Thermodynamics 2

1. **Course number and name:** 020TH2CI4 Thermodynamics 2

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

3. **Name(s) of instructor(s) or course coordinator(s):** Sami Youssef

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

5. **Specific course information**
   a. **Catalog description:**
   The objective of this course is to master and apply the concepts and fundamental principles of thermodynamics. It aims to develop the ability to solve practical problems using energy, mass, and entropy balances. Indeed, energy in all its forms is studied in various machines, such as internal combustion engines, turbojets for aerospace and naval propulsion, gas or steam turbines, thermal power plants, and refrigeration systems. Special attention is then given to heat transfer problems, which require a command of powerful tools (Laplacian, divergence) in concrete situations. The student becomes familiar with partial differential equations and learns to manipulate the famous heat diffusion equation with or without a source term in cartesian, cylindrical, or spherical geometry.

   b. **Prerequisites:** 020TH1CI2 Thermodynamics 1

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

6. **Educational objectives for the course**
   a. **Specific outcomes of instruction:**
   - Develop a strong understanding of engineering thermodynamics and heat transfer and to be able to use this to solve engineering problems.
   - Be able to understand the basic concepts of the first and second law of thermodynamics for an open system in a steady state.
   - Develop a conceptual understanding of the fundamental elements of heat transfer.
   - Gain a basic working knowledge of the various modes of heat transfer.
   - Develop some methods of analysis for problems involving heat flow

   b. **PI addressed by the course:**

PI	1.3	7.1
Covered	x	x
Assessed	x	

7. **Brief list of topics to be covered**

- Review of first and second Laws (4 lectures)
- Principles for an open system in a steady state, study of a power plant, air conditioning and refrigeration systems (7 lectures)
- Introduction to conduction, convection and radiation (1 lecture)
- Heat flux, Fourier's law, Thermal conductivity (2 lectures)
- Heat equation without a source term within a solid in cartesian, cylindrical, or spherical geometry. Generalization of the heat equation in the presence of a source term. Use a generalization in arbitrary geometry using the Laplacian operator and its provided expression (7 lectures)
- Thermal resistance in series and parallel, study of elementary models (3 lectures)
- Heat transfer coefficient h, Newton's law (4 lectures)