# Curricular Unit Form (FUC)

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| Course: | **FIRST CYCLE IN MECHANICAL ENGINEERING** | | | | | |
| Curricular Unit (UC) | **Cold Production** | | | Mandatory | | |
| | | | | Optional | **X** | |
| Scientific Area: | **Energy and Control Systems** | | | | | |
| Year: **3º** | Semester: **1º** | ECTS:**4,0** | | Total Hours: **3,0** | | |
| Contact Hours: | T: | TP:**45,0** | PL: | S: | OT: | TT: |
| Professor in charge | | Academic Degree /Title | | Position | | |
| **António Manuel Matos Guerra** | | **Licenciado** | | **Professor Coordenador** | | |

T- Theoretical ; TP – Theory and practice ; PL – Laboratory ; S – Seminar ; OT –Tutorial ; TT – Total of contact hours

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| Entry into Force | Semester: **Winter** | Academic Year: **2010/2011** |

**Objectives of the curricular unit and competences** (max. 1000 characters)

1.- Explain and characterize different energetic and environmental concepts, that enable one to choose and design the most efficient refrigerant system according to thermodynamic principles

2.- Acquire and apply the thermodynamic principles of industrial refrigeration, design and select safety and control equipment for industrial facilities, on an environmental energy optimization view.

3.- Be able to plan the assemblage of a refrigeration system, including the fundamental components, according to the base concept, performing all the mathematical calculations given the dimensions and complexity of the system.

4.- Be able to assess, compare, analyze and validate refrigeration systems, having in mind it's optimization in terms of environment and energy.

4.- Be able to work with diagrams and technical charts to properly select equipment, satisfying the need for system performance.

**Syllabus** (max. 1000 characters)

1. Standard vapour compression cycle. Multistage systems with flash gas removal. Evaporators with different temperatures in direct-expansion
2. Refrigerant plants. Pressure drops
3. Mechanically pumped liquid recirculation systems. Low pressure liquid / vapour receivers. Flooded Evaporators with surge drum. Flash tank intercooler
4. Condensers. Air-cooled, Water-cooled and Evaporatives. Heat rejection ratio. Water Cooling Towers. Evaporators. Defrosting systems
5. Refrigerants. $R_{134a}$ ; $R_{404A;}$ $R_{410A}$ a $NH_3$
6. Absorption Systems. Solution and Sorbent. Rectification. Simple and double-effect Chillers LiBr/$H_2O$; $NH_3/H_2O$ . Domestic absorption refrigerant cycle $NH_3/H_2O/H_2$.

| **Demonstration of the syllabus coherence with curricular unit's objectives** (max. 1000 characters) |
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| To solve problems that range all of the units´ contents, resourcing to abacus and technical charts is the best way according to thermodynamic principles e heat transfer referred to industrial refrigeration |

| **Teaching methodologies (including evaluation)** (max. 1000 characters) |
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| The resource to educational equipment. Theoretical lectures, supported by multimedia material, slides abacus and charts.<br>Practical classes are used to solve problems that range all of the unit's program contents, resourcing to abacus and technical charts.<br>The assessment methodology consists of 1 test or a final exam. |

| **Demonstration of the teaching methodologies coherence with the curricular unit's objectives** (max. 3000 characters) |
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| To solve problems with abacus and charts is the best way to properly perform components, satisfying the need for system optimization. |

| **Main Bibliography** (max. 1000 characters) |
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| DOSSAT, *Principles of Refrigeration*<br>ASHRAE. Handbooks *Fundamentals,*<br>ASHRAE. Handbooks *Refrigeration*.<br>GOSNEY,W., *Industrial Refrigeration* |