

## BASIC OPERATIONS IN THE FOOD INDUSTRY

Bachelor Degree:	Agricultural Engineering	<b>802G</b>
Course title:	Basic operations in the food industry	500
Year/Semester:	2nd year/2nd semester	ECTS Credits: 6

### DEPARTMENT

Agriculture and Food Department					
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### CONTENTS

- Unit 1. Introduction to the basic operations. Fundamental concepts: The basic operations in the food manufacturing process. Classification basic operations. Continuous and discontinuous operations. Flowchart. State stationary and non-stationary.
- Unit 2. Basic operations and transport phenomena. Transport phenomena in basic operations. Properties transported. Transport mechanisms. Classification of basic operations based on transport phenomena predominate.
- Unit 3. Mass and energy balance. Mass balances: base units, types and equations of mass balances. Energy balances: basic concepts of energy and enthalpy. Total energy balance.
- Unit 4. Circulation of fluids by pipeline. Rheology of food and application. Laminar and turbulent flow. Mass an energy balances in pipelines. Energy losses due to friction. Pump power. Equipment used in fluid flow.
- Unit 5. Centrifugation. Physical basis, equipment used, applications in the Food Industry.
- Unit 6. Filtration and membrane separation. Filtering physical basis. Operating modes. Filtration equipment. Membrane separation: Ultrafiltration, Microfiltration, nanofiltration and reverse osmosis. Applications in the Food Industry.
- Unit 7. Heat transfer. Heat transfer mechanisms. Heat transfer by conduction and convection. Heat exchangers.
- Unit 8. Evaporation. Fundamental principles. Factors influencing the evaporation. Mass and energy balances in evaporators. Types of evaporators. Evaporation applications in the food industry.
- Unit 9. Distillation. Vapor-liquid equilibrium. Continuous distillation of binary mixtures. Mass and energy balances.

### REFERENCES

Title
Fundamentals of heat and mass transfer / Frank P. Incropera, David P. Dewitt (2002), 5th ed New York: John Wiley & Sons,
Transport processes and separation process principles: (includes unit operations) / Christie John Geankoplis. (2003). Upper Saddle River (New Jersey)
Fundamentals of Food Process Engineering. Toledo, R.T. (1980) AVI Publ. West-port, Conectica.
Elements of Food Engineering. Watson, E.L. y Harper, J.C. (1987). Van Nostrand Reinhold Company, New York.

### EVALUATION SYSTEM

Written tests (70 %)
Work and projects (10 %)
Reports and practices memories (10 %)
Observation techniques (10 %)



Critical criteria to pass the course. In this subject different types of activities will be assessed:

1º.- Practices sessions. It is compulsory to attend all practical sessions, being essential to the presentation of a justificant in case of absence.

2º.- Monographic work and problems The final work and the problems must be delivered on the date established by the teacher.

3º.- Written test. The final exam consists of two distinct parts: theory and problems. To pass the exam is essential to have approved both parts

To pass the subject, all the activities under evaluation must be approved