

Course Unit	Option I	Field of study	-		
Master in	Technology and Animal Science	School	School of Agriculture		
Academic Year	2015/2016	Year of study	1	Level	2-1
Type	Semestral	Semester	1	ECTS credits	6.0
Code	5026-453-1105-01-15				
Workload (hours)	162	Contact hours	T 30	TP -	PL 24
			TC -	S 6	E -
			OT 20	O -	

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s) Clementina Maria Moreira dos Santos, Maria Fátima Alves Pinto Lopes da Silva

### Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:

1. Characterize an food system in terms of nutritional, sensorial, technological and healthful properties.
2. Know authorized food additives, the reasons that justify its application, the risks that can imply, and the precautions to have in account;
3. Foresee the stability of the commodities.
4. Identify potentials toxicological risks associates to foods in order to minimize/eliminate these risks.

### Prerequisites

Before the course unit the learner is expected to be able to:  
Possess knowledge in the domains of general chemistry and food microbiology.

### Course contents

Properties of the food systems: nutricionals, sensorial, technological, healthful and quality. Food additives. Stability of foods and chemical changes. Factors that determine the safety of foods. Principles of toxicology. Toxic substances in foods. Ways of toxic entrance in the human organism. Metabolism.

### Course contents (extended version)

1. NUTRITIONAL PROPERTIES OF FOOD SYSTEMS: carbohydrates, lipids, proteins, micronutrients.
2. FUNCTIONAL PROPERTIES OF FOOD SYSTEMS: polysaccharides and proteins.
3. FOOD ADDITIVES: definitions. Goals and general principles of use.
4. Classification of food additives. Common additives used in food industry.
5. FOOD STABILITY AND CHEMICAL CHANGES: characterization. Shelf-life.
6. PHYSICAL CHANGES: losses in watery content. Others.
7. PROTEIN CHANGES IN FOOD PROCESSING.
8. CHANGES IN FOOD LIPIDS: Enzymatic hydrolysis. Lipid peroxidation. Polymerization. Deep frying.
9. ENZYMATIC BROWNING: substracts and enzymes. Reaction mechanisms. Methods of control or inhibition.
10. NON ENZYMATIC BROWNING: Maillard reactions. Caramelization. Ascorbic acid oxidation. Prevention.
11. CHEMICAL ALTERATIONS OF MICROBIAN ORIGIN: consequences. Prevention.
12. NATURAL TOXIC SUBSTANCES IN FOODS: lectins, fitats, tannins, saponins, others.
13. TOXICS WITH ORIGIN IN TECHNOLOGICAL OPERATIONS: pesticidas, nitrofuranes, PCBs, dioxines, PAHs.
14. TOXIC EFFECTS OF OTHER ELEMENTS: solvents; antibiotics; radioactive elements.
15. HEAVY METALS TOXICITY: cadmium, tin, arsenic, plumb, mercury.
16. SUBSTANCE MIGRATION FROM PACKAGING.
17. WAYS OF TOXIC ENTRANCE IN HUMAN ORGANISM.
18. XENOBIOTICS BIOTRANSFORMATION. Fase I and II mechanisms.

### Recommended reading

1. Belitz, H. -D. ; Grosch, W. ; Schieberle, P. (2004). Food Chemistry, 3rd edition, Springer-Verlag.
2. d'Mello, J. P. F. (Edi. ) (2003). Food Safety: Contaminants and Toxins. CABI Publishing, London, UK, 472 pp.
3. Gutierrez, J. B. (2000). Ciencia bromatológica. Principios generales de los alimentos. Ediciones Diaz de Santos. S. A.
4. Hobbs, B. C. O. (1997) Higiene y toxicología de los alimentos. Editorial Acribia, Zaragoza.
5. Klaassen, Curtis D. ; Watkins, B. , John (2001). Toxicologia A Ciência Básica dos Tóxicos. De Casarett & Doull's. Mcgraw-Hill de Portugal, Lda. 5ª Edição.

### Teaching and learning methods

Theoretical and practical lessons will use expositive, active and interrogative methods. Laboratorial lessons with demonstrative and active methods. Personal and/or tutorial study based in the reading of the recommended bibliography available in the Institute and in information supplied by e-learning and in institutional internet sites.

### Assessment methods

1. Alternative 1 - (Regular) (Final, Supplementary, Special)
  - Final Written Exam - 100% (Theoretical/Practical exam - 4/2 ECTS; Minimum score is 9, 5; approval required for practical.)
2. Alternative 2 - (Student Worker) (Final, Supplementary, Special)
  - Final Written Exam - 100% (Theoretical/Practical exam - 4/2 ECTS; Minimum score is 9, 5; approval required for practical.)

### Language of instruction

Portuguese, with additional English support for foreign students.

### Electronic validation

Clementina Maria Moreira dos Santos, Maria Fátima Alves Pinto Lopes da Silva	Clementina Maria Moreira dos Santos	José Carlos Batista Couto Barbosa
18-12-2015	28-12-2015	07-01-2016