34Course Specification of Fluid Mechanics

I. Course Identification and General Information:

1	**Course Title:**	**Fluid Mechanics**				
2	**Course Code & Number:**	CE 206				
3	**Credit hours:**	C.H				**Credit Hours**
		Th.	**Tu.**	**Pr.**	**Tr.**	
		2	2	2		4
4	**Study level/ semester at which this course is offered:**	3rd Level/ 1st semester				
5	**Pre –requisite (if any):**	Mechanics (Statistic and Dynamics)				
6	**Co –requisite (if any):**	----------				
8	**Program (s) in which the course is offered:**	Civil Engineering				
9	**Language of teaching the course:**	English+ Arabic				
10	**Location of teaching the course:**	Class room and laboratory				
11	**Prepared By:**	Dr. Mansour Haidera & Dr. Zamzam Mubarak				
12	**Date of Approval**					

II. Course Description:

This course is important because of many problems that a civil engineer considers, especially in water resources, flood control and drainage. The knowledge and abilities taught in this course are essential in understanding the hydraulic topics. The course includes the following: Definition and dimensions of fluid - Density - Specific weight - Specific Gravity-Viscosity-compressibility - surface tension - capillarity - vapor pressure- law of ideal gas - pressure at a point - change of pressure with depth - Pressure Gauges - Static forces on flat surfaces - static forces on curved surfaces - Buoyancy - flow path lines - types of flow-continuity equation- Bernoulli equation and its applications- linear momentum equation with applications.

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III. Course Intended learning outcomes (CILOs) of the course		Referenced PILOs
a.1	Define the basic properties of fluids mechanics, measuring units and dimensions	**A1**
a.2	Identify the behavior of fluids at statics state, the acting pressure and forces on immersed bodies and the pressure by using measuring instruments.	**A5**
a.3	Recognize the behavior of fluids at motion and thus flow kinetics, momentum in fluid flow and flow via losses through pipes and orifices.	**A1**
b.1	Choose appropriate methods for analyzing dimension problems	**B2**
b.2	Discuss fluids at static state that involve pressure and force effect on immersed body, various surfaces and hydraulic gates. Also discuss fluids at motion state that involve momentum at junctions and bends and pipe flow and losses.	**B1**
c.1	Solve problems of fluids at static; pressure, force effect on immersed body, various surfaces and hydraulic gates. Also solve fluids problems at motion; momentum at junctions and bends, pipe flow and losses .	**C2**
c.2	Apply of tests in the hydraulic laboratory to verify some of the fluid properties of some fluids	**C1**
c.3	Apply of experiments to find pressures of fluids by using gauges devices, to find forces of fluids on immersed body and on surfaces, also experiments on energy, analyze of the values, use of appropriate formula for calculation	**C1**
d1	Write laboratory experiment report including the calculations ,drawing and comments.	**D1**

(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
a1-Define the basic properties of fluids mechanics, measuring units and dimensions	Lecture Tutorial	Problem set- Written exam- Written assignment
a2- Identify the behavior of fluids at statics state, the acting pressure and forces on immersed bodies and measuring instruments.	Lecture Multimedia presentation Tutorial	Problem set- Written exam- Written assignment, individual and group reports
a3-Recognize the behavior of fluids at motion and thus flow kinetics, momentum in fluid flow and flow via losses through pipes and orifices**.**	Lecture Multimedia presentation Tutorial	Problem set- Written exam- Written assignment

(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
b1- Choose appropriate methods for analyzing dimension problems	Lecture Tutorial	Problem set- Written exam- Written assignment
b2- Discuss fluids at static state that involve pressure, force effect on immersed body, various surfaces and hydraulic gates. Also discuss fluids at motion state that involve momentum at junctions and bends and pipe flow and losses.	Lecture Presentations Tutorial	Participation- Written assignment- Written exam, individual and group reports

C Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
c1- Solve problems of fluids at static; pressure, force effect on immersed body, various surfaces and hydraulic gates. Also solve fluids problems at motion; momentum at junctions and bends, pipe flow and losses .	Lecture Presentations Tutorial	Problem set- Written exam- Written assignment, individual and group reports
c2-Apply tests in the hydraulic laboratory to verify some of the fluid properties of some fluids.	Lecture in the laboratory on the experiment , small group working on experiments, Discussion	Laboratory performance, individual and group work ,Written exam.
c3-Apply experiments to find pressures by using pressure gauges, forces on immersed body, and on surfaces, also experiments on energy, analyze of the values, use of appropriate formula for calculation.	Lecture in the laboratory on the experiment , small group working on laboratory experiments, Discussion	Laboratory performance, individual and group work, Written exam.

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d1-Write laboratory experiment report including the calculations ,drawing and comments.	Lab experiments	Written report of each laboratory experiment

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IV. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	contact hours
1	Dimensions and units	a1, b1	International system units, British system units.	1	2
2	Properties of fluids	a1, b1,c1	Density - Specific weight - specific volume - Specific Gravity - Viscosity – compressibility - surface tension - capillarity - vapor pressure	1	2
3	Fluid statics	a2,b2,c1	Basic concepts and applications of Pascal's law, law of ideal gas - pressure at a point - change of pressure with depth- Pressure Gauges - Manometer - Barometer - mechanical devices.	2	4
4	Hydrostatic pressure on surfaces	a2,b2,c1	Pressures on the vertical and inclined plane surfaces, and also on curved surface Centre of pressure on the surfaces	2	4
5	Buoyancy and flotation	a2,b2,c1	Buoyancy force , center of buoyancy , metacentric height, stability of submerged and floating bodies	1	2
6	Fluid kinetics	a3,b2,c1	speed and acceleration -path lines, streamlines, types of flow, continuity equation	1	2
7	Bernoulli's equation and applications	a3,b2,c1	Siphon – Pittot tube - Venturi meter.	3	6

IV. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	contact hours
8	Momentum equation and applications	a3,b2.c1	Forces on joints and bends	1	2
9	Introduction to flow through pipes and losses	a3,b2,c1	Introduction to flow through pipes and losses	2	4
Number of Weeks /and Units Per Semester				**14**	**28**

B - Tutorial Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Learning Outcomes
1	Dimensions and units	1	2	a1, b1
2	Properties of fluids	1	2	a1, b1,c1, c2
3	Fluid statics	2	4	a2,b2,c1, c3
4	Hydrostatic pressure on plane and curved surfaces	2	4	a2,b2,c1,c3
5	Buoyancy and flotation	1	2	a2,b2,c1,c3
6	Fluid kinetics	1	2	a3,b2,c1,c3
7	Bernoulli's equation and applications	3	6	a3,b2,c1, ,c3
8	Momentum equation and applications	1	2	a3, b2.c1, ,c3
9	Introduction to flow through pipes and losses	2	4	a3,b2,c1
Number of Weeks /and Units Per Semester		**14**	**28**	

c –Practical Aspect:				
Order	**Tasks/ Experiments**	**Number of Weeks**	**contact hours**	**Learning Outcomes**
1	Properties of fluids (density, specific gravity, viscosity, capillary rise and surface tension)	3	6	a1, b1,c3, c2,d1
2	Fluid statics (pressure at free surface , dead weight pressure gauge calibrator)	2	4	a2,b2,c3, c2,d1
3	Hydrostatic pressure on plane and curved surfaces	2	4	a2,b2,c2,c3,d1
4	Buoyancy and flotation	1	2	a2,b2,c2
5	Fluid kinetics	1	2	a3,b2,c2,c3, d1
6	Bernoulli's equation and applications: total energy line and hydraulic gradient line	3	6	a3,b2,c2,c3, d1
7	Momentum equation and applications: Impact of jet	2	4	a3,b2.c2, c3, d1
Number of Weeks /and Units Per Semester		**14**	**28**	

V. Teaching strategies and tools of the course:

Lecture
Presentations
Tutorial and discussion
Reading
Laboratory experiments
Multimedia presentation
small group working on experiments,

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VI. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Dimensions and units	a1, b1	1	0.5
2	Properties of fluids	a1, b1,c1, c2,d1	3	1
3	Fluid statics	a2,b2,c1, c3.d1	4	0.5
4	Hydrostatic pressure on surfaces	a2,b2,c1,c3,d1	5	2
5	Buoyancy and flotation	a2,b2,c1,c3, d1	6	1
6	Fluid kinetics	a3,b2,c1,c3, d1	7	1
7	Bernoulli's equation and applications	a3,b2,c1, ,c3, d1	10	2
8	Momentum equation and applications	a3,b2.c1, ,c3, d1	11	1
9	Introduction to flow through pipes and losses	a3,b2,c1	13	1

VII. Reports:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Properties of fluids (density, specific gravity, viscosity, capillary rise and surface tension)	a1, b1,c3, c2,d1	3	2
2	Fluid statics (pressure at free surface , dead weight pressure gauge calibrator)	a2,b2,c3, c2,d1	2	1
3	Hydrostatic pressure on plane and curved surfaces	a2,b2,c2,c3,d1	2	2
4	Buoyancy and flotation	a2,b2,c2	1	2
5	Fluid kinetics	a3,b2,c2,c3, d1	1	1
6	Bernoulli's equation and applications: total energy line and hydraulic gradient line	a3,b2,c2,c3, d1	3	2
7	Momentum equation and applications: Impact of jet	a3,b2.c2, c3, d1	1	1

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VIII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1	Written assignment	2-3-4-5-6-7-10-11-13	10	5	a1,a2,a3,b1,b2,c1
2	Quizzes. Quizzes	Three time randomly	10	5	a1,a2,a3,b1,b2,c1
3	Mid-term exam.	7th	30	15	a1,a2,a3,b1,b2,c1
4	reports	3,5,7,8,9, 12,13	10	5	a1,a.2,a.3, b1,c3, c2,d1
5	Practical Exam,	15th	20	10	c2,c3.d1
6	Final-exam.	16th	120	60	
	Sum		**200**	**100%**	

IX. Learning Resources:

- Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).

1- Required Textbook(s) (maximum two).

1- Street, R. L., Watters, G. Z., and Vennard, J. K. (1996), "Elementary Fluid Mechanics", 7th ed., John Wiley & Sons, New York.
2- Joseph B. Franzini and E. John Finnemore (1997),” Fluid mechanics with engineering Applications”, 9th Ed., McGraw-Hill.

2- Essential References.

1-Lecture notes.
2-Munson,B. R., Young, D. F and Okiishi, T. H. (1998), "Fundamentals of Fluid Mechanics", John Wiley & Sons, New York, 3rd ed.

3- Electronic Materials and Web Sites *etc*.

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X. Course Policies:	
1	**Class Attendance:** The students should have more than 75 % of attendance according to rules and regulations of the faculty.
2	**Tardy:** The students should respect the timing of attending the lectures. They should attend within 10 minutes from starting of the lecture.
3	**Exam Attendance/Punctuality:** The student should attend the exam on time. The punctuality should be implemented according to rules and regulations of the faculty for midterm exam and final exam.
4	**Assignments & Projects:** The assignment is given to the students after each chapter, the student has to submit all the assignments for checking on time.
5	**Cheating:** If any cheating occurred during the examination, the student is not allowed to continue and he has to face the examination committee for investigation and punishment according to the faculty rules.
6	**Plagiarism:** The student will be terminated from the Faculty, if one student attends the exam on another behalf according to the policy, rules and regulations of the university.
7	**Other policies:** -All the teaching materials should be kept out the examination hall. -The mobile phone is not allowed. -There should be a respect between the student and his teacher.

Reviewed By	**Vice Dean for Academic Affairs and Post Graduate Studies** **Dr. Tarek A. Barakat** **Dr. Mohammad Algorafi**
	Deputy Rector for Academic Affairs Dr. Ibrahim AlMutaa **Dr. Ahmed mujahed** **Dr. Munaser Alsubri**

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Template for Course Plan (Syllabus) of Fluid Mechanics

I. - Information about Faculty Member Responsible for the Course:							
Name of Faculty Members	Dr. Mansour Haidera & Dr. Zamzam Mubarak	**Office Hours**					
Location& Telephone No.	Civil Engineering Department/733333016/774229900	**SAT**	**SUN**	**MON**	**TUE**	**WED**	**THU**
E-mail	mhaidera@hotmail.com Zamzam-mubarak@yahoo.com		8-10				

II. Course Identification and General Information:						
1	**Course Title:**	***Fluid Mechanics***				
2-	**Course Number & Code:**	CE206				
3-	**Credit hours:**	**C.H**				**Credit Hours**
		Th.	**Tu.**	**Pr.**	**Tr.**	
		2	2	2		4
4-	**Study level/year at which this course is offered:**	3rd Level / 1st semester				
5-	**Pre –requisite (if any):**	Mechanics (Statistic and Dynamics)				
6-	**Co –requisite (if any):**	----------				
7-	**Program (s) in which the course is offered**	Civil Engineering				
8-	**Language of teaching the course:**	English+ Arabic				
9-	**System of Study:**	Regular				
10-	**Mode of delivery:**	Lecture/Multimedia presentation				
11-	**Location of teaching the course:**	Class, Laboratory				

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III. Course Description:

This course is important because of many problems that a civil engineer considers, especially in water resources, flood control and drainage. The knowledge and abilities taught in this course are essential in understanding the hydraulic topics. The course includes the following: Definition and dimensions of fluid - Density - Specific weight - Specific Gravity-Viscosity-compressibility - surface tension - capillarity - vapor pressure- law of ideal gas - pressure at a point - change of pressure with depth - Pressure Gauges - Static forces on flat surfaces - static forces on curved surfaces - Buoyancy - flow path lines - types of flow-continuity equation- Bernoulli equation and its applications- linear momentum equation with applications.

IV. Intended learning outcomes (ILOs) of the course:

Brief summary of the knowledge or skill the course is intended to develop:

a1- Define the basic properties of fluids mechanics, measuring units and dimensions. (A1)
a2- Identify the behavior of fluids at statics state, the acting pressure and forces on immersed bodies and the pressure by using measuring instruments.(A5)
a3- Recognize the behavior of fluids at motion and thus flow kinetics, momentum in fluid flow and flow via losses through pipes and orifices. (A1)
b1- Choose appropriate methods for analyzing dimension problems. (B2)
b2- Discuss fluids at static state that involve pressure and force effect on immersed body, various surfaces and hydraulic gates. Also discuss fluids at motion state that involve momentum at junctions and bends and pipe flow and losses.(B1)
c1- Solve problems of fluids at static; pressure, force effect on immersed body, various surfaces and hydraulic gates. Also solve fluids problems at motion; momentum at junctions and bends, pipe flow and losses.(C2)
c2- Apply tests in the hydraulic laboratory to verify some of the fluid properties of some fluids. (C1)
c3-Apply experiments to find pressures of fluids by using gauges devices, to find forces of fluids on immersed body and on surfaces, also experiments on energy, analyze of the values, use of appropriate formula for calculation.(C1)
d1- Write laboratory experiment report including the calculations ,drawing and comments.(D1)

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V. Course Content:

- **Distribution of Semester Weekly Plan of Course Topics/Items and Activities.**

A – Theoretical Aspect:

Order	Topics List	Sub Topics List	Week Due	Contact Hours
1	Dimensions and units	International system units, British system units.	1	2
2	Properties of fluids	Density - Specific weight - specific volume - Specific Gravity - Viscosity – compressibility - surface tension - capillarity - vapor pressure	2	2
3	Fluid statics	Basic concepts and applications of Pascal's law, law of ideal gas - pressure at a point - change of pressure with depth- Pressure Gauges - Manometer - Barometer - mechanical devices.	3,4	4
4	Hydrostatic pressure on plane and curved surfaces	Pressures on the vertical and inclined plane surfaces, and also on curved surface Centre of pressure on the surfaces	5,6	4
5	Buoyancy and flotation	Buoyancy force , center of buoyancy , metacentric height, stability of submerged and floating bodies	7	2
6	Midterm Exam		8	2
7	Fluid kinetics	speed and acceleration -path lines, streamlines, types of flow, continuity equation	9	2
8	Bernoulli's equation and applications	Siphon – Pittot tube - Venturi meter.	10,12	6
9	Momentum equation and applications	Forces on joints and bends	13	2
10	Introduction to flow through pipes and losses	Introduction to flow through pipes and losses	14,15	4
11	Final Exam		16	2
Number of Weeks /and Units Per Semester			**16**	**32**

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B –Tutorial Aspect:			
Order	**Topics List**	**Week Due**	**Contact Hours**
1	Dimensions and units	1	2
2	Properties of fluids	2	2
3	Fluid statics	3,4	4
4	Hydrostatic pressure on plane and curved surfaces	5,6	4
5	Buoyancy and flotation	7	2
6	Fluid kinetics	8	2
7	Bernoulli's equation and applications	9,11	6
8	Momentum equation and applications	12	2
9	Introduction to flow through pipes and losses	13,14	4
Number of Weeks /and Units Per Semester		**14**	**28**

C– Practical Aspects:			
Order	**Topics List**	**Week Due**	**Contact Hours**
1	Properties of fluids (density, specific gravity, viscosity, capillary rise and surface tension)	1,2,3	6
2	Fluid statics (pressure at free surface , dead weight pressure gauge calibrator)	4,5	4
3	Hydrostatic pressure on plane and curved surfaces	6,7	4
4	Buoyancy and flotation	8	2
5	Fluid kinetics	9	2

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6	Bernoulli's equation and applications: total energy line and hydraulic gradient line	10,12	6
7	Momentum equation and applications	13	26
8	Momentum equation and applications	12	2
9	Introduction to flow through pipes and losses	13,14	4
Number of Weeks /and Units Per Semester		**14**	**28**

VI. Teaching strategies of the course:

Lecture
Presentations
Tutorial and discussion
Reading
Laboratory experiments
Multimedia presentation
small group working on experiments,

VII. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Dimensions and units	a1, b1	1	0.5
2	Properties of fluids	a1, b1,c1, c2,d1	3	1
3	Fluid statics	a2,b2,c1, c3.d1	4	0.5
4	Hydrostatic pressure on surfaces	a2,b2,c1,c3,d1	5	2
5	Buoyancy and flotation	a2,b2,c1,c3, d1	6	1
6	Fluid kinetics	a3,b2,c1,c3, d1	7	1
7	Bernoulli's equation and applications	a3,b2,c1, ,c3, d1	10	2
8	Momentum equation and applications	a3,b2.c1, ,c3, d1	11	1
9	Introduction to flow through pipes and losses	a3,b2,c1	13	1

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VIII. Reports :

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Properties of fluids (density, specific gravity, viscosity, capillary rise and surface tension)	a1, b1,c3, c2,d1	1-3	2
2	Fluid statics (pressure at free surface , dead weight pressure gauge calibrator)	a2,b2,c3, c2,d1	4-5	1
3	Hydrostatic pressure on plane and curved surfaces	a2,b2,c2,c3,d1	6-7	2
4	Buoyancy and flotation	a2,b2,c2	8	2
5	Fluid kinetics	a3,b2,c2,c3, d1	9	1
6	Bernoulli's equation and applications: total energy line and hydraulic gradient line	a3,b2,c2,c3, d1	10-12	2
7	Momentum equation and applications: Impact of jet	a3,b2.c2, c3, d1	13	1

IX. Schedule of Assessment Tasks for Students During the Semester:

Assessment	Type of Assessment Tasks	Week Due	Mark	Proportion of Final Assessment
1	Written assignment	2-3-4-5-6-7-9-11-13	10	5
2	Quizzes.	Three time randomly	10	5
3	reports	3,5,7,8,9, 12,13	10	5
4	Mid-term exam.	7^{th}	30	15
5	Practical Exam,	15^{th}	20	10
6	Final-exam.	16^{th}	120	60
	Sum		**200**	**100%**

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XI. Course Policies:	
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2	**Tardy:** The students should respect the timing of attending the lectures. They should attend within 10 minutes from starting of the lecture.
3	**Exam Attendance/Punctuality:** The student should attend the exam on time. The punctuality should be implemented according to rules and regulations of the faculty for midterm exam and final exam.
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7	**Other policies**: -All the teaching materials should be kept out the examination hall. -The mobile phone is not allowed. -There should be a respect between the student and his teacher.

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