Magnetic Induction

1. **Course number and name:** 020INMNI2 Magnetic Induction

2. **Credits and contact hours:** 2 ECTS credits, 1x1:15 contact hours

3. **Name(s) of instructor(s) or course coordinator(s):** Joseph Kesserwani, Elie Nicolas, Nader Kozhaya

4. **Instructional materials:** course handouts; slides; in-class problems

5. **Specific course information**
   a. **Catalog description:**
      This course explores the fundamental principles of magnetic induction and its applications. It covers various topics such as magnetic fields, Faraday's law, electromagnetic induction, Lenz's law, transformers, etc. The course also addresses practical applications of magnetic induction, such as electric generators, electric motors, induction coils, magnetic sensors, etc. Students will acquire the necessary foundations to understand and analyze magnetic induction phenomena in various applications. These concepts are essential in many fields, including electrical engineering, electronics, electromagnetism, energy production, telecommunications, and more.

   b. **Prerequisites:** None

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

6. **Educational objectives for the course**
   a. **Specific outcomes of instruction:**
      - Specific outcomes of instruction
      - Define scalar and vector fields as well as the magnetic field.
      - Identify the properties of the magnetic field.
      - Plot magnetic field maps.
      - Determine the force and/or torque exerted by a magnetic field on a circuit carrying current.
      - Study the case of a magnet.
      - Determine the positions of mechanical equilibrium.
      - Create a rotating magnetic field.
      - Define magnetic flux.
      - Apply Faraday's Law and Lenz's Law.
      - Calculate self-inductance and magnetic flux.
      - Establish the energy balance in the case of a stationary circuit in a variable magnetic field.

b. PI addressed by the course:

PI	1.3	7.1
Covered	x	x
Assessed	x	

7. Brief list of topics to be covered

- Definition of the magnetic field and magnetic field map (1 lecture)
- Study of a long coil (1 lecture)
- Applications on the magnetic field (1 lecture)
- Study of the rod circuit on two conducting rails (1 lecture)
- Study of the rectangular loop (1 lecture)
- Magnet and rotating magnetic field (1 lecture)
- Applications on the action of the magnetic field (1 lecture)
- Magnetic flux and Faraday's Law (1 lecture)
- Tutorials on the laws of induction (1 lecture)
- Moving circuit in a variable magnetic field (1 lecture)
- Applications on moving circuits (2 lectures)