Students will learn to develop steady state mechanical energy balance equation for fluid flow systems, estimate pressure drop in fluid flow systems and determine performance characteristics of fluid machinery. ▪ The student will understand stress-strain relationship in fluids, classify their behaviour and also establish force balance in static systems. Further they would develop dimensionless groups that help in scale-up and scale-down of fluid flow systems. ▪ Students will be able to apply Bernoulli principle and compute pressure drop in flow systems of different configurations ▪ Students will compute power requirement in fixed bed system and determine minimum fluidization velocity in fluidized bed ▪ Students will be able to describe function of flow metering devices and apply Bernoulli equation to determine the performance of flow-metering devices ▪ Students will be able to determine and analyse the performance aspects of fluid machinery.
Student's obligation	▪ The student must attendance the hall 2 hour and 2 hour in practical lab the lecturer instruction wherein early attendance and bringing requisite tools and keep the hall clean and protect furniture. ▪ The student submits a weekly report about what have done in the Lab section. For examination, there are semester exam and final exam for the practical and the theory parts. During the class hours there will be some quizzes.

<table>
<tr><td>Required Learning Materials</td><td colspan="5">▪ To avoid student bared in the hall lecturer uses several tools, whiteboard, data show and other demonstrate tools to interest student.</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>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>5</td><td></td><td></td></tr>
<tr><td>Seminar</td><td>5</td><td></td><td></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></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">▪ The course on fluid mechanics is devised to introduce fundamental aspects of fluid flow behaviour.
▪ Students will learn to develop steady state mechanical energy balance equation for fluid flow systems.
▪ Estimate pressure drop in fluid flow systems and determine performance characteristics of fluid machinery</td></tr>
<tr><td>Course References:</td><td colspan="5">1. “Fluid Mechanics, Fundamentals and Applications,” Y. A. Cengel, J. M. Cimbala, 2nd Ed., McGraw-Hill, 2009.
2. “Fluid Mechanics for Chemical Engineers,” N. de Nevers, 3rd Ed., McGraw-Hill, 2004.</td></tr>
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	3. "Fluid Mechanics for Chemical Engineers with Microfluidics and CFD," J. O. Wilkes, 2nd Ed., Prentice Hall, 2005. 4. "Fluid Mechanics," F. M. White, 6th Ed., McGraw-Hill, 2008. "An Album of Fluid Motion," M. Van Dyke, The Parabolic Press, 1982

Course topics (Theory)	Week	Learning Outcome
Fluid Statics	1	
Fluid Properties	2	
Pascal's Law	3	
Fluid-Static Law	4	
Pressure Measurement	5	
Centre of pressure	6	
Resultant Force and Centre of Pressure on a Curved Surface in a Static Fluid	7	
Buoyancy	8	
Stability of loating bodies	9	

Tutorial problems	10	
Fluid Statics	11	
Internal Fluid Flow	12	
Practical Topics	**Week**	**Learning Outcome**
Density of Liquids	1	
Viscosity	2	
Bourdon gauge	3	
Centre of pressure	4	
Rotameter	5	
Flow measurement apparatus (Venturi meter)	6	
Flow measurement apparatus (Venturi meter)	7	
Flow measurement apparatus (Orifice meter)	8	
Pressure drop over flow measurement apparatus (head loss)	9	

Questions Example Design

1/ What are the practical methods to measure the density of liquids? Then explain the procedure of one of these methods only?

10 Marks

2/ Bourdon gauge is one of the essential instrument used in many practical applications, explain the parts of the instrument that consists of with its figure.

10 Marks

3/ By using the table below, find kinematic viscosity and dynamic viscosity for water.

10 Marks

Liquid	h (cm)	t (s)	V (Lit)
Water	11.5	25	2
Liquid			
Water			

Liquid	h (m)	t (s)	V (m^3)	υ (m^2/s)	μ (N.s/m)
Water					

Extra notes:

Student must be any time ready for quizzes.

External Evaluator

I have read the terms of this article and acknowledge that it meets the required purpose.

Ramzi Barwari
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