Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	Physics II
Course code	42404
Scientific sector	
Degree	L8 – Bachelor in Electronics and Cyber-Physical Systems Engineering
Semester	II
Year	I
Academic year	2022/23
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/it/faculties/sciencetechnology/academic-staff/person/47601-franco-cacialli

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, Periodic table of the elements. 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 9. Quantum Mechanics: wavefunction, Heisenberg Uncertainty Principle, 1D Schroedinger equation (particle in a box and tunnelling). Quantization of the angular momentum. 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

<table>
<tr><td></td><td>Summative assessment

<table>
<tr><th>Form</th><th>Details</th><th>ILOs assessed</th></tr>
<tr><td>Written</td><td>Closed-book exam</td><td>1-5</td></tr>
<tr><td>Oral</td><td>Questions on theory, problems solution</td><td>1-5</td></tr>
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<tr><td>Assesment Language</td><td>English</td></tr>
<tr><td>Evaluation criteria and criteria for awarding marks</td><td>The written exam consists of two parts: A first part (problem 1) with a series of general questions, as well as a second part (problems 2-5) consisting of numerical and symbolic problems on the various topics covered.

The following aspects will be considered:

• the correctness of the approach and the mathematical steps of the solution, the calculation of numerical results and the correct use of physical quantities.
• the correctness of the answers and the arguments presented to justify assumptions and calculations, as well as the terminology used.

The oral exam will consist of questions on theory and on application (numerical or symbolic) of the theoretical concepts to physical systems.</td></tr>
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Required readings	Blackboard / Lecture notes / Selected readings from Physics for Scientists and Engineers with Modern Physics, Douglas C. Giancoli, Pearson, 4th edition, 2008.
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).