TITLE OF COURSE: Physics

PROGRAM TITLE: Enginyeria Tècnica de Telecomunicació Sistemes de Telecomunicació, 1st grade

CODE: 12011 program of Enginyeria Tècnica de Telecomunicació Sistemes de Telecomunicació

TYPE: T **YEAR:** 2nd year **SEMESTER:** Not available
CREDITS (hours/week): 7.00
ECTS CREDITS: 7.00
LECTURER: E. Farguell, F. Iglesias, F. Mazzanti, I. Blázquez, J. Albó, J. Casas
LANGUAGE: Catalan

PREREQUISITES: None

PREVIOUS KNOWLEDGE: Basic physics and elementary calculus.

SUBJECTS TO BE STUDIED SIMULTANEOUSLY: Not available

COURSE DESCRIPTION:
The main goal of the course is to give the student basic notions of vector analysis, field theory and electromagnetism, paying particular attention on their applications to the world of electronics. Additionally, the course is complemented with an introduction to the theory of harmonic, damped and forced oscillations. These models are capital to understand the formulation of many common models in physics and engineering.

COURSE OBJECTIVES:
Students attending this course have to achieve the following skills and knowledge:
1. Capacity for analysis and synthesis.
2. Basic general knowledge on the subject under study.
3. Be able to solve problems in physics.

CONTENTS:
1.- Introduction
2. Simple Harmonic Oscillator
2.1 Spring-mass systems
2.2 Basic equation of motion and general solution
2.3 Energy
2.4 Graphical representation
2.5 Harmonic oscillations around equilibrium points
2.6 Simple pendulum
3. Dumped and Forced Oscillators
3.1 Action of a damping force on a spring-mass system
3.2 Differential equation and its general solution
3.3 Overdamped, Critically damped and underdamped oscillators
3.4 Energy and power of the damped oscillator
3.5 Forced oscillations
4. Vector Analysis

4.1 Scalars and vectors
4.2 General definitions. Components, Norms, Bases
4.3 Basic vector algebra, sum of vectors
4.4 Dot product
4.5 Cross product and torques
4.6 Differentiation of a vector with respect to a parameter
5. Field Theory
5.1 Vector and Scalar fields
5.2 Equiescalar surfaces and field lines
5.3 Differential operations with fields: gradient, divergence, curl, laplacian
5.4 Flow of a vector field across a surface
5.5 Line integral of a vector field along a curve
5.6 Gauss and Stokes Theorems
6. Electric Fields
6.1 Electric charge. Characterization and properties
6.2 Coulomb's law
6.3 Electric field. Superposition theorem
6.4 Charge densities
6.5 Gauss theorem
6.6 Calculation of electric fields created by pointlike and continuum systems
7. Electric potential and electric potential energy
7.1 Work and potential energy
7.2 Kinetic energy and the Work-Energy theorem. Energy conservation
7.3 Potential energy of a system of point charges
7.4 Electric potential
7.5 Differential and integral relations between the electric field and the electric potential
7.6 Laplace and Poisson equations
8. Conductors and Capacitors
8.1 Capacity of an isolated conductor
8.2 Electric influence and induced charge
8.3 Capacitors
8.4 Association of capacitors
8.5 Energy carried by the electric field
8.6 Dielectrics
8.7 Electric susceptibility and polarization charge
9. Magnetic fields
9.1 Magnetic force between two moving charges
9.2 Magnetic force created by a system of moving charges
9.3 Magnetic field
9.4 Movement of a point charge under the action of a magnetic field
9.5 Applications to research
9.6 Force exerted on a current by a magnetic field
9.7 Magnetic field created by currents. Biot-Savart law
9.8 Ampere's Law. Flux of a magnetic field across a surface
9.9 Maxwell equations

METHODOLOGY:
This course is mainly based on teacher lectures that the students should attend.

During the lectures the teacher develops the different aspects of the subject, while some sessions are devoted to solve practical problems and specific examples. Each part has associated a set of problems that are solved on the blackboard in order to show the student

the right procedures and methods needed to successfully work out and understand their solution. Additional homework is also proposed and discussed the day after. Other sessions are reserved to present problems that the student must try to solve there, taking part on the discussion involved.

Tutorial sessions with the teacher are also being offered. In these the student can comment on particular aspects of his personal work, put questions on the subject lectured by the teacher or ask for assistance with the problems.

A set of solved problems, taken from exams of previous years, is also available. Each problem is discussed in detail and every aspect analyzed in depth, as the main goal was to write a practical guide of study.

EVALUATION:
The course has two different but complementary parts, consisting in theoretical and practical lessons. Practice is meant to serve as a complement to help the student understand the formal aspects of the subject. Both theoretical and practical parts are evaluated together in order to determine weather the student is able to find proper solutions to real life problems of physics.

Students are evaluated through
A. Exams
C. Quizzies.
D. Homework
J. Atendance

The final mark is the average of the marks of three exams performed during the course. All these exams have a practical part based in problems, a theoretical part and a quizzie. Other aspects as the degree to which the student gets involved in the discussion of lectures and problems and the homework carried out along the course are also taken into account.

A mark of 5 or higher is required to pass each exam during the course. Otherwise the student has to repeat the exam in June or in September. This requirement is relaxed if the mark of every exam is higher than 4. In this case the only constrain is to have an average mark above or equal to 5.

If any of the marks is less than 4 or the average is below 5 the student has to repeat the exam in September.

The students are offered the possibility to repeat only the third exam in September in case the mark of the other two is higher than 4. Otherwise they have to pass an exam of the whole subject when the average mark obtained in June is less than 5. In any case the final mark must be equal or higher than 5 to pass the course.

PERFORMANCE CRITERIA:
Objective 1
Students must demonstrate to have a fundamental knowledge of the subject. [A,C,D,J]

Objective 2
Students must demonstrate the ability to recognize and analyze the essential points of any problem related to the subject [A,C,D,J]

Objective 3
Students should be able to solve specific problems related to the field of physics and particularly electromagnetism [A,C,D,J]

TEXTBOOKS:
Notes on Physics, Departament Electrònica, Enginyeria La Salle, 2004
Problems of Physics, Departament Electrònica, Enginyeria La Salle, 2004
Collected and solved problems from examns, Departament Electrònica, computer notes, Enginyeria La Salle, 2004

OTHER REQUIRED MATERIAL:
Tipler Mosca, Física para la ciencia y la tecnología, Reverté, 2005.
Alonso Finn, Física, Addison Wesley iberoamericana, 1995.
Sears, Zemansky, Young, Freedman, Física universitaria, Addison Wesley Longman, 1998.
Feynman, Leighton, Sands, Lecturas de física, Fondo educativo internacional, 1976.
Gettys, Keller, Skove, Física clásica moderna, McGraw-Hill, 1991.

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REMARKS:
In the actual Spanish educational system the duration of courses can be one or two semesters. This fact was fixed for each curriculum when it was approved by the Spanish government and published in the Official Bulletin of the State (BOE). To continue to have the Spanish recognition it is necessary to maintain the structure approved by the Ministry.
Nevertheless, all our degrees have a structure that allows us to have global evaluations of the knowledge acquired by the student at the end of each semester. So, for those foreign students that spend only one semester in our university, under Erasmus or other international programs in which Ramon Llull University is involved, these evaluations will serve the student to achieve the credits allocated during such a semester.