



Engineering Program

Specialization	Common
Course Number	20207111
Course Title	Fluids and Hydraulic Machines
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

- ❖ Fluid properties, fluid static's, fluid motion, continuity equation, momentum principle, energy principle, Fluid flow in pipes, pipe friction, introduction to Pumps, Types ,Selection and application of pumps.

Course Objectives:

1. Develop competence in use of conservation laws (mass, energy, momentum) for analysis, design, selection, and operation of flow measuring devices, of open and closed water and waste water conveyance systems, and of hydraulic machines (pumps, turbines).
2. Utilize methods for risk and reliability analysis along with engineering economics in selecting components and systems.
3. Strengthen understanding of phenomena (e.g., cavitation, pressure/flow relations, losses), devices, components and systems with laboratory experiments and field trips.
4. Improve communication skills through report writing.
5. Development of dimensionally consistent equations. Competence with both SI and British Gravitational system of units.
6. Development of mass, momentum, and energy balances.
7. Application of conservation equations for pipe flow, pumping, and simple open channel flow application.



Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Introduction	<ul style="list-style-type: none"> ▪ Introduction ▪ Units of measurement ▪ Fluid physical properties, Density, specific weight, viscosity, surface tension, compressibility 	
2.	Hydrostatics	<ul style="list-style-type: none"> ▪ Fluid pressure, Pascal's law, Pressure variation in static fluid, pressure head, Gage and absolute pressure ▪ Pressure measurements (barometer, Manometers, Piezometer, Bourdon tube) ▪ Engineering applications of hydrostatics 	
3.	Equilibrium of Floating Bodies	<ul style="list-style-type: none"> ▪ Archimedes principle ▪ Metacenter and metacentric height ▪ Condition of Equilibrium ▪ Oscillation of floating body 	
4.	Fluid Flow Concept	<ul style="list-style-type: none"> ▪ Types of flow, Laminar and turbulent flow, uniform flow, steady and unsteady flow, incompressible and Compressible flow ▪ Fluid energy: internal energy, Kinetic energy, potential energy, pressure energy ▪ Fluid motion equations: Continuity, equation of motion for steady flow, Bernoulli equation and its applications ▪ Flow measurement: Flow through Orifice, venture, flow over notches, Pitot tube, Rota meter, discharge coefficients 	
5.	Flow through pipes	<ul style="list-style-type: none"> ▪ Types of flow in pipes, Reynolds number, boundary layer and flow in pipe, loss head in pipes Darcy-Wies formula of head in pipe, relation between friction coefficient and Reynolds ▪ Friction loss in sudden contraction and expansion ▪ Friction loss in fittings and valves ▪ Velocity distributions in pipe flow ▪ Positive displacement pumps ▪ Gear and screw pumps ▪ Centrifugal pumps 	

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		<ul style="list-style-type: none"> ▪ Pumps performance and characteristics curves ▪ Power and efficiency calculations 	
6.	Pumps	<ul style="list-style-type: none"> ▪ Types of Pumps, Principle of operation ▪ Pump power and efficiency ▪ Net positive section head ▪ Reciprocating pumps: Construction, reducing flow fluctuations 	
7.	Compressors	<ul style="list-style-type: none"> ▪ Types of Air compressors ▪ Reciprocating compressors ▪ Centrifugal compressors 	

Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	
	Second Exam	20%	
	Final Exam	50%	
Homeworks and quizzes		10%	

Teaching Methodology:

1. Lectures
2. Power point presentations
3. Discussion

Text Books & References:

References:

1. Textbook of Hydraulics, Fluid Mechanics and Hydraulic Machines by R.S. Khurmi, Publisher: S Chand, New Delhi (May 1987), ISBN: 8121901626.
2. Franzini, Fluid Mechanics with Engineering Applications, 10th Edition, McGraw Hill, 2002.
3. Giles R V et al, "Schaum's Outline of Theory and Problems of Fluid Mechanics and Hydraulics", 3rd Edition, McGraw-Hill, 1994.
4. E John Finnemore and Joseph B Franzini, Fluid Mechanics With Engineering Applications, 10th Edition.

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Common
Course Number	20207112
Course Title	Fluids and Hydraulic machines Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

- ❖ Measuring of physical properties of fluids, force on immersed plate, Jet force on plate, Bernoullis equation, Reynolds experiments, flow through orifices, and nozzle venture friction factor.

Course Objectives:

At the completion of this course, each student is expected to be able to:

1. Validate Bernoulli's equation.
2. Measure the fluid Density and viscosity.
3. Determine the Force of pressure on immersed plate.
4. Study the Energy loss and friction coefficient.
5. Perform Flow rate measurements (by orifice and venture).
6. Study the performance of Reciprocating, gear, and centrifugal pumps.
7. Connect pumps in series and parallel and investigate the performance of each configuration.



Detailed Course Description:

Lab Number	Lab Name	Lab Content	Time Needed
1.	Density and viscosity measurements		1
2.	Force of pressure on immersed plate		1
3.	Demonstrating of Bernoulli's equation		1
4.	Flow rate measurements (flow through orifice and venture)		1
5.	Energy loss and friction coefficient measurements		1
6.	Head loss in smooth and rough pipes		1
7.	Pipe flow, Reynolds number, laminar and turbulent flow in pipes		1
8.	Flow over notches and Weirs		1
9.	Pump Testing in Series		1
10.	Reciprocating pump performance		1
11.	Gear pump efficiency		1
12.	Performance of Reciprocation air compressor		1
13.	Centrifugal Pump Testing		1

Evaluation Strategies:

Exams		Percentage	Date
Exams	Mid Exam	20%	--/--/----
	Reports	30%	--/--/----
	Final Practical Exam	50%	--/--/----

Teaching Methodology:

2. Laboratory

Text Books & References:

Instructional Lab. Sheets



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