Fluid Mechanics

Module Information معلومات المادة الدراسية					
Module Title	**Fluid Mechanics**			**Module Delivery**	
Module Type	**support**			☒ **Theory**	
Module Code	UOMU0203033			☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	UGII		**Semester of Delivery**	3	
Administering Department	**Building and Construction Engineering Technologies**		**College**	**Technical Engineering College**	
Module Leader	Omran Issa Mohammed		**e-mail**	Omran.Issa.Mohammed@uomus.edu.iq	
Module Leader's Acad. Title	Assist. Professor		**Module Leader's Qualification**	Phd in Water resources engineering	
Module Tutor			**e-mail**		
Peer Reviewer Name	Assist. Prof.Dr. Omran Isaa		**e-mail**	Omran.Issa.Mohammed@uomus.edu.iq	
Scientific Committee Approval Date			**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims	1. To understand the science of fluid in rest and motion 2. To understand the types and methods of pressure measurement 3. To understand the behaviors of forces on submerged gates 4. To determine the behavior of fluid in rigid body movement 5. To understand flow of ideal fluid 6. To derive the continuity equation 7. To derive the energy equation for real fluid 8. To classified the type of the flow in pipes. 9. To determine the losses in pipes 10. study the momentum equation and dimensional analysis with model simulates 11. Study the open channel flow with their characteristics
Module Learning Outcomes	1. An ability to apply knowledge of mathematics, science, and engineering. 2. An ability to design and conduct experiments and to analyze and interpret data. 3. An ability to design a system, component, or process to meet desired need. 4. An ability to identify, formulate, and solve engineering problems. 5. An ability to communicate effectively 6. Understanding the impact of engineering solutions on global and societal context 7. Using the techniques, skills, and modern tools necessary for engineering practice 8. Present laboratory findings in a clear, concise laboratory report. 9. Statistical concepts and applications in fluid mechanics engineering 10. Critical Thinking 11. Analytical methods in solving problems 12. Identify operational problems to carry out fluid mechanics engineering studies and evaluate alternative solutions.

Indicative Contents	SI Units, dimensions, symbols , abbreviations [2 hrs.] Development of fluid mechanics, properties of fluids; density, specific weight, viscosity, compressibility, surface tension, capillarity etc. Characteristics of flow; discharge, velocity, pressure, shear etc. [3 hrs.] Fluid static's; absolute and gauge pressure, pressure measurement; Bourdon gauge, piezometer column, simple manometer, differential manometers. Hydrostatic forces on plane and curved surfaces, center of pressure. [3 hrs.] Fluid static's; absolute and gauge pressure, pressure measurement; Bourdon gauge, piezometer column, simple manometer, differential manometers. Hydrostatic forces on plane and curved surfaces, center of pressure. [3 hrs.] Energy equation for steady flow; potential, kinetic and flow energy; hydraulic grade line and energy line; cavitations; power; solution of flow problems; jet trajectory. [3 hrs.] . Momentum in fluid flow; impulse momentum principle; momentum correction factor ; forces on pressure conduits ; forces on stationary blades ; forces on moving blades ;jet reaction ; application of momentum equation to fluid flow problems . [3 hrs.] Steady flow in pressure conduits ; laminar and turbulent flow; critical flow ; general equation for conduit friction ;friction for laminar flow ; friction for turbulent flow ; pipe roughness ; friction factor charts ; empirical equations for pipe flow; economical diameter of pipes. [3 hrs.]

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on 9. Exams. 10. Student feedback.

Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem)	63	**Structured SWL (h/w)**	4.2
Unstructured SWL (h/sem)	62	**Unstructured SWL (h/w)**	4.1
Total SWL (h/sem)	125		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	10% (10)	3,5,6,10	
	Assignments	2	10% (10)	7, 8	
	reports	2	10% (10)		
	Seminar	1	10% (10)	11	
Summative assessment	**Midterm Exam**	2 hr	10% (10)	12	
	Final Exam	3hr	50% (50)	16	
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري محتوى كل اسبوع يجب ان يغطي الوقت المحدد

	Material Covered
Week 1	SI Units, dimensions, symbols , abbreviations

Week 2	SI Units, dimensions, symbols , abbreviations
Week 3	Development of fluid mechanics, properties of fluids; density, specific weight, viscosity, compressibility, surface tension, capillarity etc. Characteristics of flow; discharge, velocity, pressure, shear etc.
Week 4	Development of fluid mechanics, properties of fluids; density, specific weight, viscosity, compressibility, surface tension, capillarity etc. Characteristics of flow; discharge, velocity, pressure, shear etc.
Week 5	Fluid static's; absolute and gauge pressure, pressure measurement; Bourdon gauge, piezometer column, simple manometer, differential manometers. Hydrostatic forces on plane and curved surfaces, center of pressure.
Week 6	Fluid static's; absolute and gauge pressure, pressure measurement; Bourdon gauge, piezometer column, simple manometer, differential manometers. Hydrostatic forces on plane and curved surfaces, center of pressure.
Week 7	Fluid static's; absolute and gauge pressure, pressure measurement; Bourdon gauge, piezometer column, simple manometer, differential manometers. Hydrostatic forces on plane and curved surfaces, center of pressure. Fluid static's; absolute and gauge pressure, pressure measurement; Bourdon gauge, piezometer column, simple manometer, differential manometers. Hydrostatic forces on plane and curved surfaces, center of pressure.
Week 8	Fluid static's; absolute and gauge pressure, pressure measurement; Bourdon gauge, piezometer column, simple manometer, differential manometers. Hydrostatic forces on plane and curved surfaces, center of pressure.
Week 9	Energy equation for steady flow; potential, kinetic and flow energy; hydraulic grade line and energy line; cavitations; power; solution of flow problems; jet trajectory.
Week 10	Energy equation for steady flow; potential, kinetic and flow energy; hydraulic grade line and energy line; cavitations; power; solution of flow problems; jet trajectory.
Week 11	Momentum in fluid flow; impulse momentum principle; momentum correction factor ; forces on pressure conduits ; forces on stationary blades ; forces on moving blades ;jet reaction ; application of momentum equation to fluid flow problems .
Week 12	Momentum in fluid flow; impulse momentum principle; momentum correction factor ; forces on pressure conduits ; forces on stationary blades ; forces on moving blades ;jet reaction ; application of momentum equation to fluid flow problems .
Week 13	Steady flow in pressure conduits ; laminar and turbulent flow; critical flow ; general equation for conduit friction ;friction for laminar flow ; friction for turbulent flow ; pipe roughness ; friction factor charts ; empirical equations for pipe flow; economical diameter of pipes.
Week 14	Steady flow in pressure conduits ; laminar and turbulent flow; critical flow ; general equation for conduit friction ;friction for laminar flow ; friction for turbulent flow ; pipe roughness ; friction factor charts ; empirical equations for pipe flow; economical diameter of pipes.
Week 15	Preparing to final exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	General looking for the instruments in the fluid laboratory; How to write the practical report.
Week 2	Properties of fluid; a- density measurement b- viscosity measurement
Week 3	Pressure measurement devices ; a- barometers b- Manometers; 1.piezometers, 2.open U-tube manometer, 3.inclined manometer, 4. Differential manometer. c- Balancing of the force; 1.piston type, 2.bell type, 3.ring type. d- Borden gauge.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. Douglas, J.F. et al; 2011 (Fluid Mechanics). Prentice Hall. 2. Durgaiah D. R.; 2002 (Fluid Mechanics and Machinery). New Age international publishers. 3. White, F. M.; 1994 (Fluid Mechanics).3rd ed. McGraw-Hill, New York. 4. Khurmi, R.S.; 1994 (Hydraulics, Fluid Mechanics and Hydraulic Machines). S. Chand and Co. Ltd.	
Recommended Texts		
Websites		

Grading Scheme