

Academic Year/course: 2022/23

30802 - General physics and fundamentals of physical analysis

Syllabus Information

Academic Year: 2022/23

Subject: 30802 - General physics and fundamentals of physical analysis

Faculty / School: 105 - Facultad de Veterinaria

Degree: 568 - Degree in Food Science and Technology

ECTS: 6.0

Year: 1

Semester: First semester

Subject Type: Basic Education

Module:

1. General information

2. Learning goals

3. Assessment (1st and 2nd call)

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, problem-solving sessions, laboratory sessions and supervised work.

This course is divided in 36 lectures of one hour each, 10 hours of problem-solving and 14 hours of laboratory sessions (attendance is compulsory), distributed as indicated in the next sections.

Classroom materials will be available via Moodle. Thus, the student can review it in detail before and after the class. The material that is left available to students includes the lecture notes used in class, as well as a collection of problems. In addition, students will be provided with the practical guides needed for the laboratory.

Further information regarding the course will be provided on the first day of class.

Students must follow the regulations described in:

- Prevention: A guide for students at the University of Zaragoza:

https://uprl.unizar.es/sites/uprl.unizar.es/files/archivos/Procedimientos/guia_preventiva_para_estudiantes.pdf

- Manual de seguridad en los laboratorios de la Universidad de Zaragoza y normas marcadas por la Unidad de Prevención de Riesgos Laborales:

https://uprl.unizar.es/sites/uprl.unizar.es/files/archivos/Procedimientos/manual_de_seguridad_en_los_laboratorios_c
<https://uprl.unizar.es/inicio/manual-de-procedimientos>

In addition, students will follow as well any instructions related to biosecurity given by the professor.

4.2. Learning tasks

This 6 ECTS course includes the following learning tasks:

- **Lectures** (36 hours)
- **Problem-solving** (10 hours)
- **Laboratory sessions** (14 hours) 7 two-hour sessions in the Physics Laboratory. Students are provided in advance with task guidelines for each session.

Competences that the student is expected to acquire:

- To know the physical fundamentals of dynamic models applicable to texture analysis and rheology of food, and which are the basis of the 2nd year course ?Análisis físico y sensorial de los alimentos?.
- To take measurements of properties of solids and liquids, and calculate the error of measurements, as a critical foundation of the reports made in each case.
- To know the physical fundamentals of Thermodynamics and Optics applicable to thermo-mechanical and optical states of food analysis, which are needed for the 2nd year course ?Análisis físico y sensorial de los alimentos?.
- To understand the physical fundamentals of electricity and waves and its application in solving problems related to the alimentary industry.
- To present and defend reports and to speak in public and to correct reporting practices.
- To analyse many experimental data using statistical techniques, thus approaching a real situation of industrial control laboratory or research.

4.3. Syllabus

This course will address the following topics:

- **Topic 1:** Mechanics
Kinematics and dynamics. Momentum. Work and energy. Conservative forces. Mechanical energy.
- **Topic 2:** Size, shape, density, volume
Size and shape. Roundness and sphericity. Mass and weight. Volume. Density. Porosity.
- **Topic 3:** Elasticity
Stress and Strain: Hooke law. Torsion. Compressibility.
- **Topic 4:** Ideal fluids
Hydrostatic. Surface tension. Fluid dynamics. Bernoulli's equation. Viscosity. Poiseuille's law. Viscous drag force. Reynolds number. Stokes' law. Newtonian and non-Newtonian fluids. Stokes' law. Centrifugation. Rheology.
- **Topic 5:** Surface properties
Surface tension, Capillarity. Colloidal systems
- **Topic 6:** Thermodynamics
Heat and temperature. Heat transfer: conduction, convection and radiation. First and second laws of Thermodynamics. Phase transitions. Heat engine; refrigerators and heat pumps.
- **Topic 7:** Electricity and magnetism
Forces between electric charges: Coulomb's law. Field and electric potential. Electric current: Ohm's law. Joule effect. Capacitors. Magnetism. Magnetic induction.
- **Topic 8:** Waves
Sound waves. Ultrasounds. Propagation of light: reflexion and refraction. Total reflexion. Lenses. Optical instruments. Microwaves applied to the processing of food.

4.4. Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course will be provided on the first day of class or please refer to the Faculty website (<http://veterinaria.unizar.es/horarios1cta>).