

**Code: 1632 Unit Operations I****Degree:** 2<sup>nd</sup> cycle – Forestry and Natural Resources**Stream:** Forest Products**Curricular Year:** 1<sup>st</sup>**Semester Course:** 2<sup>nd</sup>**Credits:** 6 ECTS**Compulsory****Language:** Portuguese/English**Responsible:** Maria Suzana Leitão Ferreira Dias Vicente**Other lecturer(s):** Helena Margarida Nunes Pereira**Web Site:** <http://www.isa.utl.pt/home/node/3843>**1. Contact hours:****Lecture/Practicals 56 Praticals/Laboratory 14 Others 14 Total 84****2. Objectives:**

Understanding the concept of Unit Operation. Study of the following unit operations: mechanical size reduction, free settling, centrifugation, classic filtration, drying and evaporation. Their application to industrial case-studies and sizing of the equipment.

**3. Programme:**

Unit operation concept and its importance for the study of industrial processes.

Characterization of solid particles; size reduction. Unit operations involving only mass transfer: free settling, centrifugation, classical filtration. Unit operations involving mass and/or energy transfer: drying (classical), psychrometry; heat exchangers; evaporation (single and multiple effect evaporation in forward and backward feed mode); mixing.

**4. Bibliography:****Main Bibliography**

Bayazitoglu, Y., Ozisik, M.N. (1988), *Elements of Heat Transfer*, McGraw-Hill International Editions, New York.

Coulson, J.M. & J.F. Richardson, (1977) *Tecnologia Química. Vol. I. Fluxo de fluidos, transferência de calor e transferência de massa*, 3<sup>a</sup> edição, Fundação Calouste Gulbenkian.

Ferreira-Dias, S., Miranda, I, Pereira, H. (2003/2004), *Balanços de Massa: Fundamentos Teóricos e Alguns Problemas de Aplicação*, Texto de apoio da disciplina de Fenómenos de Transferência I, ISA/UTL, pp. 70, Lisboa.

**Other Bibliography**

Geankoplis, C.J. (1986), *Transport Processes and Unit Operations*, 3<sup>a</sup> Edição, Prentice-Hall International, Inc.

**5. Assessment:**

Two tests or a final exam (80% of the final mark) and a laboratory report (20% of the final mark). A minimum of 9.5 either in the exam or in the report is required.

**6. Estimated Workload:**

168	Hours
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**7. Last Update:**

21/7/2010
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