COURSE DATA

Data Subject	
Code	36360
Name	Physic
Cycle	Grade
ECTS Credits	6.0
Academic year	2019 - 2020

Study (s)

Degree	Center	Acad. year	Period
1212 - Degree in Gastronomic Sciences	Faculty of Pharmacy and Food Sciences	1	First term

Subject-matter

Degree	Subject-matter	Character
1212 - Degree in Gastronomic Sciences	3 - Physic	Basic Training

Coordination

Name	Department
PEDROS ESTEBAN, ROBERTO	345 - Earth Physics and Thermodynamics

SUMMARY

Physics is a first-year 6-credits quarterly core subject taught in the first quarter of the academic year. This course is intended for students to start on the concepts and physical phenomena of interest in issues related to gastronomy and its research.

The course is divided into four parts: errors and units, fluid Mechanics, Thermodynamics and wave phenomena. Lectures and exercises are given in the classroom with the entire group. Experiments are performed in the laboratory into smaller groups of 16 students. Also 2 seminars and 2 tutorial classes are part of the course.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

It is strongly recommended that the student had taken Physics and Mathematics courses in Secondary School. Otherwise, the students will have to work harder to stand on an equal footing with the rest of the class.
Physics pre-requisites; Newton laws; force, work, energy and power; velocity; pressure; density; conservation of energy; waves.
Mathematics pre-requisites: solving linear and quadratic equations; solving systems of linear equations; solving exponential and logarithmic equations; derivative and in

OUTCOMES

1212 - Degree in Gastronomic Sciences

- Know the fundamentals of physics in its theoretical and experimental aspects and the influence of physical factors on food components.

LEARNING OUTCOMES

Knowledge of the International System units and proper use for each physical quantity. Use of the error analysis and linear regression. Understanding of a physical model and its applications.

Application of the principles of Mechanics to fluid systems. Understanding the concept of pressure and Archimedes' principle. Differentiation of the types of flows. Application of the continuity equation and Bernoulli equations. Understanding what is viscosity and how reologically charachterize fluids. Application of Poiseuille equation. Understanding of surface phenomena and its applications to food, particularly in emulsions and foams.

Understanding of temperature and its measurement. Heat as an energy exchange and its application to food processing and storage. Conservation of energy and the Fist Principle of Thermodynamics.

Understanding the energy requirement of people and its relationship with energy content. The Second Principle of Thermodynamics and its relevance in life. Knowledge of the main thermal properties of food.

Basic concepts of waves. Applications to food processing and quality control. Understanding the basics of hearing and applications to chewing. Distinguish ionizing from non ionizing radiation and understanding physical and biological dosimetry. Food applications.

Solving numerical problems as an application of the concepts seen in class.

Difference between precision and accuracy and application to measurement with scientific equipment.

Assessment of instrumentation based on its exactitude. Measurement of a physical quantity with its error.

Retrieval and interpretation of results from experimental data.

DESCRIPTION OF CONTENTS

1. MEASUREMENTS AND UNITS

Magnitudes in Physics. Units
Errors as uncertainties. Absolute and fractional uncertainties. How to report a measurement
Estimation of uncertainties: direct measurements and propagation of uncertainties
Data representation: tables and figures. Linear interpolation
Modelling. Linear fit. Model validation

2. IDEAL FLUIDS

What is a fluid? Pressure
Types of flows
Pascals Principle
Archimedess Principle
Hydrostatic pressure
Continuity equation
Bernoullis equation
Applications

3. VISCOUS FLUIDS

Viscosity.
Poiseuilles equation
Turbulence
Motion of a solid in a fluid
Newtonian and non-Newtonian fluids
Thickeners and gelifiers

4. SURFACE PHENOMENA

Surface tension
Drops and bubbles: Laplace equation
Liquid drop formation: Tate equation
Angle of contact
Capillarity

Emulsions and foams

5. HEAT AND TEMPERATURE

Introduction
Thermometric scales
Heat and work
Transfer of heat: applications to cooking and freezing.
Thermal properties: specific heat and thermal conductivity
Latent heat
Cooling

6. PRINCIPLES OF THERMODYNAMICS

First Principle of Thermodynamics. Energy
Energy requirements of people
Energy from food
Second Principle of Thermodynamics: Carnot. Clausius. Interpretation of entropy
Thermodynamics of the living systems
High cuisine Thermodynamics

7. WAVES

What a wave is
Mathematical description. Wave function
Wave propagation. Atenuation. Absorption. Doppler effect.
Applications

8. ACOUSTICS

Sound level
Acoustic sensibility
Food noise
Ultrasounds

9. IONIZING RADIATION

X rays. Applications
Radioactivity.
Half-life
Dosimetry
Applications in food industry

10. PHYSICS LABORATORY

Session # 1: Measurement of density of solids and liquids
Density control: potatoes, bread and coffee
Session # 2: Measurement of viscosity: Newtonians and non-Newtonian fluids
Molecular Gastronomy I. Viscosity control: thickeners and gelifiers
Session # 3: Measurement of surface tension: pendant drop method
Molecular Gastronomy II. Surface tension:, spherifications, emulsions and foams
Session # 4: Molecular Gastronomy III
Thermodynamics: sous-vide cooking; cooking with liquid nitrogen
Waves: ultrasound cooking

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	45,00	100
Laboratory practices	15,00	100
Development of group work	10,00	0
Development of individual work	5,00	0
Study and independent work	20,00	0
Readings supplementary material	5,00	0
Preparation of evaluation activities	25,00	0
Preparing lectures	5,00	0
Preparation of practical classes and problem	20,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

The classroom lectures will deal with the main concepts of the subject and their practical applications. The participation of the students will be encouraged.

The students can access to a collection of problems for each unit. The professor will solve some of these problems in class, and some others will be assigned as homework.

The tutorial lectures may consist on groups of 16 students discussing especially interesting exercises with the professor. The work of the students during such sessions will be part of the marks.

The seminars consist on a written report (5000-8000 words), a work diary and an oral presentation about a topic suggested by the professor. The students will work in groups of 3-5 and the results will be part of the marks.

The laboratory consists on 8 experiments divided in 4 sessions, with 16 students and one professor. The students will work in pairs and will have to hand in a written report detailing: introduction; material and methods; results and discussions; conclusions. The use of spreadsheet applications will be encouraged, particularly during the laboratory session. Attendance to laboratory session is compulsory.

EVALUATION

Subject marking is divided in two blocks:

• Theory (70% of the mark)

- written exam with theoretical questions and problems (50%)

- seminars, tutorials and classroom work (20%)

• Laboratory (30% of the mark)

- written exam (15%)

- laboratory reports (15%)

The attendance of 100% of the laboratory is compulsory. Absence must be justified and will require the student to attend the session with another group.

It is necessary to get at least 4/10 mark in each item to pass Physics. If a student does not take the exam in both calls, the grade will be "Not present". If a student passes the laboratory part, the mark will be valid for two academic years. After that, the student will have to repeat the laboratory part.

REFERENCES

Basic

- Referencia b1: Herráez, J. V. y Delegido, J., 2011 Elementos de Física Aplicada y Biofísica. PUV, Universitat Valencia.
  Referencia b2: Davidovits P., 2008, Physics in Biology and Medicine. Academic Press.
  Referencia b3: McGee H., 2007, La cocina y los alimentos: enciclopedia de la ciencia y la cultura de la comida. Debate.

Additional

- Referencia c1: Tipler, P.A., 1992, Física, Reverté.
- Youssef J., 2016, Molecular Gastronomy at home, 2016, Firefly Books Ltd

- Logsdon J., Modernist cooking made easy, 2012, Logsdon

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

English version is not available