

28439 - Food Technology

Información del Plan Docente

Academic Year	2017/18
Faculty / School	105 - Facultad de Veterinaria
Degree	451 - Degree in Veterinary Science
ECTS	12.0
Year	5
Semester	Annual
Subject Type	Compulsory
Module	---

1.General information

1.1.Introduction

1.2.Recommendations to take this course

1.3.Context and importance of this course in the degree

1.4.Activities and key dates

2.Learning goals

2.1.Learning goals

2.2.Importance of learning goals

3.Aims of the course and competences

3.1.Aims of the course

3.2.Competences

4.Assessment (1st and 2nd call)

4.1.Assessment tasks (description of tasks, marking system and assessment criteria)

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

" Food Technology "

This part consists of 100 hours divided in 70 hours for lectures in classroom, 20 hours for laboratory and 10 hours for seminars.

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Student will have in advance the contents of the corresponding lectures. Professor will focus his presentation in those aspects harder to understand. Student should have read the material supplied in advance in order to formulate questions to the professor

Laboratory activities will consist in 5 sessions of 4 hours. The main objective of laboratory activities is to show and demonstrate different issues previously explained in the lectures.

Seminars will be attended by smaller number of students than lectures. In this activity it will present "case studies" to be solved by students with the support of the professor and some person working in the food industry will be invited to do a presentation.

"Practicum in Food Technology "

This part consists in 30 hours (4 h of lectures, 18 h of activities in the pilot plant and 8 hours for the presentation of the work conducted in the pilot plant).

In this part it will be simulated in the pilot plant that students are in a food company and they will have to conduct all the steps required for elaboration of a specific food: quality control of the raw material, elaboration of the foods, control of the final products. These activities will be conducted in coordination with the course "Hygiene, inspection and food control" and it will be also developed the good hygienic practices for the corresponding food elaborated during this activity.

5.2.Learning tasks

5.3.Syllabus

" food technology "

Lessons:

UNIT I.- INTRODUCTION (2H)

Lesson1. Introduction. Food Technology in Veterinary degree. Activities of a veterinarian in the food industry. Course objectives, teaching methodology, contents and bibliography.

Lesson 2. Food Science and Technology. Origin, objectives and historic evolution. Current situation and future prospects.

UNIT II.- QUALITY PARAMETERS AND FOOD COMPONENTS (8H)

Lesson 3. Quality parameters of foods. Food definition. Nutritional properties: Energy supplied by foods, essential nutrients. Sensory properties: la texture, el colour, el flavour, Sensory analysis. Food safety: Abiotic and biotic agents. Shelf-life and caducity.

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Lesson 4. Water. Content and distribution of water in foods. Physical and chemical properties. Water interactions with foods. Water activity concept.

Lesson 5. Carbohydrates. Content and distribution of carbohydrates in foods. Monosaccharides and oligosaccharides: properties. Polysaccharides: main polysaccharides in foods, functional properties.

Lesson 6. Lipids. Content and distribution of lipids in foods. Sensory, nutritional and functional properties of lipids.

Lesson 7. Proteins. Content and distribution of proteins in foods. Sensory, nutritional and functional properties of proteins.

Lesson 8. Vitamins y minerals. Content and distribution in foods. Losses of vitamins and minerals during food processing.

Lesson 9. Disperse systems. Importance of the physical structure in food properties. Disperse systems: gels, emulsions y foams.

Lesson 10. Additives. Definition. Classification. Properties of the main groups of food additives. Applications.

UNIT III. FOOD SPOILING (5H)

Lesson 11. Physical and chemical agents. Physical agents. Chemical reactions . Lipid oxidation: factors affecting velocity of lipid oxidations. Non-enzymatic browning: factors affecting velocity of non-enzymatic browning.

Lesson 12. Biotic agents I: Enzymes. Endogenous enzymes. Microbial enzymes. Factors affecting enzymatic spoiling.

Lesson 13. Biotic agents II: microorganisms. Microbial contamination of foods. Factors affecting grown and survival of microorganisms in foods. Microbial groups: Pathogenic microorganism, spoiling microorganisms.

UNIT IV. FOOD PRESERVATION (19H)

Lesson 14. Main strategies for food preservation. Preservation by eliminating microorganisms from foods. Preservation by reducing microbial activity and enzymatic reactions. Preservation by microbial and enzymatic inactivation.

Lesson 15. Food preservation by low temperatures: principles. Introduction. Effect of low temperatures on food properties. Effect of low temperatures on microorganisms, enzymes and chemical reactions. Cold generation systems .

Lesson 16. Refrigeration. Introduction. Applications of the refrigeration in the food industry. Control parameters in cold storage. Refrigerated warehouse and transportation at low temperatures.

Lesson 17. Freezing. Introduction. Ice crystals formation, nucleation and crystal growth. Freezing curve. Effect of

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freezing on food properties, microorganisms and microbial and enzymatic reactions. Frostbite, recrystallization. Frozen storage. Unfreeze.

Lesson 18. Food preservation by atmosphere modification. Vacuum package, controlled atmosphere and modified atmosphere. Properties and characteristics of used gases. Effect on microorganism and food properties. Applications in the food industry.

Lesson 19. Food preservation by reducing water activity: Principles. Introduction. Sorption isotherms. Interactions water/air: Relative humidity in equilibrium. Psychrometric chart. Procedures to measure water activity. Influence of water activity on microbial growth, enzymatic reactions and chemical reactions.

Lesson 20. Dehydration and lyophilisation. Dehydration: Kinetics and mechanism. Effect of dehydration on food properties. Changes in dehydrated foods. Reconstitution of dehydrated foods. Facilities. Lyophilisation: Principles and parameters affecting food lyophilisation, effect of food properties and alteration of freeze dried goods. Facilities.

Lesson 21. Evaporation and other methods of food concentration. Evaporation: principles and parameters affecting the process. Applications and facilities. Concentration by freezing and using membranes. Osmotic dehydration.

Lesson 22. Food preservatives. Effect of preservatives on microorganisms. Main preservatives and applications. Food preservatives of animal origin: from animals, from plants and from microorganisms. Smoking: composition and properties of smoke. Antioxidants.

Lesson 23. Preservation by low pH and fermentation. Effect of pH on microbial growth, chemical and enzymatic reactions. Decrease of pH in foods: natural and artificial acidification. Fermentation: characteristics of microorganisms used in food fermentations. Types of fermentations: Applications.

Lesson 24. Food preservation by heating: principles. Introduction. Kinetics of microbial and enzymatic inactivation by heat. Survival curve. D t value. Thermodestruction curve: Z value. Factors affecting microbial and enzymatic resistance to heat. Microorganisms and enzymes of interest in food preservation by heating

Lesson 25. Fitting a heat treatment. Risk concept: commercial risk and sanitary risk. Botulinum cook. TDT curve: Ftz value. Effect of heat on sensory and nutritional value of foods: Ctz value.

Lesson 26. Pasteurization and blanching. Blanching: objectives, application, and facilities. Pasteurization: objectives, application, facilities.

Lesson 27. Sterilization. Sterilization: objectives, application, facilities. Alterations of foods treated by heat.

Lesson 28. New technologies for food preservation. New systems for microbial inactivation: ionizing irradiation, high hydrostatic pressure, pulsed electric fields, light pulses, ultrasound. Food preservation by combined process.

Lesson 29. Food packaging. Principles. Functions of packaging. Materials: paper, cardboard, metal, glass, plastic, mix films, edible films. Types of packages . Interaction package-food. Active packaging. Aseptic packaging.

UNIT V. MEAT AND MEAT PRODUCTS (12H)

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Lesson 30. The conversion of muscle to meat. Meat composition and nutritional value. Muscle structure and ultra-structure. Rigor Mortis. PSE y DFD meats. Meat aging. Meat Quality Parameters: colour, odour, flavour, texture and water holding capacity.

Lesson 31. Fresh meat technology. Meat categories, dressing and cutting. Fresh meat preservation and commercialization.

Lesson 32. Meat products. introduction, classification. Preservation methods. Microbial and biochemical changes. Additives for meat products.

Lesson 33. Fresh and dry-cured meat products . Production processes and most important alterations.

Lesson 34. Cooked meat products . Production processes and most important alterations.

Lesson 35. Dry-cured products . Dry-ham elaboration processes and most important alterations. Other dry-cured products.

UNIT VI FISH, FISH PRODUCTS, FISH EGGS, EGGS AND EGGS-PRODUCTS. (7H)

Lesson 36. Fish composition, structure and post-mortem changes : Introduction. Composition and nutritional value of fish. Classification of fish. Fish muscle structure. Post-mortem changes of fish. Freshness assessment of fish. Influence of fishing methods and refrigeration systems on fish quality. Most consumed species.

Lesson 37. Fish processing and preservation. Preservation methods: refrigeration, freezing, drying, salting, smoking, marinating, canning. Fresh processing of the most consumed fish species. Frozen fish: hake, cephalopods, crustaceans. Salted fish: cod. Canned fish: sardines and tuna. Semi preserved products: anchovies. Surimi and surimi based products.

Lesson 38. Technology of eggs and egg products. Introduction. Formation and structure. Chemical composition and nutritive value. Egg microbiology. Egg preservation. Egg products: pasteurization, refrigeration, freezing, concentration and drying.

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UNIT VII MILK AND MILK PRODUCTS (12H)

Lesson 39. Properties of milk. Composition, structure and physico-chemical properties of milk. Fat globule: structure and composition,. Milk carbohydrates: lactose. Casein micelles: composition and structure. Acidic and enzymatic coagulation. Whey proteins. Other constituents: vitamins and minerals. Physico-chemical properties of milk: density, pH acidity, crioscopic point. Dairy microbiology: pathogens and spoiling microorganisms.

Lesson 40 . Liquid milks . Obtention, handling, transport and milk control in the dairy processing Factory. Preliminary operations. Heat treatment: pasteurized and sterilized milks: technology and effects on milk properties. Concentrated milks: evaporated and condensed milk. Milk poder.

Lesson 41. Fermented milks : yogurt elaboration. Other fermented milks.

Lesson 42 . Cheese . General cheese types. Cheese manufacture. Acidic and enzymatic coagulation. Draining. Cheese ripening. Processed cheese.

Lesson 43. Cream, butter and ice cream . Cream processing. Butter manufacture and types. Ice cream manufacture.

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UNIT VIII. OTHER ASPECTS RELATED WITH THE FOOD INDUSTRY (5H)

Lesson 44.- Ready to eat foods. Types. Elaboration and preservaton procedures. Problematic of ready to eat foods

Lesson 45.- Catering. Organization of a catering kitchen. Processing of foods by catering.

Lesson 46.- Design of a food industry. Characteristics of the processing area, distribution, auxiliary facilities. Processing conrol.

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Lesson 47.- Water supply and treatment of food waste . Applications of water in the food industry. Water quality. Water purification. Characteristics of wastes of food industry: Biology demand of oxygen, chemical demand of oxygen. Procedures for treating wastes: physical, chemical and biological methods. Le

Laboratory lessons

Lesson 1.- Sensors for controlling food safety and quality. (4 H) Main sensor used in the food industry: temperature, pH, water activity, relative humidity,

Lesson 2.- Predictive Microbiology. (4 H) Programs and resources of predictive microbiology to predict factors affecting microbial growth and survival

Lesson 3.- Pilot plant for food processing. (4 H) Organization. Identification of the different equipments for food preservation and processing.

Lesson 4.- Processing of meat (4 H) Main physico-chemical and microbiological analysis in meat processing.

Lesson 5.- Milk processing (4 H) Main physico-chemical and microbiological analysis in milk processing.

SEMINARS

Seminar 1.- Thermal processing (4 H) . Survival curve, thermodestruction curve. Graphical calculation of D_t and z values. F_0 parameter and "botulinum cook"

Seminar 2.- Case. (2 H) It will be presented a practical issue related with food preservation and students will have to find the solution to the issue using different sources of information (books, internet etc)

Seminar 3 Meat and meat products (2 H) Discussion of a current issue related with the food industry.

Seminario 4 Milk and milk products (2 H) Discussion of a current issue related with the food industry.

Practicum

Activities related with Practicum will be conducted in the Pilot Plant of Food Science and Technology. Small group of students will conduct all the steps related with the elaboration of a specific food. Examples of foods that will be elaborated are: Yogurt, cheese, Curd sausages, chorizo, chistorra.

5.4.Course planning and calendar

http://veterinaria.unizar.es/gradovet/horarios1.php?COD_TITULACION=6

5.5.Bibliography and recommended resources

[BB: Bibliografía básica / BC: Bibliografía complementaria]

- [BB] Casp Vanaclocha, Ana. Procesos de conservación de alimentos / Ana Casp Vanaclocha, José Abril Requena . 2ª ed. corr. Madrid : A. Madrid Vicente : Mundi-Prensa, 2003
- [BB] Ciencia de los alimentos : bioquímica, microbiología, procesos, productos. Volumen 1, Estabilización biológica y fisicoquímica / coordinadores, Romain Jeantet ... [et al.]. Zaragoza : Acribia, 2010
- [BB] Ciencia de los alimentos : bioquímica, microbiología, procesos, productos. Volumen 2, Tecnología de los productos alimentarios / coordinadores, Romain Jeantet ... [et al.]. Zaragoza : Acribia, 2010
- [BB] Tecnología de los alimentos. Vol.I, Componentes de los alimentos y procesos / Juan A. Ordóñez Pereda (editor) . Madrid : Síntesis, D.L. 1998
- [BB] Tecnología de los alimentos. Vol.II, Alimentos de origen animal / Juan A. Ordóñez Pereda (editor) . Madrid : Síntesis, D.L. 1998

Listado de URL

- Agencia española de consumo, seguridad alimentaria y nutrición [<http://www.aecosan.msssi.gob.es/>]
- CTA-Magazine [<http://www.catedu.es/ctamagazine/>]
- España. Ministerio de Agricultura, Alimentación y Medio Ambiente. Alimentación [<http://www.magrama.gob.es/es/alimentacion/temas/default.aspx>]
- European Food Safety Authority [<http://www.efsa.europa.eu/>]
- Grupo de Bioquímica de los Alimentos (PACA) [<http://milksci.unizar.es/>]
- Página web de Paul Singh [<http://www.rpaulsingh.com/>]
- Planta Piloto de Ciencia y Tecnología de los Alimentos de la Facultad de Veterinaria de Zaragoza [<http://ppcta.unizar.es/>]