Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

COURSE DESCRIPTION – ACADEMIC YEAR 2023/2024

Course title	Physics II
Course code	42404
Scientific sector	FIS/01
Degree	L8 – Bachelor in Electronics and Cyber-Physical Systems Engineering
Semester	II
Year	I
Academic year	2023/24
Credits	9
Modular	No

Total lecturing hours	54
Total exercise hours	36
Attendance	Recommended
Prerequisites	Physics I, Mathematical Analysis I, and Geometry
Lecturer	Professor Franco Cacialli Office: Building K, Room 2.04 e-mail: franco.cacialli@unibz.it tel. 0471 017119 https://www.unibz.it/en/faculties/engineering/academic-staff/person/47601-franco-cacialli
Lecturing assistant	Manuela Ciocca
Contact LA	manuela.ciocca@unibz.it

Office hours LA	
Specific educational objectives	The student should understand the basic principles of electrostatics, electrodynamics, magnetism, optics, and elementary quantum mechanics as well as be able to apply them.

Learning outcomes	1. Knowledge and understanding Knowledge and basic understanding of physical laws: 1. Fundamentals of atomic structures 2. Electrostatics 3. Electrodynamics 4. Magnetism 5. Optics 6. Fundamentals of quantum mechanics 2. Applying knowledge and understanding Students are expected to develop the ability to explain physical phenomena, systems and components based on the concepts learned in the course

	3. Making judgements Students are expected to develop the ability to give explanations of physical phenomena, systems or devices basing their explanation on the concepts learned in the course. 4. Communication skills Maturing of technical-scientific terminology. 5. Ability to learn Development of an analytic attitude leading the student to decompose a problem in sub-tasks which can be solved with the knowledge already acquired, and the ability to acquire knowledge beyond this course.
List of topics covered	1. Fundamentals of atomic structure, orbitals. 2. Electrostatics: Charge, Coulomb, electric field, electric potential, capacity, dielectrics, permittivity 3. Electrical current: Ohm's law; resistance; Joule's effect; power; direct/alternating current; electrical circuits; Kirchhoff's laws. 4. Magnetostatics: magnetostatic field; magnetic induction; Lorentz's forces; Ampère's laws; magnetic dipoles; magnetic energy. 5. Magnetodynamics (Faraday-Lenz; self-induction Inductance, Electromagnetic Oscillations, and AC Circuits - Parallel-series connection, RLC circuits. Spin and magnetic orbital momentum in atoms. 6. Electrodynamics: Maxwell's equations and e.m. waves 7. Optics: Light and its properties (reflection, refraction, diffraction and interference 8. Failure of classical mechanics I: Photoelectric, and Compton effect effects and early Q.M. Photon (E, momentum). Wave nature of matter, Bohr atom, De Broglie hypothesis, early models of the atom. 9. Quantum Mechanics: wavefunction, Heisenberg Uncertainty Principle, 1D Schroedinger equation (particle in a box and tunnelling). Quantization of the angular momentum. Quantum mechanics of the atom. Pauli Exclusion Principle. Bloch Theorem. Model of Kronig and Penney.

Assessment	**Formative assessment** **Form** / **Details** / **ILOs assessed** In-class exercises / Continuously as part of the course problem classes / 1-5

Summative assessment

Form	Details	ILOs assessed
Written	Closed-book exam	1-5
Oral	Questions on theory, problems solution	1-5

Assesment Language	English
Evaluation criteria and criteria for awarding marks	The exam includes a written and an oral component. The written exam consists of two parts: a first part (problem 1) with a series of (mostly) qualitative questions based on the understanding of the topics covered in the lectures, as well as a second part (problems 2-5) consisting of several numerical or symbolic problems to be solved related to the various topics covered in the lectures. Grading will be based upon: - The correctness of the approach and the mathematical steps of the solution, the calculation of numerical results and the correct use of physical quantities and units. - The correctness of the provided answers and of the presented, as well as the terminology used. To pass the exam the final grade must be greater or equal to 18. If the final score is greater than 30, a "with honors" grade is awarded. The student can have access to the exam with pen, pencil and a portable calculator. A short list of constants is provided to the students along with the text of the exam. Students should also be able provide proof of identity (e.g. Campus card, ID card, passport) before the start of the exam. The oral exam will include questions on the programme covered in the lectures (including those of the written part of the exam), and may lead to an increase or a reduction of the grade of the written component. Students should also be able provide proof of identity (e.g. Campus card, ID card, passport) before the start of the exam.

Required readings	Blackboard / Lecture notes / Selected readings from Physics for Scientists and Engineers with Modern Physics, Douglas C. Giancoli, Pearson, 4th edition, 2008. Also available in electronic format (pdf) from UNIBZ library.

Supplementary readings	Physics for Scientists and Engineers with Modern Physics, Douglas C. Giancoli, Pearson, 4th edition, 2008. Other languages: 1. Physik, Douglas C. Giancoli, Pearson Studium, Pearson Deutschland GmbH, 3rd edition, 2010 (based on 3rd edition "Physics for scientists and engineers with modern physics", 2000). 2. Fisica. Con fisica moderna, Douglas C. Giancoli, terza edizione, 2017 (based on 7th edition "Physics. Principles with applications", 2014).