Thermal engineering

1. **Course number and name:** 020GTHCS3 Thermal engineering

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

3. **Name of instructor:** Khattar Assaf

4. **Instructional Materials:**
- Fundamentals of Heat and Mass Transfer, Bergman and Lavine, 8th ed, 2017.

5. **Specific course information**
   a. **Catalog description:**
   Convection study (Natural convection: empirical relations, forced convection in pipelines, laminar regime - Theoretical relations and empirical relations, turbulent regime - empirical relations, Extension to non-cylindrical pipes and film flows, Forced convection around solid obstacles, The cylinder and the sphere case, Bundles of tubes case, The shell case of a multitube exchanger). Theory of heat exchangers (Notion of co-current, countercurrent and multipasses, Definition and expression of the global exchange coefficient, DTML method, Efficiency method, Practical sizing method: this part is mainly treated based on example of multitube exchangers). Other heat transfer technologies (plate exchangers, transfer in stirred tanks).

   b. **Prerequisites:** 020TH2NI3 Thermodynamics 2

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

6. **Educational objectives for the course**
   a. **Specific outcomes of instruction:**
      - Understand the different phenomena of heat transfer
      - Identify heat transfer modes
      - Calculate the convective heat transfer coefficients using correlations
      - Determine the exchanged heat flow rate for a given configuration
      - Design and analyze a heat exchanger
      - Size a heat exchanger for a given application

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

PI	1.1	1.2	1.3
Covered	x	x	x
Assessed	x	x	x

7. **Brief list of topics to be covered**
   - Introduction, overview, study of conduction
   - Concept of thermal resistance and applications
   - Study of convection, boundary layer equations
   - Study of forced convection: external flow

- Study of forced convection: internal flow
- Forced convection applications
- Study of free convection and applications
- Heat exchanger theory, configurations, and coefficients
- Design of heat exchangers using the DTLM method
- Analysis of heat exchangers using the efficiency method
- Technology and design of shell and tube heat exchangers
- Technology and design of plate heat exchangers
- Transient heat transfer in stirred tanks