Universidad Carlos III de Madrid
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ENGINEERING FLUID MECHANICS		
BACHELOR IN INDUSTRIAL TECHNOLOGY ENGINEERING	**COURSE: 2**	**SEMESTER: 1**
BACHELOR IN MECHANICAL ENGINEERING **BACHELOR IN INDUSTRIAL ELECTRONICS AND AUTOMATION** **BACHELOR IN ELECTRICAL ENGINEERING** **BACHELOR IN ENERGY ENGINEERING**	**COURSE: 2**	**SEMESTER: 2**

WEEKLY PLANNING

WEEK	SESSION	DESCRIPTION	GROUP		SPECIAL ROOM FOR SESSION (Computer class room, audio-visual class room	Indicate YES/NO If the session needs 2 teachers	WEEKLY PROGRAMMING FOR STUDENT		
			LECTURE	SEMINAR			DESCRIPTION	CLASS HOURS	HOMEWORK HOURS (Max. 7h week)
1	1	**Course presentation** **Course motivation: applications of Fluid mechanics** **Introduction.** Solids, liquids and gases. Continuum hypothesis and fluid particle. Density, velocity and internal energy. Local thermodynamic equilibrium. Thermodynamic variables and relations		X		NO	Review of thermodynamics	1.66	3
1	2	**Hydrostatics.** Volume and surface forces. Hydrostatic pressure. Pressure distribution on a fluid at rest.	X			NO	Study of lecture notes on hydrostatics	1.66	
2	3	Hydrostatics applied to pressure measurements Examples of hydrostatics problems		X		NO	Additional hydrostatics problems	1.66	4
2	4	Computation of hydrostatic forces and moments on planar and curved surfaces. Archimedes' law. Stability of submerged bodies.	X			NO	Study of lecture notes on hydrostatics	1.66	
3	5	Problems 29, 13, 19 and 18 of the collection		X		NO	Additional hydrostatics problems	1.66	5
3	6	**Kinematics.** **Conservation laws in Fluid mechanics and Reynolds transport theorem.** Mass, momentum and energy conservation. Fluid volumes and control volumes. Convective flux. Reynolds transport theorem.	X			NO	Study of lecture notes	1.66	
4	7	**Continuity equation.** Mass conservation equation. Mass flow rate and volume flow rate. 1D approximation of the flux terms. **Momentum equation.** Volume forces and surface forces. Viscous forces. Conservation of momentum equation. **Example:** Flow in a contraction section of a conduit.		X		NO	Study of lecture notes and additional problems	1.66	7
4	8	**QUIZZ 1**	X			YES		1.66	

5	9	Bernoulli equation and example problems		X		NO	Study of lecture notes and additional problems	1.66	5
5	10	Problems solved with the aid of the Bernoulli equation	X			NO	Study of lecture notes and additional problems	1.66	
6	11	**LAB SESSION 1**		X	LAB 1.0D02	YES	Report on the lab session	1.66	7
6	12	**Energy equation.** The first law of thermodynamics. Heat transfer. Work exerted by surface forces and by volume forces. Energy conservation equation. Energy balance on fluid machines.	X			NO	Study of lecture notes and additional problems	1.66	
7	13	**Angular momentum equation.**		X		NO	Study of lecture notes and additional problems	1.66	5
7	14	Problems on conservation laws.	X			NO	Study of lecture notes and additional problems	1.66	
8	15	**LAB SESSION 2/3**		X	LAB 1.0D02	YES	Report on the lab session	1.66	7
8	16	**Dimensional analysis.** Units and dimensions. The Pi theorem.	X			NO	Study of lecture notes and additional problems	1.66	
9	17	Problems on dimensional analysis		X		NO	Study of lecture notes and additional problems	1.66	7
9	18	**QUIZZ 2**	X			YES		1.66	
10	19	**LAB SESSION 2/3**		X	LAB 1.0D02	YES	Report on the lab session	1.66	5
10	20	Relevant dimensionless parameters in Fluid mechanics. Physical similarity and model theory.	X			NO	Study of lecture notes and additional problems	1.66	
11	21	Problems on dimensional analysis		X		NO	Study of lecture notes and additional problems	1.66	5
11	22	**Flow in ducts.** Introduction. Laminar and turbulent regimes. Fully developed flow in a circular pipe. Energy conservation equation with frictional losses.	X			NO	Study of lecture notes and additional problems	1.66	
12	23	Problems 10, 13, 14 and 15 of the collection.		X		NO	Study of lecture notes and additional problems	1.66	5
12	24	Secondary losses in pipes bends and elbows. Entrance losses. Expansions and contractions. Valves and other fittings. Analysis of simple pipe systems.	X			NO	Study of lecture notes and additional problems	1.66	
13	25	**QUIZZ on the LAB**		X	LAB 1.0D02	YES		1.66	5
13	26	External flow	X			NO		1.66	
14	27	Problems 2, 20 and 22 of the collection.		X		NO	Study of lecture notes and additional problems	1.66	7
14	28	**QUIZZ 3**	X			YES		1.66	
	29	Review problems		X		NO		1.66	1.5
							Subtotal 1	**48.33**	**78.5**
							Total 1 *(Hours of class plus student homework hours between weeks 1-14)*	**126.83**	
15		Available for recovery lectures or tutorials							3
16		Assessment preparation and assessment					Assessment preparation and assessment	3	9
17									
18									
							Subtotal 2	**3**	**12**
							Total 2 *(Hours of class plus student homework hours between weeks 15-18)*	**15**	
							TOTAL *(Total 1 + Total 2. Maximum 180 hours)*	**141.83**	