Code: 1727 **Unit Operations II**
Degree: 2nd cycle – Food Science and Engineering
Stream: Food Processing
Curricular Year: 1st **Semester Course: 1st**
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/3834

1. Contact hours:
Lecture/Practicals 56 **Praticals/Laboratory** 14 **Others** 14 **Total** 84

2. Objectives:

Use of the concept of unit operation in food engineering. Study of the following unit operations: extraction based on phase equilibrium, adsorption; influenced settling, membrane filtration, pervaporation, crystallization and distillation. Application to industrial case-studies and sizing of equipment.

3. Programme:

Unit operations involving mass transfer: influenced settling and flotation. Unit operations involving contact-equilibrium separation: liquid/liquid, solid/liquid and solid/gas extraction; single and multi-stage in counter-current extraction systems; distillation (simple and fractionated); physical and chemical adsorption; membrane filtration, pervaporation and crystallization. Sizing of equipment.

4. Bibliography:

Main Bibliography

Earle, R.L. (1985), *Unit Operations in Food Processing*, Pergamon Press.

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

Other Bibliography

McCabe, W.L., Smith, J.C., Harriot, P., *Unit Operations of Chemical Engineering*, McGraw-Hill, Inc., 5ª Edição, New York.

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: 19/7/2010