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Course unit title:	Fluid Mechanics I		
Course unit code:	ME 202		
Type of course unit:	Compulsory		
Level of course unit:	Bachelor (1st Cycle)		
Year of study:	2		
Semester when the unit is delivered:	4 (Spring)		
Number of ECTS credits allocated :	5		
Name of lecturer(s):	Dr. Marios M. Fyrillas		
Learning outcomes of the course unit:	1. Identify the properties of a fluid and classify fluids in categories based on their stress-strain relationship. Calculate the stress/strain of a Newtonian fluid. 2. Calculate the pressure variation in manometers, tubes, containers etc and compute the force on an immersed surface due to the presence of a static fluid. 3. Compute the forces and velocities in a moving fluid using conservation laws in control volume form (continuity, momentum equation), for steady flow. 4. Differentiate between streamline vs pathline, and streamfunction vs velocity potential, and apply Bernoulli's equation along a streamline. 5. Use dimensional analysis to obtain the dimensionless groups associated with a physical problem and apply similarity to relate the conditions of the prototype with its model. 6. Determine the velocity profile of some basic internal flows. 7. Calculate the viscous losses associated with a pipe network hence estimate the necessary pressure/power to drive the flow.		
Mode of delivery:	Face-to-face		
Prerequisites:	AMAT122	Co-requisites:	AMAT204
Recommended optional program components:	None		
Course contents:	• **Fundamental concepts:** Definition of a fluid, control volume and differential analysis, kinematics of fluid motion, stress and strain rate, Newtonian fluid. • **Fluid in equilibrium:** Fluid statics, variation of pressure with depth, forces on immersed surfaces. • **Conservation laws in control volume form:** continuity, momentum equation for steady flow, first law of thermodynamics (relation to Bernoulli's equation), applications. • **Differential analysis of fluid motion:** streamfunction for two-dimensional incompressible flow, incompressible inviscid flow, Bernoulli's equation, irrotational flow and the velocity potential. • **Dimensional analysis and similitude:** Nature of dimensional analysis, Buckingham's Π theorem, arrangement of dimensionless group. • **Viscous flow:** - Laminar internal flows: Poiseuille and Couette flow, turbulent internal flow, major and minor losses.		

	- External flow: General external flow characteristics, lift and drag concepts, boundary layer analysis, estimation of lift and drag coefficient. • **Laboratory Work:** Small group experiments performed in the Fluid Mechanics Laboratory. The laboratory work is designed such that it provides a visual verification of the principles mentioned in class.
Recommended and/or required reading:	
Textbooks:	Donald F. Young, Theodore H. Okiishi, Bruce Roy Munson, **Fundamentals of Fluid Mechanics**, John Wiley & Sons, 4th edition, 2002
References:	J. Fox, K. McDonald, **Introduction to Fluid Mechanics**, 5th Edition, Wiley, 1998 Merle C. Potter, **Mechanics of Fluids**, 1997 Prentice Hall J.F. Douglas, **Fluid Mechanics**, Third Edition, Longman 1998 Pijush K. Kundu, Ira M. Cohen, **Fluid Mechanics**, Second Edition by Academic Press, 2001. C. T. Crowe, D.F. Elger, John A Roberson, **Engineering Fluid Mechanics**, John Wiley & Sons, 7th Edition, 2000. Robert L. Mott, **Applied Fluid Mechanics**, Prentice Hall, 5th edition, 1999 Anthony Esposito, **Fluid Mechanics with applications**, Prentice Hall, 1998
Planned learning activities and teaching methods:	The taught part of course is delivered to the students by means of lectures, conducted with the help of both computer presentations and traditional means. Practical examples and exercises are included in the lectures to enhance the material learning process. Lecture notes and presentations are available through the web for students to use in combination with the textbooks. Lectures are supplemented with laboratory work carried out in the Mechanical Engineering Lab. Laboratory sessions are designed such that the students would appreciate the theory presented in the lectures and, furthermore, practical applications of the results are demonstrated. Students are assessed continuously and their knowledge is checked through tests with their assessment weight.
Assessment methods and criteria:	• Assignments 10% • Tests: 20% • Laboratory Work: 20% • Final Exam 50%
Language of instruction:	English
Work placement(s):	No