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<table>
<tr><td>Course unit title:</td><td colspan="3">Hydrodynamics and Hydraulics</td></tr>
<tr><td>Course unit code:</td><td colspan="3">CE230</td></tr>
<tr><td>Type of course unit:</td><td colspan="3">Compulsory</td></tr>
<tr><td>Level of course unit:</td><td colspan="3">Bachelor (1st Cycle)</td></tr>
<tr><td>Year of study:</td><td colspan="3">2</td></tr>
<tr><td>Semester when the unit is delivered:</td><td colspan="3">4 (Spring)</td></tr>
<tr><td>Number of ECTS credits allocated :</td><td colspan="3">5</td></tr>
<tr><td>Name of lecturer(s):</td><td colspan="3">Dr. George Michaelides</td></tr>
<tr><td>Learning outcomes of the course unit:</td><td colspan="3">1. Define basic terms and concepts such as density, specific weight, specific gravity, surface tension, viscosity, pressure, and compressibility.
2. Differentiate among various basic fluid properties, atmospheric and gauge pressure.
3. Describe the principles behind the measurement of pressure and the function of barometers.
4. Understand the theory governing the flow (motion of fluids) and Bernoulli’s Equation, and the variation of flow parameters in time and space.
5. Solve problems pertaining to the variation of pressure, the equilibrium of a fluid with constant density and numerical problems that make use of the Bernoulli Equation principles.
6. Calculate the hydrostatic thrust on submerged surfaces.
7. Apply Archimedes principle of buoyancy and stability.
8. Describe relationships and interconnections between various concepts involved in the Momentum Equation that refers to forces due to fluids in motion.
9. Solve problems that utilize the principles of the Momentum Equation.
10. Understand the geometry and efficiency of typical open channels.
11. Use equations to calculate friction losses in pipes.
12. Calculate major and minor (exit and entrance losses, contractions, bends, sudden enlargements) friction losses in pipes, flow characteristics in pipes-in-series and in pipes-in-parallel networks</td></tr>
<tr><td>Mode of delivery:</td><td colspan="3">Face-to-face</td></tr>
<tr><td>Prerequisites:</td><td>APHY111</td><td>Co-requisites:</td><td>None</td></tr>
<tr><td>Recommended optional program components:</td><td colspan="3">None</td></tr>
<tr><td>Course contents:</td><td colspan="3"><u>Part A: Theory</u>

1. Properties of fluids
2. Fluid statics
3. Fluid motion
4. Open Channels
5. Flow in pipes; energy losses.
6. Pipe networks:
Single pipes and pipes in series
Parallel pipes
7. Hydraulic systems:
Interconnected reservoirs
Quasi-steady flow
8. Momentum Equation

<u>Part B: Laboratory work</u></td></tr>
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	Lab Exercise 1: Rotary Viscometer • Properties of Fluids o Density, Gravity, Specific Gravity, Viscosity o Measurement of Viscosity **Lab Exercise 2: Buoyancy** • Pressure and Fluid Statics o Introduction to Fluid Statics o Hydrostatic Forces on Submerged Surfaces o Buoyancy and Stability **Lab Exercise 3: Confined flows in water channels** • Fluid Kinematics o Fundamentals of Flow Visualisation o Conservation of Mass o The Bernoulli Theorem **Lab Exercise 4: Flow Rate Measurement with a Venturi Tube** • Flows in pipes o Laminar and Turbulent Flows o Laminar and Turbulent Flows in Pipes o Flow Rate and Velocity Measurement **Lab Exercise 5: Impact Force of a Jet Fluid** • Momentum Analysis of Flow Systems o Newton's Laws and Conservation of Momentum o Forces Acting on a Control Volume o The Linear Momentum Equation
Recommended and/or required reading:	
Textbooks:	• Donald F. Young, Theodore H. Okiishi, Bruce Roy Munson, 2002. ***"Fundamentals of Fluid Mechanics"***. John Wiley & Sons; 4th edition.
References:	• Clayton, T. Crowe, John A. Roberson, Donald F. Elger. 2004. ***"Engineering Fluid Mechanics"***. John Wiley & Sons Inc. • Frank White. 2002. ***"Fluid Mechanics"***. McGraw-Hill College.
Planned learning activities and teaching methods:	The course will be presented through theoretical lectures in class, numerical problem-solving sessions, and laboratory exercises. The lectures will present to the student the course content and allow for questions. The material will be presented using visual aids (i.e. PowerPoint presentation slides, documentaries, etc.). The aim is to familiarize the student with the different and faster pace of presentation and also allow the instructor to present related material that would otherwise be very difficult to do. The learning process will be enhanced with the application of theoretical concepts covered through in-class numerical examples, the requirement from students to tackle numerical exercises, and participate in small-group discussions that will seek to interconnect the theoretical backdrop with the numerical application of these. In-class problem-solving as well as homework exercises (mostly numerical) will allow students to hone their quantitative analysis skills in a controlled setting. A laboratory component for this course seeks to further elucidate theoretical concepts introduced in class. Besides from the notes taken by students in class, all of the course material will be made available through the class website which will be available through the University's E-learning platform ("Moodle"). The instructor will be available to students during office hours or by appointment in order to provide necessary guidance.
Assessment methods and criteria:	• Coursework 50% • Final Examination 50%
Language of instruction:	English
Work placement(s):	No