UCLouvain

lbir1122

2017

General Physics 2

7 credits	45.0 h + 40.0 h	Q2

Teacher(s)	Bertrand Bruno ;Lambot Sébastien ;Poncelet Adrien ;
Language :	French
Place of the course	Louvain-la-Neuve
Main themes	This course aims to introduce the basic concepts of physics for use in the field of bioengineering at large. In particular, the following topics are covered: I. Mechanics : Strength of materials and fluid mechanics II. Thermodynamics : Elements of thermodynamics and kinetic theory of gases, states and state changes of matter. III. Electricity and electromagnetics : Electrostatics, direct current, magnetostatic, electromagnetism.
Aims	After the course, students will be able to: 1 • Understand the basic laws of electricity and magnetism (B.1.1). • Manipulate basic mathematical tools of general physics (dimensional analysis, vectors, differential and integral calculation) (B.1.4). • Model physical systems following a rigorous reasoning, formalized through mathematical equations (B.1.5). • Quantitatively observe physical phenomena using measurement instruments. • Translate a problem of physics into mathematical equations and vice versa. • Identify relevant and irrelevant data for solving a simple problem of physics. • Transpose theoretical concepts of physics to practical problems related to the field of bioengineering. - - - - *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Evaluation methods	The exam is only written and covers all the material covered in the courses and exercise sessions. In addition, a practical work has to be individually prepared by the students and submitted by the exam session. This practical work represents 10% of the final evaluation score.
Teaching methods	All of the course material is exposed during the theoretical courses via slides and notes on the blackboard. The basic concepts are illustrated through concrete applications of bioengineering via direct illustrations and multimedia. The exercise sessions play a key role for the understanding of the theoretical courses and constitute a learning to the solving of concrete problems in context of bioengineering. Special attention is given to the illustrations and applications with reference to this field (e.g., tractors and agricultural machinery, biophysics, geophysics, etc.). These exercises will allow in this respect the contextualization of most of the theoretical concepts based on concrete problems to which the bioengineer will face throughout his training and his professional life. Organization of tutorials: The exercises are compulsory. The preparation of these sessions is required. During the exercise sessions, the teacher assistant presents problems of physics to the students and explains how to solve them. The students are interactively invited to contribute to the solution orally or on the blackboard. Sessions are organized at fixed dates and times. Study Tips: The golden rule is of course a continuous work. It is important that the student makes himself regularly exercises without simply read solved exercises.
Content	Mechanics: strength of materials, fluid mechanics, hydrostatic, surface tension, capillarity, hydrodynamics, laminar and turbulent flow, viscosity, applications (aircraft wings, dams, silos, lifts, etc.). Thermodynamics: heat and temperature, gas laws, kinetic theory, transitions between states, applications (thermal expansion of a structure, temperature of the planets and the sun, greenhouse effect, refrigerators and heat pumps). Electricity and Electromagnetism: electrostatics, Coulomb's law, electric field and potential, Gauss' theorem, capacitance and capacitors, polarization of materials, dielectric permittivity, continuous currents, electric power, Joule's law, Ohm's law, resistance and resistivity, calculation of currents and resistances (Kirchhoff), measurement instruments, internal resistance of devices and electric sources, magnetostatic, magnetic interaction, Ampere's theorem, Maxwell's equations, electromagnetic wave propagation, Biot and Savart law, calculation of magnetic fields and magnetic forces, applications (electric motor, dielectric sensors, geophysical tools: electrical tomography, electromagnetic induction, ground penetration radar, etc.).

Bibliography	L'ouvrage de base suivi dans le cours est le livre de Physique de Harris Benson, édition De Boeck Université. Ce livre sera également utilisé pour le programme de physique de la deuxième année du baccalauréat. Les diapositives du cours et notes complémentaires sur certaines parties, des exercices complémentaires et un manuel de laboratoire seront mis à la disposition des étudiants. L'utilisation d'une calculatrice scientifique est requise pour tous les travaux pratiques et les séances d'exercices, ainsi que pour l'examen.
Faculty or entity in charge	AGRO

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Bachelor in Bioengineering	BIR1BA	7		🔍