Course Syllabus

1. **Course number and name:** 020IMFCI4 Introduction to Fluid Mechanics
2. **Credits and contact hours:** 4 ECTS credits, $2 \times 1{:}15$ course hours
3. **Instructor's or course coordinator's name:** Marwan Brouche
4. **Textbook:**
   - *Physique tout-en-un MP, Salamito, J'intègre-Dunod, 2014*
   - *Physique tout-en-un PC, Salamito, J'intègre-Dunod, 2013*
5. **Specific course information**

   Catalog description:

   Fluids, Fluid properties, viscosity, Basic Principles of Pressure, Hydrostatic Law, Pascal Law, Archimedes Law, Hydrostatic force on a plane surface and a curved surface.

   Flow visualization, lines of flow, Types of flow- steady, unsteady, uniform, non-uniform, laminar, turbulent, velocity field and acceleration, continuity equation, Navier-Stokes equation, Equation of streamline, stream function, velocity potential function, circulation, flow net, Vorticity, irrotational and rotational flow, compressible and incompressible flows, Lagrangian and Eulerian Description.

   a. **prerequisites:** None
   b. **Required/Elective/Selected Elective:** Required

6. **Specific goals for the course specific outcomes of instruction**
   - To learn the fundamental principles of Fluid properties.
   - Define the basic principles of Pressure.
   - Illustrate the Hydrostatic Law, Archimedes Law and Pascal Law.
   - To describe Hydrostatic force on a plane surface and a curved surface.
   - Understand the type of flows.
   - Explain the Lagrangian and Eulerian perspectives to fluid flow problems.
   - Review and understand the continuity equations for viscous, incompressible fluids.
   - Understand vorticity and circulation concepts and theorems.
   - Understand and utilize approximate solutions of the Navier-Stokes equation.
   - Calculate the motion of a fluid particle (kinematics) including translation (particle acceleration), rotation (vorticity), angular deformation (proportional to shear stress), and linear deformation (volume dilation rate).

   a. **KPIs addressed by the course:**

KPI	a1	a2	b1	b2	b3
Covered	x				
Assessed	x				
Give Feedback	x				

7. **Topics and approximate lecture hours:**
   - Fluid properties (2 Lecture)
   - Basic Principles of Pressure (2 Lectures)
   - Hydrostatic Law, Pascal Law, Archimedes Law (4 Lectures)
   - Hydrostatic force on a plane surface and a curved surface (6 lectures)
   - Type of flows (2 Lecture)
   - Continuity equation, Navier-Stokes equation, Equation of streamline (3 Lectures)
   - Stream function, velocity potential function, circulation, flow net (3 Lectures)
   - Vorticity, irrotational and rotational flow, compressible and incompressible flows (3 Lectures)
   - Lagrangian and Eulerian Description. (3 Lectures)