

60569 - Systems and processes of food industries

Información del Plan Docente

Academic Year	2016/17
Academic center	201 - Escuela Politécnica Superior
Degree	546 - Master in Agricultural Engineering
ECTS	6.0
Course	1
Period	Second semester
Subject Type	Compulsory
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

The methodology used in the subject will be based on theoretical classes to study the basic concepts of the subject, trying to encourage student participation through short questions. On the other hand, problems and practical cases related to the theoretical concepts will be resolved in the classroom and in the computer room. These studies are supplemented with visits to food processing industries.

5.2.Learning activities

1. Classes of theory and problems where the teacher develops the contents of the subject.

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2. Seminars (10 sessions). The students develop and apply practical cases with teacher's guide (see practical program).
3. Visits to different food processing industries.

5.3.Program

Theory programme

I. PROCESSES OF FOOD INDUSTRY

1. DAIRY INDUSTRY: Previous treatments (filtration, elimination of air and clarification). Centrifugal separation. Homogenization. Pasteurization. Sterilization and UHT treatment.
2. PRODUCTION OF JUICES: Treatment of fruit (washing, brushing and inspection). Extraction of juice and essential oils. Treatment of the juice (clarification, mixing and correction, elimination of air and pasteurization). Preparation of concentrated juice (evaporation, freezing and membrane separation).
3. BEER INDUSTRY. Mashing. Filtration. Cooking. Whirlpool tank. Wort cooling. Fermentation. Maturation. Beer filtration. Pasteurization. Packing.
4. FLOUR INDUSTRY. Milling and storage. Trituration. Extraction. Purification. Compression.

II. DESIGN OF FOOD INDUSTRY

1. Design of the minimum requirements of the food system: Production capacity, raw materials, product specifications
2. Preliminary design: Flowchart, basic operations, biochemical processes, mass and energy balances
3. Simulation and optimization of the plant:
 - Dimensioning and selection of main equipments (reactors, heat exchangers, separation equipment, etc.).
 - Auxiliary equipments (pumps and compressors, cold production, etc.).
 - Choice and design of control systems and automation.
 - Energy integration (pinch analysis and network optimization exchangers).

Practical programme

1. **Design of a production system of pasteurized milk.** Mass and energy balances. Design and choice of the equipment needed for the different stages: storage tanks, elimination of air, centrifugal separation, standardization and homogenization equipments, heat exchangers, process controllers, cleaning systems.
2. **Design of a juice production system.** Mass and energy balances. Design and choice of equipments needed for the different stages of the process: Handling of fruit and juice extraction (reception, unloading and storage of fruit, juice extraction, juice preparation, recovery of essential oil, recovery of pulp and/or juice, pasteurization and cooling of the juice).

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Evaluation								4	4
Personal work									89
Individual work	2	2	1		4	8	8		79
Colaborative work	2	2	2	2					10
TOTAL	8	8	7	9	6	8	8	4	152

5.5. Bibliography and recommended resources

Basic bibliography

- "Nuevo Manual de Industrias Alimentarias". A. Madrid Vicente y J. Madrid Cenzano. A. Madrid Vicente Ediciones, Mundi-Prensa Libros, S.A., Madrid, 2001.
- "Manual de Industrias Lácteas". M. Gösta Bylund (Tetra Pak). Editorial A. Madrid Vicente, 1996.
- "Producción y envasado de zumos y bebidas de frutas sin gas". P.R. Ashurst. Editorial Acribia, .Zaragoza, 1999.
- "Industrias de cereales y derivados" M.J. Callejo González. Mundi Prensa, Madrid, 2002.

Complementary bibliography

- SINGH, R. P., HELDMAN, D. R. Introducción a la Ingeniería de los Alimentos. 2ª ed. Zaragoza: Acribia, 2009.
- McCABE, W. L., SMITH, J. C., HARRIOT, P. Operaciones unitarias en ingeniería química. 7ª ed. Madrid: McGraw Hill, 2007.
- J. M. Coulson, y J. F. Richardson. T. II, Operaciones básicas / con la colaboración de J. R. Backhurst y J. H. Harker ; versión española de la 3ª ed. original por Joaquín Casal Fábrega. Reverté, D. L. 1981.
- GÓDIA, F. y LÓPEZ, J. Ingeniería Bioquímica. Madrid: Síntesis.
- López Gómez, A., Las instalaciones frigoríficas en las industrias agroalimentarias. A. Madrid Vicente, ediciones.