Refrigeration Systems

1. **Course number and name:** 020SFRES5 Refrigeration Systems

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

3. **Name(s) of instructor(s) or course coordinator(s):** Said Chehab

4. **Instructional Materials:** PowerPoint slides; course handouts; Software

5. **Specific course information**
   a. **Catalog description:**
      Industrial refrigeration - The refrigeration cycle - Mollier diagram - Volumetric compression - The components of the refrigeration machine: Compressor - Heat exchangers - Refrigerant - The design of a cold room - External quantities: Thermostat - Internal quantities: Regulators - Safety equipment - Defrosting.

   b. **Prerequisite:** HVAC 1 (020CL1ES3).

   c. **Selected Elective** for ME and EE students.

6. **Educational objectives for the course**
   a. **Specific outcomes of instruction:**
      - Understand the principles of refrigeration.
      - Describe the components of mechanical refrigeration systems.
      - Identify the different types of refrigerants.
      - State the safety precautions associated with refrigerants.
      - Describe the different types of refrigerant equipment.
      - Apply the codes and standards related to refrigeration systems
      - Design a refrigeration system for a specific application.

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

PI	1.2	1.3	2.3	2.4
Covered	x	x	x	x
Assessed	x	x	x	x

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

- **Fundamentals of Refrigeration:** Types of refrigeration systems; major processes of vapor-compression refrigeration and the field of refrigeration.
- **Multistage and Cascade Refrigeration Cycles:** Single-stage ideal refrigeration cycle; two-stage ideal refrigeration cycle; cascade refrigeration cycle; refrigeration-system performance parameters; deviations of actual refrigeration systems from ideal systems; and refrigeration system types.
- **Evaporators:** air-cooling evaporators; and liquid-cooling evaporators.

- **Compressors:** Reciprocating compressors; rotary screw compressors; rotary vane compressors; scroll compressors; and centrifugal compressors.
- **Condensation processes**: air-cooled condensers; water-cooled condensers; and evaporative condensers.
- **Expansion Devices:** Capillary tubes and short tube restrictors; pressure control valves; thermostatic expansion devices; electronic expansion devices; hand expansion devices; level control valves; and turbo expanders.
- **Refrigerant Selection:** Types of refrigerants; saturation pressure and temperature of a refrigerant; refrigeration capacity and efficiency; safety of refrigerants; environmental impact of refrigerants; and codes and standards.