COURSE PROGRAM

Academic year 2017-2018

Identification and characteristics of the subject					
Code	400514			ECTS Credits	6
Name (Spanish)	OBTENCIÓN Y TRANSFORMACIÓN DE LA CARNE				
Name	MEAT PRODUCTION AND PROCESSING				
Degree	UNIVERSITY MASTER IN MEAT SCIENCE AND TECHNOLOGY				
Institute/Center	FACULTY OF VETERINARY				
Semester	1º	Nature	COMPULSORY		
Module	MEAT AND MEAT PRODUCTS TECHNOLOGY AND BIOCHEMISTRY				
Subject	MEAT PRODUCTION AND PROCESSING				

Teachers			
Name	Office	E-mail	Webpage
Sonia Ventanas Casillas	2D5	sanvenca@unex.es	htpp://veterinaria.unex.es
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Area of Knowledge	FOOD TECHNOLOGY
Department	ANIMAL PRODUCTION AND FOOD SCIENCE
Coordinator	MARIO ESTÉVEZ GARCÍA

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Academic skills

Basic skills

CB1: To learn and understand the knowledge required as a base or opportunity to be original in the development and application of ideas, often in a research context.

CB2: That the students know how to apply the acquired knowledge and their capability to solve problems in new or poorly known settings within broader or multidisciplinary contexts related to their study area.

CB3: That the students are able to integrate knowledge from different sources and to face the complexity of making judgements from information that, being incomplete or limited, include thoughts on social and ethical responsibilities linked to their knowledge and judgement.

CB4: That the students are able to communicate their conclusions and knowledge, as well as the reasons underlying, to both specialized and non-specialized professionals, in a clear and unambiguous way.

CB5: That the students have learning skills that allow them to continue learning in mainly a self-directed and autonomous way.

General skills

CG1: Ability to analyze and summarize.

CG2: Ability to learn and to apply knowledge to real situations.

CG3: Time management and planning.

CG4: Basic general knowledge in the work field.

CG5: Oral and written communication in Spanish.

CG6: Skills for information management (ability to find and analyze information from different sources).

CG7: Ability to generate new ideas.

CG8: Problem solving skills.

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CG9: Decision making.
CG10: Interpersonal and teamwork skills.
CG11: Ability to communicate with laymen.

Transversal competences

CT1: Ability to share information, ideas, problems, and solutions both to specialized personnel and laymen.
CT2: Giving public presentations of ideas, problems and solutions in a logical and structured way, both orally and written.
CT3: Using new information technologies as an intellectual working tool and as an essential mean for information, learning and communication.
CT4: Manage and use social and interpersonal skills and working collaboratively in multidisciplinary teams.
CT5: Have basic knowledge of a second language, especially on technical aspects related to meat science and technology.
CT6: Efficiently use a set of resources, techniques, and strategies of learning to warranty autonomous, responsible, and continuous lifelong learning.
CT7: Updating the knowledge in the socio-educational field through research and knowing how to analyse future trends.

SPECIFIC COMPETENCES

CE1.1.1. To know the transport and slaughter operations of livestock animals.

CE1.1.2. To identify the diverse meat cuts and the appropriate means for carcass dressing.

CE1.1.3. To know the onset and progression of rigor mortis.

CE1.1.4. To know the physico-chemical and histological composition of meat and influential factors.

CE1.1.5. To know the factors determining the shelf life of meat and strategies to preserve it.

CE1.1.6. To know the diverse packaging systems, the atmospheres and most common plastic polymers.

CE1.1.7. To know the technological suitability and quality of meat for processing.

CE1.1.8. To know the stages during the production/processing of different types of meat products.

CE1.1.9. To know the most relevant factors having an influence on meat quality.

CE1.1.10. To learn the characteristics and controlling the machinery used for production of muscle foods.

CE1.1.11. To learn identifying the characteristics and defects of different meat products.

CE1.1.12. To know adequate strategies aimed to avoid or alleviate the symptoms of different meat defects.

CE1.1.13. To know smoke composition and variables having an influence on it.

CE1.1.14. To know the additives, condiments, and spices used in the production of muscle foods and their properties and characteristics.

CE1.1.15. To be able to design a slaughterhouse and a processing plant of fresh meat and processed muscle foods.

CE1.1.16. To be able to detect and resolve problems during slaughter and meat handling operations.

CE1.1.17. To be able to establish the most suitable fate of meat based on objective and subjective assessments.

CE1.1.18. To be able to detect problems related to the technological, nutritional, sensorial or microbiological quality of meat and meat products and establish appropriate procedures for amendment.

CE1.1.19. To choose the best procedures for the preservation of meat and meat products.

CE1.1.20. To be able to detect mistakes or frauds in commercial meat cuts and in processed meat products.

Contents

Brief description of content

Current situation of the meat industrial sector. Meat structure and composition. Nutritional value of meat. Quality parameters in fresh meat. Factors having an influence on meat composition. Slaughter of livestock animals. Onset and development of Rigor Mortis. Carcass classification. Strategies for meat preservation. Refrigeration and freezing. Other methods for meat preservation. Packaging and storage of meat under modified atmosphere. General strategies for manufacture of meat products. Cooked meat products. Meat emulsions. Additives in the meat industry. Exploitation of by-products from meat industry.

Subject project

Block 1: INTRODUCTION

Designation of lesson 1: Subject concept and didactic division.

Contents of lesson 1: Meat industry, present, past and future. Economic relevance. Meat science and technology and relationship with other sciences.

BLOCK 2: MEAT COMPOSITION AND CHARACTERISTICS

Designation of lesson 2: Histology and physiology of skeletal muscle.

Contents of lesson 2: Muscle structure and annex tissues. Energy metabolism of muscle. Muscle contraction mechanism.

Designation of lesson 3: Chemical composition of muscle.

Contents of lesson 3: Proteins, lipids, water, carbohydrates, vitamins and minerals. Nutritional value of meat.

Designation of lesson 4: Meat Quality.

Contents of lesson 4: Quality parameters in fresh meat. Interconnections with meat composition and structure. Methods for assessment.

Designation of lesson 5: Factors having an influence on meat quality.

Contents of lesson 5: Influence of pre-, peri- and post-mortem on meat composition and characteristics.

BLOCK 3: SLAUGHTER OF LIVESTOCK ANIMALS

Designation of lesson 6: Slaughter of livestock animals.

Contents of lesson 6: Transportation and stabling of animals. Stunning methods, Bleeding and dressing. Complementary operations in slaughterhouses: technological aspects.

Designation of lesson 7: Transformation of muscle into meat.

Contents of lesson 7: Onset and resolution of rigor mortis. Abnormal forms of development of rigor mortis: PSE and DFD meats.

Designation of lesson 8: Classification and categorization of carcasses.

Contents of lesson 8: Assessment of commercial value of livestock animals and carcass categorization. Relevance of carcass classification on meat production. Fundamentals for classification.

BLOCK 4: PRESERVATION OF FRESH MEAT

Designation of lesson 9: General strategy for meat preservation.

Contents of lesson 9: Meat contamination. Factors having an influence on bacterial growth on meat. Physical and biochemical changes in meat during storage.

Designation of lesson 10: Cold preservation of meat: refrigeration.

Contents of lesson 10: Technological aspects. Physical, microbiological and biochemical modifications in chilled meat.

Designation of lesson 11: Cold preservation of meat: freezing. **Contents of lesson 11:** Meat freezing and thawing. Technological aspects. Physical, histological, biological and biochemical modifications in frozen meat. Cold shortening and thawing rigor.
Designation of lesson 12: Complementary processes to cold preservation. **Contents of lesson 12:** Electrical stimulation of carcasses. Hot deboning of meat. Other procedures for meat preservation. Heat application. Irradiation. Organic acids.
Designation of lesson 13: Meat packaging. **Contents of lesson 13:** Packaging and storage of meat under modified atmospheres. Most commonly used gases and plastic polymers.
Designation of lesson 14: Meat preservation through lowering water activity. **Contents of lesson 14:** Meat drying and dehydration. Lyophilization. Meat salting and curing.
Designation of lesson 15: Smoking **Contents of lesson 15:** Effect of smoking on meat preservation. Smoking chambers. Health aspects of smoking.
BLOCK 5: MANUFACTURE OF MEAT PRODUCTS
Designation of lesson 16: Instruments and machinery of meat industry. **Contents of lesson 16:** Relevance of processing industry. Machines for grinding, cutting, stuffing, kneading, bone and tendons separation, injection, cooking, smoking...
Designation of lesson 17: Ingredients and additives of meat products. **Contents of lesson 17:** Concept of ingredient, additive, spice and condiment. Main additives used in the meat industry.
Designation of lesson 18: Fresh meat products. **Contents of lesson 18:** Raw fresh ground and non-stuffed meat products, added or not with condiments, spices and additives. Intact meat or cut raw marinated meat products.
Designation of lesson 19: Cooked meat products. **Contents of lesson 19:** Ingredients and additives, technological implications. Main processes occurred as a result of the heat treatment. Meat emulsions and batters. Scalded or cooked sausages.
Designation of lesson 20: Cooked intact meat products. **Contents of lesson 20:** Cooked hams and shoulders. Other cooked intact meat products.
Designation of lesson 21: Canned and semi-sterilized meat products. **Contents of lesson 21:** Types of canned and semi-sterilized meat products. Thermal treatments. Canning.
Designation of lesson 22: Exploitation of meat with low commercial value. **Contents of lesson 22:** Mechanically separated meats. Restructured meats.
Designation of lesson 23: Ready-to-eat meat meals and others. **Contents of lesson 23:** Guidelines and legal frame on ready-to-eat meals. Types. Thermal treatments. Vacuum cooking.
BLOCK 6: BY-PRODUCTS FROM THE MEAT INDUSTRY
Designation of lesson 24: By-products from the meat industry **Contents of lesson 24:** Industrial exploitation of blood, offal, bones and other by-products. Gelatin industry. Meat extracts. Industrial processing of livestock animal fats.
Practical program
Practical lesson 1. Assessment of quality characteristics in different types of meat. Interpretation of results. Length: 2 hours. Type: laboratory.
Practical lesson 2. Effect of pH on meat characteristics. Interpretation of results. Length: 2 hours. Type: laboratory.
Practical lesson 3. Effect of refrigeration on meat preservation. Length: 2 hours. Type:

laboratory.
Practical lesson 4. Speed on freezing. Effect on meat quality Length: 2 hours. Type: laboratory.
Practical lesson 5. Psychrometric diagrams: application on the drying of meat slices. Length: 2 hours. Type: laboratory.
Practical lesson 6. Effect of smoke components on meat colour. Length: 1 hour. Type: laboratory.
Practical lesson 7. Effect of different additives and ingredients on functional properties of meat. Length: 2 hours. Type: laboratory.
Practical lesson 8. Manufacture of fresh meat products. Length: 2 hours. Type: Pilot plant.
Practical lesson 9. Manufacture of cooked meat products. Length: 4 hours. Type: Pilot plant.

Training activities					
Working hours by student per lesson		**Face-to-face training (On-site)**		**Follow-up activities**	**Non-classroom training**
Lesson	**Total**	**LG**	**SL**	**TP**	**EP**
1	3.25	1	0.25		2
2	3.25	1	0.25		2
3	10	1	2		7
4	11	2	2		7
5	3.25	1	0.25		2
6	6.75	1.5	0.25		5
7	11.5	1.5	2		8
8	4.25	1	0.25		3
9	3.25	1	0.25		2
10	7	1	2		4
11	7	1	2		4
12	3.25	1	0.25		2
13	3.25	1	0.25		2
14	5	1	1		3
15	6	1	2		3
16	5	1	1		3
17	8	1	2		5
18	3.25	1	0.25		2
19	9	2	2		5
20	12	1	4		7
21	3.25	1	0.25		2
22	5	1	1		3
23	6	1	2		3
24	6.5	2	0.5		4
Overall assessment	4	2	2		
Total	150	30	30		90

LG: Large group (up to 100 students).
SL: Seminar/Lab
PT: Programmed tutorials (learning follow up, ECTS type tutorials).
IL: Individual learning, team or individual assignments, literature reading

Teaching methodologies

1. Direct instruction/participative teaching/learning: lectures including concepts and theoretical knowledge with audio-visual support.
2. Participative teaching/learning: lab practical lectures to medium to small groups.
3. Participative teaching/learning: search and analysis of literature, assignments for small /medium teams, discussion of reports with students.
4. Follow up activities on advised assays or projects, doubt solving and advising to small groups or to individuals.
5. Individual learning activities through literature analysis, reports and study of provided teaching materials.
6. Direct instruction/participative teaching/learning: Presentation of specific knowledge and concepts on real situation scenarios during visits to industries.

Training outcomes

Students who take the course will be able to:

- Evaluate meat quality, choose the adequate methods for its evaluation and design strategies for its improvement.
- Design a correct system for livestock slaughtering aiming for high quality meat.
- Select the best conditions for an optimal meat preservation until consumption or further technological use and evaluate potential problems.
- Design meat products processing flows, from raw materials selection to dispatch and further product preservation.
- Establish the best possible use of different by-products of the meat processing industry.

Assessment system

It will be possible to choose between a continuous evaluation (see assessment tolls by the end of this section) or an evaluation system based on a unique exam. For this latter option it will be required to assist to all the practical lessons from this subject. The exam consists of a number (5-7) of short questions in relation to both the practical and theoretical aspects of the subject. To have a positive assessment in the subject it will be necessary to have an overall assessment of at least 6.

The following aspects will be evaluated:

- Knowledge and understanding of course contents
- Ability to apply theoretical knowledge to solving practical cases
- Ability to address topics related to new product development, to the use of novel ingredients or to solving processing practical problems, presenting them in a correct format, including an up to date state of the art, a reasoned discussion and a clear presentation.
- Active participation in teaching activities

Assessment tools:

1. Short test after every lecture

10%

2. Continuous evaluation of activities during practical sessions and of assignments on such sessions	25%
3. Development of counselled work on theoretical-practical meat industry case (new products, novel ingredients, defect solving...)	7.5%
4. Oral presentation of reports	7.5%
5. Written exam on the theoretical and practical content of the course	50%

Recommended Literature (Basic)

DURAND, P. (2002) Tecnología de los productos de charcutería y salazones. Editorial Acribia. Zaragoza.

LAWRIE, R. (1998) Ciencia de la carne. Acribia, Zaragoza.

ORDOÑEZ, J. A. Y COL. (1998) Tecnología de los Alimentos. Vol I. Alimentos de origen animal. Ed. Síntesis. Madrid.

PRÄNDL, O. Y COL. (1994) Tecnología e higiene de la carne Ed. Acribia.

PRICE, J.F. Y COLS. (1994) Ciencia de la Carne y de los Productos Cárnicos. Ed. Acribia, Zaragoza.

TOLDRÁ, F. (2005) Handbook of Fermented meat and poultry. Blackwell Publishing, Ames, USA.

VARNAM, A.H. (1998) Carne y productos cárnicos. Tecnología. Química. Microbiología. Acribia, Zaragoza.

WARRIS, P.D. (2003) Ciencia de la carne. Editorial Acribia. Zaragoza.

Recommended Literature (Complementary)

TOLDRÁ, F. (2005) Handbook of Fermented meat and poultry. Blackwell Publishing, Ames, USA.

MIN DU, RICHARD J. MCCORMICK (2009). Applied Muscle Biology and Meat Science, CRC Press.

TOLDRÁ, F. (2017). Lawrie's Meat Science, Woodhead Publishing.

TOLDRÁ, F. (2017). Advances in Food and Nutrition Research. Academic Press Inc.

PURSLOW, P. (2017). New Aspects of Meat Quality. Woodhead Publishing.

Tutoring timetable

Day	Lecturer	Time	Place
Monday	Dr. Sonia Ventanas Canillas	12-14h	Office nº 2D5
Tuesday	Dr. Sonia Ventanas Canillas Dr. Mario Estévez García Dr. David Morcuende Sánchez	12-14h 10-12h 12-14h	Office nº 2D5 Office nº 2S7 Office nº 10 (Facultad de Empresariales)
Wednesday	Dr. Sonia Ventanas Canillas Dr. Mario Estévez García Dr. David Morcuende Sánchez	12-14h 10-12h 12-14h	Office nº 2D5 Office nº 2S7 Office nº 2S5
Thursday	Dr. Mario Estévez García Dr. David Morcuende Sánchez	10-12h 12-14h	Office nº 2S7 Office nº 2S5

Recommendations

Previous knowledge

- There is no specific required qualification other than those allowing the students to join the Master. Nevertheless, basic knowledge on muscle histology, physiology and biochemistry is ad advantage.

Studying and work

- Regular recommended literature checking.
- Daily review on the taught theoretical knowledge will greatly improve the outcome of the practical sessions.
- Regular checking of online virtual teaching portal is strongly suggested, not only for being updated with the news about the course, but also for checking the uploaded teaching materials.

Review of exams

- Exams review will be carried out under the current norms for UEx.