Fluid Mechanics

1. **Course number and name:** 020MEFES2 - Fluid Mechanics

2. **Credits and contact hours:** 4 ECTS credits, 2x1:15 course hours per week.

3. **Instructor:** Renalda SAMRA (EL) Khalil

4. **Instructional materials:**
   - **a.** Class notes and slides by instructor
   - **b.** White, F. (2015). Fluid Mechanics. 8th edition, McGraw-Hill
   - **c.** Daugherty et al. (1985). Fluid Mechanics with Engineering Applications. 8th edition, McGraw-Hill

5. **Specific course information**
   - **a. Catalog description:**
     Provides the fundamental elements for understanding incompressible fluid flow. Topics include Characteristics of fluids - Kinematics - Conservation equations - Study of viscous fluids – Dimensional analysis and similarity - Flow regimes - Laminar and turbulent flows in pipes. Euler and Bernouilli theorem - Navier-Stokes equations. Dimensional analysis applying the PI theorem.

   - **b. Prerequisites:** Mechanics 2 (020MC2CI3 or 020MC2NI3)

   - **c. Selected Elective** for EE students.

6. **Educational objectives for the course**
   - **a. Specific outcomes of instruction:**
     By the end of the course, the students will:
     - Understand the concepts of mass, momentum, and energy conservation principles.
     - Know the methods and assumptions needed to describe a fluid flow quantitatively and analytically.
     - Be able to use Bernoulli's equation to calculate pressures and velocities.
     - Know about dimensionless analysis and similitude.
     - Be familiar with the flow of real or viscous fluids.
     - Be able to identify different flow types and regimes.

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

PI	1.3	3.1	5.1	6.2	6.3	6.4
Covered	x	x	x	x	x	x
Assessed	x	x			x	x

7. Brief list of topics to be covered:

- Introduction and fluid properties (1h15)
- Introduction to fluid pressure and statics (3h45)
- Fluid kinematics (3h45)
- Mass conservation and continuity equation (2h30)
- Conservation of linear momentum (2h30)
- Conservation of energy (2h30)
- Differential formulation of the mass, momentum, and energy equations (3h45)
- Flow of an ideal or inviscid fluid (Euler and Bernoulli's equations) (3h45)
- Dimensional analysis and similitude (3h45)
- Flow of a real or viscous fluid (3h45)
- Laboratory Sessions (2h30)
    i. Venturi Tube (Bernoulli)
    ii. Flow through orifices
    iii. Impact of a water jet
    iv. Kinematic viscosity measurement using Poiseuille's method.