COURSE INFORMATION

PHYSICS II

Code number: 606410107
Degree: Degree in Mechanical Engineering
Department: Ciencias Integradas
Academic Year: 2017-2018. Second semester
Course type: Foundational. 1st year
Teaching hours: 3 hours a week, 2 days a week
Credit value: 6 ECTS
Link to Spanish counterpart: http://www.uhu.es/etsi/guia-de-asignatura/?codigo=606410107

TEACHING STAFF

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Second Semester: Mon 16-18h, Tu 11:30-13:30, TH 11:30-13:30.

PROGRAMME

1. DESCRIPTION

The course will cover the topics of:

Electrostatics - Electrical Circuits - Magnetostatics - Magnetic Induction - Thermodynamics

2. PREREQUISITES

It is highly recommended to have taken previous courses in Physics at the High School level.

3. LEARNING OUTCOMES

The fundamental objective in that the student learns the basic concepts on the electromangnetic theory and acquires the skills to apply them in the understanding and solving engineering problems. Other objectives are:

1. To understand the basics concepts and theories of Physics.
2. To apply Physics laws to solve problems.
3. To get familiar with the scientific language: Graphics, mathematical language ...
4. Ability to search for bibliography.
5. To get introduce in the experimental techniques.
6. Capability for team work.

4. COMPETENCES

B02, CB1, CB2, CB3, G01, G04, G07

5. TEACHING METHODOLOGY

Classroom lectures. Solving problem sessions. Individual and group tutoring. Report on group assignments on specific topics. Written exams.

6. CONTENTS

1 ELECTRIC CHARGE AND ELECTRIC FIELD
- 1.1 Electric Charge.
- 1.2 Conductors, Insulators, and Induced Charges.
- 1.3 Coulomb's Law.
- 1.4 Electric Field and Electric Forces.
- 1.5 Electric-Field Calculations.
- 1.6 Electric Field Lines.
- 1.7 Electric Dipoles.

2 GAUSS'S LAW
- 2.1 Charge and Electric Flux
- 2.2 Calculating Electric Flux.
- 2.3 Gauss's Law.
- 2.4 Applications of Gauss's Law.
- 2.5 Charges on Conductors

3 ELECTRIC POTENTIAL
- 3.1 Electric Potential Energy.
- 3.2 Electric Potential.
- 3.3 Calculating Electric Potential.
- 3.4 Equipotential Surfaces.
- 3.5 Potential Gradient

4 CAPACITANCE AND DIELECTRICS
- 4.1 Capacitors and Capacitance.
- 4.2 Capacitors in Series and Parallel.
- 4.3 Energy Storage in Capacitors.
- 4.4 Dielectrics.

5 CURRENT, RESISTANCE, AND ELECTROMOTIVE FORCE.
- 5.1 Current.
- 5.2 Resistivity.
- 5.3 Resistance.
- 5.4 Electromotive Force and Circuits.
- 5.5 Energy and Power in Electric Circuits.
- 5.6 Theory of Metallic Conduction.

6 DIRECT-CURRENT CIRCUITS.
- 6.1 Resistors in Series and Parallel.
- 6.2 Kirchhoff's Rules.

7 MAGNETIC FIELD AND MAGNETIC FORCES.
- 7.1 Magnetism.
- 7.2 Magnetic Field.
- 7.3 Magnetic Field Lines and Magnetic Flux.
- 7.4 Motion of Charged Particles in a Magnetic Field-
- 7.5 Applications of Motion of Charged Particles.
- 7.6 7.6 Magnetic Force on a Current-Carrying Conductor.

7.7 Force and Torque on a Current Loop.
7.8 The Direct-Current Motor.

8 SOURCES OF MAGNETIC FIELD.
- 8.1 Magnetic Field of a Moving Charge
- 8.2 8.2 Magnetic Field of a Current Element
- 8.3 8.3 Magnetic Field of a Straight Current-Carrying Conductor.
- 8.4 8.4 Force Between Parallel Conductors
- 8.5 Magnetic Field of a Circular Current Loop.
- 8.6 8.6 Ampere's Law 8.7 Ampere's Law Applications.

9 ELECTROMAGNETIC INDUCTION.
- 9.1 nduction Experiments.
- 9.2 Faraday's Law.
- 9.3 Lenz's Law
- 9.4 Motional Electromotive Force.
- 9.5 Induced Electric Fields.
- 9.6 Eddy Currents.
- 9.7 Displacement Current and Maxwell's Equations.
- 9.8 Mutual Inductance.
- 9.9 Self-Inductance and Inductors.

10 ELECTROMAGNETIC WAVES
- 10.1 Maxwell's Equations and Electromagnetic Waves.
- 10.2 Plane Electromagnetic Waves and the Speed of Light.
- 10.3 Sinusoidal Electromagnetic Waves.
- 10.4 Energy and Momentum in Electromagnetic Waves.
- 10.5 Standing Electromagnetic Waves

11 THERMODYNAMICS
- 11.1 Introduction.
- 11.2 The zero principle and calorimetry.
- 11.3 First law.
- 11.4 Second law.

7. BIBLIOGRAPHY

Basic:
F. W. Sears, M. W. Zemansky y H. D. Young, University Physics 13th Edicition. Ed. Addison- Wesley(2012).

Additional: There are many general physics manuals, some examples are:

P.A. Tipler & G. Mosca, Physics for Scientists and Engineers, 6th Edition, Freeman, W. H. & Company (2007)

R. A. Serway. Fisica, Ed. McGraw-Hill (1985).

R. Resnick, D. Halliday y K. S. Krane, Fisica, Ed. CECS (1994).

8. ASSESSMENT

Written exam (80%).
Report on laboratory experiments and exam (10%).
Homework and solution of problems in class (10%).

NOTE 1: The homework grade will only be considered for students that obtain more than 40% of the grade of the written exam.
NOTE 2: The students must achieve more than the 40% in both the theoretical and the laboratory parts of the course to obtain a passing grade.
NOTE 3: To attend laboratory sessions is mandatory and a requirement to pass the course.