Course Syllabus

1. **Course number and name:** 020TH2NI3 Thermodynamics 2
2. **Credits and contact hours:** 4 credits, 2x1:15 course hours
3. **Instructor's or course coordinator's name:** Sami YOUSSEF
4. **Textbook:** *Physique tout-en-un MP, Salamito, J'intègre-Dunod, 2013*
5. **Specific course information**
   a. **catalog description:**
   Internal energy and entropy of a thermodynamic system, Laws of thermodynamics for open systems, Pressure-enthalpy diagram, Heat flux and heat flux density, Fourier's law, Heat equation, Elementary models analysis in steady-state regime, Wall model, Hollow cylinder model, Hollow sphere model, Convective heat transfer, Heat sink, Black body, Stefan-Boltzmann law, Gray body, Luminous Exitance and energy density, Wien's law, Planck's law.
   b. **prerequisites:** 020TR1NI2 Thermodynamics I
   c. **Required/Elective/Selected Elective:** Required
6. **Specific goals for the course**
   a. **specific outcomes of instruction**
   - Apply the basic concepts and principles of thermodynamics.
   - Develop the ability to solve concrete problems using energy, mass and entropy balances.
   - Apply the laws of thermodynamics in various machines, such as combustion engines, turbojets for aeronautical and naval propulsion, gas or steam turbines, thermal power plants and refrigeration systems.
   - Identify the three types of heat transfer.
   - Manipulate the famous heat equation with or without internal heat generation in Cartesian, cylindrical or spherical geometry.

   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 :**
   - Course introduction (1 Lecture)
   - Internal energy and entropy of a thermodynamic system, State functional formulation for infinitesimal processes (2 Lectures)
   - Open system and control volume, Principle of mass conservation, Steady-state mass balance, Flow work or PV work, Steady flow energy equation (3 Lectures)
   - Nozzle and diffuser, Compressor and turbine, Pressure regulator (3 Lectures)
   - Entropy balance equation for open systems, Pressure-enthalpy diagram, Rankine and refrigeration cycles (5 Lectures)
   - Heat flux and heat flux density, Fourier's law, Heat equation (2 Lectures)
   - Wall, hollow cylinder and hollow sphere models in steady-state regime, R-value, Convective heat transfer, Heat sink (8 Lectures)
   - Black body, Stefan-Boltzmann law, Gray body, Luminous Exitance and energy density, Wien's law, Planck's law (4 Lectures)