Course Syllabus

1. **Course number and name:** 020TH1CI2 Thermodynamics 1
2. **Credits and contact hours:** 6 ECTS credits, 3x1:15 course hours
3. **Instructor's or course coordinator's name:** Sami YOUSSEF
4. **Textbook:** *Physique tout-en-un MPSI, Salamito, J'intègre-Dunod, 2013*
5. **Specific course information**
   a. **catalog description:**
   States of matter, Length scales, State of thermodynamic system, Equation of state, Internal energy, Thermodynamic process, First law of thermodynamics, Work, Heat, Energy balances for gas systems, Irreversibility or time's arrow, Second law and entropy, Applications of second law, Qualitative study of a phase transition, Thermodynamic study of a phase transition, Gas liquefaction, Heat engine, Refrigerator, Heat pump.
   b. **prerequisites:** None
   c. **Required/Elective/Selected Elective:** Required
6. **Specific goals for the course**
   a. **specific outcomes of instruction**
   - To be able to understand the basic concepts of thermodynamics such us macroscopic and microscopic scales, system, equilibrium, thermodynamics parameters, state function, pressure and temperature.
   - To be able to use the equation of state of an ideal gas.
   - To be able to state the first law of thermodynamics and to describe energy exchange processes in terms of various forms of energy, heat and work.
   - To be able to state the second law of thermodynamics, to evaluate entropy changes in a wide variety of transformations and determine the reversibility or irreversibility of a process.
   - To be able to describe transitions between solid, liquid and gaseous sates of matter and to analyze the most important features of a phase diagram.
   - To be able to quantify the efficiency and properties of thermodynamic cycles for heat engines, refrigerators and heat pumps.
   b. **KPIs addressed by the course:**

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

7. Topics and approximate lecture hours:

- States of matter, length scales (2 Lecture)
- Thermodynamic system, equilibrium, state function, ideal gas, internal energy, heat capacity at constant volume (5 Lectures)
- Thermodynamic processes, first law of thermodynamics, work, heat, enthalpy, heat capacity at constant pressure (5 Lectures)
- Quasi-static processes of an ideal gas, Carnot cycle, Joule expansion (3 Lectures)
- Irreversibility, second law of thermodynamics, entropy (4 Lectures)
- Applications of the second law (6 Lectures)
- Thermodynamic description of a phase transition (6 Lectures)
- Gas liquefaction, Andrew's isotherms, saturation curve, state functions of vapor-liquid equilibrium (3 Lectures)
- Heat engines, refrigerators, heat pump (8 Lectures)