Introduction to Fluid Mechanics

1. **Course number and name:** 020IMFCI4 Introduction to Fluid Mechanics

2. **Credits and contact hours:** 2 ECTS credits, 1 x 1:15 contact hours

3. **Name(s) of instructor(s) or course coordinator(s):** Remi Z. DAOU

4. **Instructional materials:** PowerPoint slides

5. **Specific course information**
   a. **Catalog description:**
      Fluid properties, Hydrostatic Law, Pascal Law, Archimedes Law, Hydrostatic force on plane and curved surfaces. Lines of flow, Types of flow, velocity field and acceleration, continuity equation, Equation of streamline, stream function, velocity potential function, circulation, vorticity, irrotational and rotational flow, compressible and incompressible flows, Lagrange and Euler Description.

   b. **Prerequisites:** None

   c. **Required/Selected Elective/Open Elective:** Required

6. **Educational objectives for the course**
   a. **Specific outcomes of instruction:**
      - Name the properties of fluids
      - Define the dynamic and kinetic viscosities
      - Make use of the bulk modulus definition
      - Define the static pressure in a motionless fluid
      - Calculate the pressure force on immersed surfaces.
      - Make use of Archimedes' principle
      - Derive the fundamental law of hydrostatics
      - Calculate Lagrange variations using Euler fields
      - Derive the mass continuity equation
      - Determine the velocity potential of a potential flow
      - Determine the stream function for a steady planar flow

   b. **PI addressed by the course:**

PI	1.3	5.1	7.1
Covered	x	x	x
Assessed	x	x	

7. **Brief list of topics to be covered**
   - General concepts of Fluids: Distinction between solids, liquids and gases, viscosity, definitions and properties of a fluid. (1 lecture)
   - TD (2 lectures)

- Fluid Statics: definition of pressure, pressure distribution in a fluid at rest, action of pressure forces on a wall, fundamental equation of fluid statics. (2 lectures)
- TD (3 lectures)
- Introduction to fluid kinematics: Lagrange description and Euler description, velocity distribution, continuity equation, stationary and irrotational flows of incompressible perfect fluids, examples of simple flows. (2 lectures)
- TD (2 lectures)