Code: 1631 **Unit Operations I**
Degree: 1st cycle – Food Science and Engineering
Curricular Year: 2nd **Semester Course: 2nd**
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/4036

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" 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*, 3ª 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
7. Last Update:	23/7/2010	