UCLouvain

lbir1122

2024

Thermodynamics and Electromagnetism

6.00 credits	30.0 h + 30.0 h	Q2

Teacher(s)	Lambot Sébastien ;
Language :	French
Place of the course	Louvain-la-Neuve
Main themes	
Learning outcomes	
Evaluation methods	The examination is entirely written and covers all the material taught in lectures and exercise sessions. The examination consists of two parts: multiple-choice questions primarily covering theory but also including small exercises (50% of the exam), and three problem-solving exercises, one on thermodynamics, one on electricity, and one on magnetism (50% of the exam).
Teaching methods	The entire course material is presented during the theoretical lectures using slides and chalkboard notes. Fundamental concepts are illustrated through general practical applications and examples from bioengineering using multimedia presentations. It is crucial for students to actively participate in the lectures to prepare for the exams. The exercise sessions play a vital role in understanding the theoretical content and serve as a practical problem-solving learning experience contextualized within the field of bioengineering. Special attention is given to illustrations and applications related to this domain (e.g., tractors and agricultural machinery, biophysics, geophysics, etc.). The exercises will provide context for most theoretical concepts by addressing real-world problems that bioengineers may encounter throughout their education and professional careers. Organization of Exercise Sessions: Attendance in exercise sessions is mandatory, and students are expected to prepare in advance (having a solid grasp of the theory). During these sessions, exercises will be provided, and students will attempt to solve them independently. Subsequently, the assistant will present the solutions to each exercise and address any questions from the students. It is important for students to regularly practice solving exercises entirely on their own to prepare for the exams.
Content	Thermodynamics: temperature, ideal gas law, thermal expansion, the first law of thermodynamics, specific heat and latent heat, work in thermodynamics, specific heats at constant volume and constant pressure, heat transfer (convection, conduction, radiation), kinetic theory, Van der Waals equation, the second law of thermodynamics, thermal engines, refrigerators, and heat pumps, the Carnot cycle, the gasoline engine, entropy. Electricity: Coulomb's law, electric field, dipoles, Gauss's theorem, electric potential, capacitors and dielectrics, electric current, resistance, direct current circuits, Kirchhoff's law. Magnetism: magnetic field, Lorentz force, electric motor, cyclotron, Biot-Savart law, Ampère's theorem, electromagnetic induction, generators, inductance, alternating current circuits, RLC circuits, applications in geophysics (electrical tomography, electromagnetic induction, ground-penetrating radar).
Inline resources	The course slides, exercise materials from the exercise sessions, and other relevant information are available on Moodle.
Bibliography	Vesrion française: Les ouvrages de base suivis dans le cours sont les livres de Physique de Harris Benson, édition De Boeck (1: Mécanique et 2: Electricité & magnétisme). Ces livres sont également utilisés dans les autres cours de physique du programme d'étude. Les diapositives du cours ainsi que des exercices et résolutions complémentaires sont mis à la disposition des étudiants via Moodle. Le syllabus des diapositives du cours est disponible en version imprimée à la DUC. L'utilisation d'une calculatrice scientifique est requise pour les séances d'exercices et l'examen. English version: The core textbooks used in the course are the Physics books by Harris Benson, De Boeck edition (1: Mechanics and 2: Electricity & Magnetism). These books are also used in other physics courses within the study program. Course slides, additional exercises, and solutions are made available to students through Moodle. A printed syllabus of the course slides is available at the DUC. The use of a scientific calculator is required for exercise sessions and the exam.
Faculty or entity in charge	AGRO

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Bachelor in Bioengineering	BIR1BA	6		🔍