HVAC 2

1. **Course number and name:** 020CL2ES4 HVAC 2

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

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

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

5. **Specific course information**
   a. **Catalog description:**
   Heat pump – Mollier diagram – Environmental issues related to cooling fluids (Ozone and global warming) and new fluids – Summer thermal balance sheet – Cold battery and air evolution on cold batteries – Direct and indirect expansion air conditioning modes – Low and high-speed duct systems – Single and double flow and variable air flow.

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

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

6. **Educational objectives for the course**
   a. **Specific outcomes of instruction:**
   A student who successfully fulfills the course requirements will have demonstrated an ability to:
   - Understand and design HVAC systems, including air distribution, zoning, and load calculations.
   - Analyze and implement energy-efficient HVAC solutions, exploring advanced technologies for reduced energy consumption.
   - Explore alternative refrigerants and understand their environmental impact, with a focus on sustainability.
   - Examine advanced ventilation techniques, indoor air quality considerations, and the integration of ventilation into HVAC designs.
   - Design duct system, encompassing calculations for duct system pressure, velocity pressure, static pressure losses, frictional losses, cost estimation, and strategies for economical duct design.

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

PI	1.1	1.2	1.3	2.3	4.2	7.1	7.2
Covered	x	x	x	x	x	x	x
Assessed	x	x	x	x	x	x	x

7. Brief list of topics to be covered

- Heat Pumps (Air to water heat pump – Air to air heat pump and reversible cycles – Energy efficiency ratio – Mollier diagram – Air to water heat pump for hot water production – Geothermal heat pump).
- Cooling Load Calculations (Principle of cooling load – Why cooling load & heat gains are different – Design conditions – Understand CLTD/CLF method).
- Air Flow and its Distribution (Air handling unit design – Psychrometric chart – Air distribution system inside space – Ventilation systems).
- Air conditioning systems (Heating and cooling systems – General overview of VRF Technology – General overview of VRV Technology – Review of design considerations – District cooling – Split systems).
- Duct design (Duct system pressure – Velocity pressure – Static pressure losses – Frictional loss calculation – Equal friction method – Approximate ductwork cost – Economical duct design).