# 30802 - General physics and the basics of physical analysis

**Información del Plan Docente**

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| **Academic Year** | 2017/18 |
| **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

## 1.1.Introduction

## 1.2.Recommendations to take this course

## 1.3.Context and importance of this course in the degree

## 1.4.Activities and key dates

## 2.Learning goals

## 2.1.Learning goals

## 2.2.Importance of learning goals

## 3.Aims of the course and competences

## 3.1.Aims of the course

## 3.2.Competences

## 4.Assessment (1st and 2nd call)

## 4.1.Assessment tasks (description of tasks, marking system and assessment criteria)

## 5.Methodology, learning tasks, syllabus and resources

## 5.1.Methodological overview

**DISCLAIMER**

The English version is a translation of the original in Spanish for informational purposes only. In case of discrepancy, the Spanish original shall prevail.

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**The learning process designed for this course is based on:**

This course is divided in 40 lectures of one hour each, 8 hours of problems, 10 hours of laboratory and 25 hours of supervised work, distributed as indicated in the following section.

The course material is uploaded in the ADD of the University of Zaragoza. Thus, the student can review it in detail before and after the class. The material that is left available to students includes presentations of the theoretical concepts, as well as a collection of problems. In addition, students will be provided with the practical guides needed for the laboratory.

Attendance in lab is mandatory.

Supervised work will take place at the premises of 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.

## 5.2.Learning tasks

**The program offered to the student to help him to achieve the expected results includes the following activities**

Block I

**Teaching and learning activities:** 3.8 ECTS in total.

-Class attendance: 26 hours of lectures plus 5 hours of problem solving

-Lab: 6 hours.

-Supervised work: 12 hours divided in:

-Information search.

-Interpretation of work protocols in Spanish and English

-Answer to issues raised while doing the work.

-Lab report submission.

**Competences:** In addition to those described in paragraph 3 as generic, the student must acquire during this block the following competences:

- To know the physical fundamentals of dynamic models applicable to texture analysis and rheology of food, and which are the basis of the 2 nd year course "Análisis físico y sensorial de los alimentos".

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- 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 learn to present and defend those reports.

**Assessment:** See the corresponding section.

Block II

**Teaching and learning activities** : 2.3 ECTS in total.

-Class: 14 h of lectures plus 3 hours of problem solving

-Lab: 6 hours.

-Supervised work: 13 hours of teamwork under the supervision of the teacher:

The first part will consist on the corrections of the lab reports from his classmates.

The second part will consist in analysing the data obtained in the lab 6 and later do an oral presentation of the results.

**Competences:** In addition to those described in paragraph 3 as generic, the student must acquire during the block the following competences:

- To know the physical fundamentals of Thermodynamics and Optics applicable to thermo-mechanical and optical states of food analysis, which are needed for the 2 nd year course "Análisis físico y sensorial de los alimentos".

- To learn to speak in public and to correct reporting practices.

- To learn to analyse many experimental data using statistical techniques, thus approaching a real situation of industrial control laboratory or research.

**Assessment:** See the corresponding section.

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## 5.3.Syllabus

1: Introduction

What is the Physics? The scientific method. Measurements and units; dimensional analysis. Precision and accuracy; errors in a measurement. Vectors and scalars; definition of vectors.- Vectorial algebra.- Scalar and vector product.- scalars and vectorial magnitudes.

2: Statics

Forces; equilibrium.- Systems of particles; solids.- Torques,. Equilibrium conditions for a solid.- Force couple.- Systems of equivalent forces.- Systems of parallel forces.- Constraints.- Friction.

3: Kinematics

Particle motion; displacement, velocity and acceleration.- Linear motion.- Harmonic motion.

4: Newton's Laws and gravitation

Newton's Laws, inertial reference systems.- Examples .- Gravitational forces.- Gravitational mass.

5: Dynamics

Linear momentum; Angular momentum conservation.- Work.- Kinetic Energy.- Power.- Conservative and no conservative forces.- Mechanical Energy.- Gravitational Potential.- Elastic Potential

6: Solids and fluids

Stress and Strain: Hooke law.- Torsion.- Compressibility.- Fluids; pressure in a fluid. Archimedes' principle. Surface tension and capilarity.- The equation of continuity; Bernoulli's Equation.

7: Viscous fluid flow

Viscosity.- Laminar flow in a tube: Poiseuille's law. Flow resistance- Viscous drag force.- Reynolds number.- Stokes law.- Centrifugation

8: Deformable Bodies

Elastic body model.- Newtonian Fluid.- Non Newtonian Fluid.- Plastic Materials. Bingham model.- Viscoelastic materials, Maxwell model. Kelvin-Voigt model. Burgers model.

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9: Heat and temperature

Thermodynamic equilibrium.- Heat and temperatura. Zero Principle of Thermodynamics.- Thermometry; ideal gas scale.- State equation of and ideal gas.- Ideal gas model

10: Thermodynamics

Work; First Law of Thermodynamics.- Internal energy; calorific capacity.- Isotherm and adiabatic processes. Quasistatic processes in ideal gases.- Cyclic quasistatic processes in ideal gases. Carnot cycle. Entropy. Second Law of Thermodynamics.- Reversibility.- Heat engine; refrigerators and heat pumps.

12: Optics

The light.- Reflection and refraction: Total reflection.- Polarization of light.- Reflection and refraction in a spherical surface.- Lenses.- Optical instruments: magnifying glass, microscope and camera.- The eye as an optical system.

## 5.4.Course planning and calendar

The calendar of this course can be found on the Faculty website ( http://cta.unizar.es/gradocta /). It will be updated at the start of each academic year.

**Proposed Timetable** : 5 hours a week

**Weeks 1-7** : Theory, problems and supervised work from first block.

The labs will begin in week 3, and will be held from Monday to Friday.

Students will be divided into 5 groups, and each group will work in pairs.

**Weeks 7-12:** Theory, problems and supervised work from second block.

Labs are held Monday to Friday.

Students will be divided into 5 groups, and each group will work in pairs.

The working groups will be 2 students who match the team laboratory practice. These groups may be different from those of block 1.

**Weeks 13 to 15:** Group work 3rd block.

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The working groups will be 2 students who match the team laboratory practice.

## 5.5.Bibliography and recommended resources

See above the original in Spanish.