Universidad Zaragoza

Academic Year/course: 2021/22

30802 - General physics and fundamentals of physical analysis

Syllabus Information

Academic Year: 2021/22
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 40 lectures of one hour each, 8 hours of problem-solving, 12 hours of laboratory sessions (attendance is compulsory) and 25 hours of supervised work, 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.

Supervised work will take place in the Department of Applied Physics, at a time previously agreed between students and teachers. In case of non-attendance the student will have to take the full final exam.

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_de_la_

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** (40 hours)
- **Problem-solving** (8 hours)
- **Laboratory sessions** (12 hours) 6 two-hour sessions in the Physics Laboratory. Students are provided in advance with task guidelines for each session.
- **Assignments** (20 hours) Students work in small groups. Tasks are organized as follows:
    a. Review of problems related to vectors and kinematics.
    b. Alimentary industry related problem solving sessions in small groups.
    c. Perform a statistical analysis of the measurements obtained in the lab 6 and make an oral presentation of the results.

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, waves and radiations 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**: Introduction
    - What is Physics? Physical magnitudes and units. Vectors. Vectorial algebra. Dot product and cross product.
- **Topic 2:** Mechanics
    - Kinematics and dynamics. Momentum. Work and energy. Conservative forces. Mechanical energy.
- **Topic 3**: Elasticity
    - Stress and Strain: Hooke law. Torsion. Compressibility.
- **Topic 4**: Ideal fluids
    - Hydrostatic. Surface tension. Fluid dynamics. Bernoulli's equation.
- **Topic 5**: Viscous fluids
    - Viscosity. Poiseuille's law. Viscous drag force. Reynolds number. Stokes' law. Newtonian and non-Newtonian fluids. Stokes' law. Centrifugation. Rheology.
- **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.
- **Topic 9**: Radiation
    - Types of radiations. Activity of a radioactive substance. Absorbed dose and biological efficacy. Food irradiation.

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).