Introduction to Heat Transfer

1. **Course number and name:** 020THENI3 Introduction to Heat Transfer

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

3. **Name(s) of instructor(s) or course coordinator(s):** Joseph Kesserwani, Abbas Mgharbel, Adnan Naja, Georges Moussaed.

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

5. **Specific course information**
   a. **Catalog description:**
      This course explores the fundamental principles of heat transfer mechanisms such as conduction, convection, and radiation, with an emphasis on thermal conduction. The objective is to establish the thermal balance and apply Fourier's laws to determine the heat equation. Additionally, students will be able to calculate the thermal resistance of different systems, which is crucial for the design of efficient heat transfer systems. This introductory course on heat transfer provides the necessary foundations to understand and analyze heat transfer phenomena in a variety of systems. This is essential in many fields such as thermal engineering, materials science, thermodynamics, and more.

   b. **Prerequisites:** 020TH1NI2 Thermodynamics 1

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

6. **Educational objectives for the course**
   a. **Specific outcomes of instruction:**
      - Distinguish the different modes of heat transfer.
      - Determine the thermal current density vector.
      - Calculate the thermal power exchanged between the system and the surroundings.
      - Establish the thermal balance of a system in transient regime.
      - Apply Fourier's laws for heat transfer.
      - Determine the heat equation of a system.
      - Study elementary models in steady-state regime.
      - Schematize a system with an equivalent electrical circuit.
      - Calculate the equivalent thermal resistance of systems.
      - Study the phenomenon of conducto-convection and calculate the corresponding thermal resistance.

b. PI addressed by the course:

PI	1.2	1.3
Covered	x	x
Assessed	x	x

7. Brief list of topics to be covered

- Introduction and mathematical preliminaries (1 lecture)
- Different modes of heat transfer (1 lecture)
- Thermal current, heat flux, and Fourier's law (1 lecture)
- Study of the parallel plate system model (2 lecture)
- Study of the hollow cylinder model (1 lecture)
- Study of the hollow sphere model (1 lecture)
- Conductive-convective heat transfer (1 lecture)
- Applications (4 lectures)