

# SYLLABUS

Code-Course	051211 - Physical and Physicochemical principles of Culinary Products and Processes		
Thematic Area	Science and cooking	Year	First
Course Type	Mandatory	Credits	6 cr. ECTS
In-class Hours	60 hours	Hours of Individual Work	90 hours

## BRIEF COURSE DESCRIPTION

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Acquiring the basis to understand the physicochemical basis of food and the culinary techniques and processes is essential to be able to apply the knowledge to the practice and analysis of the culinary processes. It is also essential to learn the basic concepts of physical chemistry in the culinary and gastronomy field; and understand the importance of the scientific knowledge about the qualities of foods and their culinary transformation.

## GENERAL SKILLS

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GS8 – Students must be able to make assumptions, collect and interpret information according to the scientific method.

## SPECIFIC SKILLS

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SS14 – Students must be able to scientifically and technically inform and give advice to the food industry and to customers in order to design intervention and formation strategies in the gastronomic and culinary field.

SS16 – Students must be able to understand the chemical structures, the properties and the transformations of the components of foods.

## LEARNING OBJECTIVES

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1. Introduction
2. Matter: structure and properties
  - 2.1. Molecules and intermolecular forces
  - 2.2. Gas, liquid and solid

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- 2.3. Matter and electromagnetic radiation
- 3. Chemical transformation of foods
  - 3.1. Chemical reactions in food
- 4. Culinary techniques and processes
  - 4.1. Temperature and foods
  - 4.2. Water in foods
  - 4.3. Aromas
  - 4.4. Effect of substances in foods
  - 4.5. Food dispersion
- 5. Chemical reactions in food.
  - 5.1. Speed of a chemical reaction.
  - 5.2. Types of simple reactions.
  - 5.3. Complex reactions.
- 6. Temperature and food
  - 6.1. Heat: specific heat and heat capacity
  - 6.2. Heat transport: convection, conduction and radiation.
  - 6.3. Food cooking
  - 6.4. Freezing.
- 7. Water in food
  - 7.1. Water, gel and water vapor: phase diagram
  - 7.2. Changes between phases: enthalpy and entropy.
  - 7.3. Phase equilibrium: fusion, vaporization and sublimation.
  - 7.4. Lyophilization
- 8. Aromas in the kitchen
  - 8.1. Mixtures of liquids and gases: partial molar magnitude
  - 8.2. Liquid-vapor equilibrium: Raoult's law
  - 8.3. Carbonated drinks: Henry's law.
- 9. Effects of substances on food
  - 9.1. Electrolytic and non-electrolytic solutions
  - 9.2. Colligative properties

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- 9.3. Water activity: sugar in jams
- 10. Food dispersions
  - 10.1. Surface tension
  - 10.2. Surfactants and tensioners: surface adsorption
  - 10.3. Colloidal systems: classification.
  - 10.4. Stability of dispersions
  - 10.5. Gelification

## **Workshops**

1. Molecular vibrations and rotations. Kitchen with microwave.
2. Cooking: Temperature and pressure effect
3. Spherification: a molecular vision

## **Practices**

1. Protein structure
2. Viscosity
3. Colorimetry
4. Kinetics
5. Heat
6. Phase changes
7. Component separation
8. Osmotic pressure

## **LEARNING METHODOLOGY**

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This course combines lectures, practical workshops, laboratory practices and assessment.

## **ASSESSMENT SYSTEM**

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The assessment system assesses the student's achievement of learning outcomes regarding the subject's own competences.

Students may choose between continuous assessments throughout the year or a final examination at the end of the course.

**Continuous assessment:** the teaching-learning process is assessed by a continuous monitoring of the work done by the students throughout the course.

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**Final examination:** it assesses the students learning outcomes by means of a final exam at the end of the course. Students who cannot come to class regularly due to justified reasons will be assessed at the end of the course.

Assessment systems	Continuous	Final
Mid-term exam I	25 %	-
Mid- term exam II	25 %	
Final written exam	--	60 %
Tasks done by the student	15 %	40%
Practices	35 %	

### Review and Reassessment of the Course

The student has the right to review all the evidences that have been designed for the assessment of learning.

If a student fails to achieve the learning objectives of the course, in order to opt for the reassessment of the course and submit a new reassessment task, it will be mandatory to fulfil one of these conditions:

A) Students must have been awarded a mean grade of 5.0 or higher in relation to the activities carried out throughout the semester without taking into account the final exam/s (both continuous assessment and single assessment) and having attended the final exam.

B) Students must have been awarded a final minimum grade of 4.0 in the overall course.

After the reassessment, the maximum grade is 5.0 in the overall course.

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## BIBLIOGRAPHY

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Peter Barham (2002). La Cocina y la Ciencia. Acribia, Zaragoza.

Carmen Cambón, Soledad Martín y Eduardo Rodríguez (2007). Ciencia a la Cazuela. Alianza Editorial, Madrid,

Robert L. Wolke (2005). Lo que Einstein le contó a su Cocinero 2. Robinbook. Barcelona.

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Pieter Walstra (2003). Physical Chemistry of Foods. CRC Press, Boca Raton.