

DEGREE CURRICULUM ADVANCED TECHNOLOGY FOR FOODS OF ANIMAL ORIGIN

Coordination: GINER SEGUÍ, JOAQUÍN JESÚS

Academic year 2021-22

Subject's general information

Subject name	ADVANCED TECHNOLOGY FOR FOODS OF ANIMAL ORIGIN							
Code	102232							
Semester	2nd Q(SEMESTER) CONTINUED EVALUATION							
Туроlоду	Degree				Character		Modality	
	Bachelor's Degree in Food Science and Technology			3	COMPULSORY		Attendance-based	
Course number of credits (ECTS)	6							
Type of activity, credits, and groups	Activity type	PRACAMP	PR	RAULA		TEORIA		
ů i	Number of credits	0.7		1.5		3.8		
	Number of groups	1	1			1		
Coordination	GINER SEGUÍ, JOAQUÍN JESÚS							
Department	FOOD TECHNOLOGY							
Teaching load distribution between lectures and independent student work	On-site time: 60 h Off-site time of independent student work: 90 h							
Important information on data processing	Consult <u>this link</u> for more information.							
Language	Spanish: 85 % English: 15 %							

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
GINER SEGUÍ, JOAQUÍN JESÚS	joaquin.giner@udl.cat	6	

Subject's extra information

This subject, likewise to *Technology for Foods of Animal Origen*, is part of a block of food technology topics that are taught in the third course of the *Degree of Science and Food Technology*. This block of subjects focus on the study of the processes involving foods and on the implementation of the knowledges acquired in transversal matters such as, especially, *Fundamentals of Food Engineering* and *Processes of Food Industry*. The present subject is about dairy technology. Thus, chemical and physical properties of milk, details of the processes applied in the manufacture of the main milk products as well as microbiological, safety and legal aspects are studied.

The skills of this subject will come in useful to student for joining unit operations and auxiliary systems, learning to define, configure, plan, model, develop and manage complete manufacturing processes of different dairy products.

Recommendations

It is strongly recommended to have passed or, at least, to have completed the following subjects: *Physics and Food Chemistry I* and *II*, *Microbiology* and *Parasitology of Foods*, *Production of Animal Raw Materials*, *Fundamentals of Food Engineering* and *Processes of Food Factories*.

Notes

Scheduled hours and activities, as well as the evaluation methodology and procedure may be modified for extraordinary reasons.

Learning objectives

Upon passing this subject, the student must be able to:

1) To be aware of the characteristics and regulatory frame of dairy industries.

- 2) To be cognizant of the main components of milk as well as their variability factors.
- 3) To be acquainted with the physical, chemical and nutritional properties and characteristics of milk and milk products.
- 4) To identify and to prevent agents that affects negatively on milk quality.
- 5) To set up and model lines for preparation of dairy products.
- 6) To be able to show knowledge about the market and consume tendencies related to milk and milk products.
- 7) To stablish, to execute and to interpret accurate controls of raw materials, intermediate products and finished products.
- 8) To carry out accurately disposable technology in order to manufacture milk products.
- 9) To plan and to develop new dairy products and their manufacture processes.
- 10) To be able to use accurately English vocabulary concerning milk, dairy products and milk industry.

Competences

• Specific

- CE1. Select and apply the physical and mathematical foundations necessary for the development of other disciplines and the activities of the profession.
- CE2. Identify and apply the chemical foundations necessary for the development of other disciplines and the activities of the profession.
- CE4. Select and apply the basic concepts of the statistical method, being able to statistically analyze the results of studies and interpret them critically.
- CE5. Apply the basic processes of a laboratory and use equipment, handle reagents, meet safety conditions and prepare reports.
- CE6. Posing and solving problems by correctly applying the concepts acquired to specific situations.
- CE19. Analyze the technological aspects of animal production that determine the quality of raw materials for subsequent transformation.
- CE21. Discuss the rationale and apply basic operations to food manufacturing processes.
- CE22. Recognize food processing equipment and know how to use it.
- CE23. Outline, based on flow diagrams, the processes of food preparation and preservation.
- CE24. Identify and evaluate raw materials, ingredients, additives and technological aids for use in the agri-food industry.
- CE25. Explain the role of ingredients and food additives.
- CE26. Apply basic knowledge about raw materials, ingredients and additives to food formulation.
- CE27. Interpret the physical and chemical changes that occur during the different food-making processes.
- CE28. Modify the processes of making a food based on some objectives.

- CE29. Select equipment and organize food preparation and packaging lines.
- CE30. Develop new processes and products.
- CE31. Identify and assess the various parts of a project of an agri-food industry.
- CE32. Sizing production lines.
- CE33. Estimate equipment capabilities for production lines and auxiliary systems needs.

• Basic

CB1. That students have demonstrated to possess and understand knowledge from the base of general secondary education at a level that, while supported by advanced textbooks, also includes some aspects that involve knowledge from the forefront of their field of study

CB2. That students know how to apply their knowledge to their work or vocation in a professional way and possess the competencies that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study.

CB3. That students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include reflection on relevant issues of a social, scientific or ethical nature.

CB4. That students can transmit information, ideas, problems and solutions to both specialized and non-specialized audiences.

CB5. That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.

• General

- CG1. Analyze specific situations, define problems, make decisions and implement action plans in search of solutions.
- CG2. Interpret studies, reports, data and analyze them numerically.
- CG3. Select and manage the available written and computerized sources of information related to the professional activity.
- CG4. Work alone and in a multidisciplinary team.
- CG5. Understand and express themselves with the appropriate terminology.
- CG6. Discuss and argue in various forums.
- CG7. Recycle in new technological advances through continuous learning.
- CG8. Value comprehensive training, personal motivation and mobility.
- CG9. Analyze and assess the social and ethical implications of professional activity.
- CG10. Have a critical and innovative spirit.
- CG11. Analyze and assess the environmental implications in professional activity.

• Transversal

- CT1. Correctly present information orally and in writing.
- CT2. Communicate and master a foreign language.
- CT3. Use existing IT and communication tools as support for the development of their professional activity.

CT4. Respect the fundamental rights of equality between men and women, the promotion of Human Rights and the values of a culture of peace and democratic values.

Subject contents

Unit 1.- Introduction. (1 h)

- 1.1.- Historical overview of dairy technology.
- 1.2.- Characteristics of dairy industries.
- 1.3.- Dairy products.
- 1.4.- Economic indicators and structure of dairy sector.
- 1.5.- Regulatory frame.

Unit 2.- Milk: composition, properties and sources of variation. (3 h)

- 2.1.- Definition and main characteristics of milk.
- 2.2.- Major components.
- 2.3.- Structure and important properties of milk.
- 2.4.- Variability and limits on composition of milk.

Unit 3.- Major and minor components of milk. (2 h)

3.1.- Milk carbohydrates. Properties of lactose.

- 3.2.- Milk fat; compounds lipids; fat globules.
- 3.3.- Nitrogen compounds: classification; casein micelles.
- 3.4.- Enzymes: importance; enzymes of technological interest.
- 3.5.- Salts and minerals: macroelements and microelements.
- 3.6.- Vitamins.

Unit 4.- Quality of milk. (2 h)

- 4.1.- Factors affecting quality of milk.
- 4.2.- Contaminants.
- 4.3.- Origin and microbial alterations.
- 4.4.- Most frequent manipulation and frauds.
- 4.5.- Sampling and main determinations.

Unit 5.- Stages and operations prior to dairy processing centres. $(2\ h)$

- 5.1.- Milking: ways and its influence on the quality of milk.
- 5.2.- Filtration: methods.
- 5.3.- Refrigeration of milk: factors conditioning its effectiveness.
- 5.4.- Refrigeration systems and storage of milk in farms.
- 5.5.- Collection of milk. Quality controls at reception.

Unit 6.- Prior treatments of milk at dairy industries. (2 h)

- 6.1.- Reception and storage of milk. Traceability.
- 6.2.- Quality controls of milk at reception.
- 6.3.- De-aeration: equipment.
- 6.4.- Clarification of the milk.
- 6.5.- Skimming: skimmers; influential factors on skimming.
- 6.6.- Standardization.
- 6.7.- Homogenization: effects on milk and types; advantages and disadvantages.

Unit 7.- Production of pasteurized milk. (1 h)

- 7.1.- Definition and types.
- 7.2.- Methods, conditions and equipment for pasteurization.
- 7.3.- Packing of pasteurized milk.
- 7.4.- Continuous pasteurized milk lines.
- 7.5.- Defects and quality controls.

Unit 8.- Sterilization of milk. (3 h)

- 8.1.- Sterilized and UHT milk.
- 8.3.- Effects of heat treatments on milk.
- 8.4.- Differences between conventional sterilized milk and UHT milk.
- 8.5.- Equipment for in flow and in package sterilization of milk.
- 8.6.- Package systems for sterilized milk and UHT milk.
- 8.7.- Aseptic tanks. Continuous manufacture lines.
- 8.8.- Defects and quality control.

Unit 9.- Concentrated milks. (2 h)

- 9.1.- Definitions. Composition of evaporated milks.
- 9.2.- Changes in milk during concentration.
- 9.3.- Stabilization of concentrated milks.
- 9.4.- Requirements of raw milk for concentration. Standardization of milk for concentration.
- 9.5.- Methods and equipment for milk concentration.

- 9.6.- Sweetened condensed milk.
- 9.7.- Manufacture lines.
- 9.8.- Main defects. Quality controls.

Unit 10.- Milk powder. (2 h)

- 10.1.- Definition. Kinds of milk powder. Composition. Additives.
- 10.2.- Roller-dried milk and freeze dried milk.
- 10.3.- Spray drying: equipment and operating conditions.
- 10.4.- Manufacture of instant milk powder.
- 10.5.- Properties and quality control of milk powder.

Unit 11.- Fermented milks. (2 h)

- 11.1.- General aspects.
- 11.2.- Yogurt: definitions; types; raw materials and additives.
- 11.3.- Main stages of manufacture of yogurt: continuous manufacture lines for set, stirred and liquid yogurt.
- 11.4.- Quality controls of raw materials, during manufacturing and finished product.
- 11.5.- Other fermented milks: kefir, acidophilus milk; kumis.

Unit 12.- Manufacture of cream (1 h)

- 12.1.- Definitions and types; composition; additives.
- 12.2.- Pasteurized creams and sterilised creams.
- 12.3.- Whipping and whipped cream. Clotted (scalded) cream. Dried cream.
- 12.5.- Frozen cream.

Unit 13.- Butter (2 h)

- 13.1.- Definition; composition and essential quality attributes; additives.
- 13.2.- The technology of its manufacture: batch and continuous systems.
- 13.3.- High fat products: manufacture of anhydrous milk fat.
- 13.4.- Storage of butter.
- 13.5.- Defects and more frequent alterations. Quality scales.

Unit 14.- Cheese making. (11 h)

- 14.1.- Origin. Definitions and types of cheese.
- 14.2.- General flowchart of cheese manufacture: essential process steps.
- 14.3.- Clotting of milk: types of curds.
- 14.4.- Curd treatment in vat and operations for removal of whey; salting.
- 14.5.- Ripening, packaging and quality control.
- 14.6.- Cheese yield.
- 14.7.- Technology of the main cheese families.
- 14.8.- Processed cheese manufacture.
- 14.9.- Exploitation of milk whey.

Unit 15.- Ice cream. (2 h)

- 15.1.- Definition and classification of ice creams.
- 15.2.- Main steps in ice cream manufacturing.
- 15.3.- Raw material and mix formulation. Optimum over-run in ice creams.
- 15.4.- Structure.
- 15.5.- Storage of raw materials.
- 15.6.- Changes of the mix during its processing.
- 15.7.- Ice cream production lines.

15.8.- Quality controls.

Learning activities

Visit to, at least, one dairy:

- Dairy factory which manufactures sterilized milk, UHT milk, cream and butter.
- Artisanal cheese factory.
- Industrial factory which manufactures cheese, processed cheese factory, butter and lactose by recovering of whey.
- Industrial dairy factory which manufactures yogurt and other dairy fresh desserts.

Seminar about miscellaneous milk issues:

- · Effects of heat treatments on vitamins in milk.
- Modelling of processes involved in dairy products.
- Traceability of milk and milk products.
- Economical importance of dairy sector.
- · Others.

Guided activities:

- Preparation and elaboration of individual and group works.
- Public presentation of works using multimedia devices.

Methodology

		In classroom activity		Out classroom activity		Evaluation	Total time	
Kind of activity	Description	Objectives	Hours	Personal job	Hours	Hours	Hours	ECTS
Masterly lesson	Masterly Lesson (Classrooom. Big group)	Explanation of main concepts	38	Personal study: acquisition, understanding and sinthetization of knowledges and development of skills	36	6	80	3.20
Problems and cases	Clase participativa (Aula. Grupo grande)	Setting out and solving problems and cases	5	Solving problems and cases Information searching	16		21	0.84
Seminars	Participative session (Medium group)	Realización de actividades de discusión o aplicación	8	Searching information. Solving problems and cases Discussions	19		27	1.08
Guided activities	Student´s work. (Individual or group)	Meeting with students in tutorial hours	7	Writing. Drawing up presentations.	15		22	0.88
Visits	Visiting a dairy factory	Attending to the factory	0	Redaction of inform	0		0	0.00
Totals			58		89	6	150	6.00

If, for health reasons, or other unforeseen circumstances, teaching activities cannot be carried out in the classroom, they will take place remotely.

Evaluation

	Assesment activity						
Learning activity	Proccedure	Number	(%)				
Master lesson	Two printed long exams about shyllabus contents (Part I and Part II) Monitoring with short answer tests	2 3-5	55 5				
Problems, questions and cases	Delivering of requested materials (problems, questions, reports, others)	≤15	20				
Group activities	Attandance and participation in groupal activities (delivering meories, presentations and others) Redaction and delivery of reports	2	20				
Visits to factories	Delivering inform	0	0				
Total			100				

NOTES

For the purposes of the final grade, to pass the course it will be necessary to have obtained in the set of tests a cumulative total equal to or greater than 5.0 points out of 10.

The average grade of Partial I and Partial II must be equal to or greater than 5 out of 10 to pass the course and, in turn, compute the rest of the activities. The qualification of the

Partials I and II must be greater than 4 out of 10 for these to be averaged.

If for health reasons or other unforeseen circumstances, it is not possible to carry out face-to-face tests, these will take place virtually.

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