Thermodynamics 1

1. **Course number and name:** 020TH1NI2/020TD1NI2 Thermodynamics 1

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

3. **Name of course coordinator:** Alain Ajami

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

5. **Specific course information**
   a. **Catalog description:**
   This course allows students to master the key concepts of thermodynamics. It begins with an introduction to the different states of matter and scales of study. It then explores the state of a thermodynamic system, equations of state, and internal energy. Transformations of a thermodynamic system and the first law of thermodynamics are also studied, with a focus on pressure forces and heat transfers. The second law of thermodynamics and the concept of entropy are introduced, along with their applications. The course also covers the thermodynamic study of phase transitions.

   b. **Prerequisites:** None

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

6. **Educational objectives for the course**
   a. **Specific outcomes of instruction:**
   - Explore the different states of matter, scales of study, and the state of a thermodynamic system.
   - Know and apply the equation of state, internal energy, and transformations of a thermodynamic system.
   - Master the first law of thermodynamics and understand the work of pressure forces.
   - Understand heat transfers and perform energy balances for thermodynamic systems.
   - Comprehend the second law of thermodynamics and entropy.
   - Explore the applications of the second law and monothermal machines.
   - Study phase transitions in a descriptive manner and analyze them thermodynamically.

   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**
   - Thermodynamic System at Equilibrium: States of matter, Scales of study, State of a thermodynamic system, Equation of state, Internal energy + Tutorial 1 (5 lectures)
   - Energy Exchanged by a Closed System during a Thermodynamic Transformation (First Law): Transformations of a thermodynamic system, First law of thermodynamics, Work of pressure forces, Heat transfers, Energy balances + Tutorial 2 (7 lectures)
   - Principle of Evolution (Second Law): Irreversibility, Entropy, Applications of the second law, Monothermal machines + Tutorial 3 (6 lectures)
   - Phase Transition: Descriptive and thermodynamic study of a phase transition, Gas liquefaction + Tutorial 4 (6 lectures)