SYLLABUS

1. Data about the program of study

1.1 Institution	Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Electronics, Telecommunications, and information Technology
1.3 Department	*Applied Electronics*
1.4 Field of study	Electronic Engineering, Telecommunications, and Information Technologies
1.5 Cycle of study	Bachelor of Science
1.6 Program of study / Qualification	Applied Electronics / Engineer
1.7 Form of education	Full time
1.8 Subject code	3

2. Data about the subject

2.1 Subject name	Physics I						
2.2 Subject area	Theoretical area Methodological area Analytic area						
2.3 Course responsible	Prof. Ioan Ardelean, PhD, ioan.ardelean@phys.utcluj.ro						
2.4 Teacher in charge with seminar / laboratory / project	Prof. Ioan Ardelean, PhD, ioan.ardelean@phys.utcluj.ro Teaching assist. Mihai Rusu, PhD, mihai.rusu@phys.utcluj.ro						
2.5 Year of study	I	2.6 Semester	1	2.7 Assessment	Exam	2.8 Subject category	DID/DOB

3. Estimated total time

3.1 Number of hours per week	14	of which: 3.2 course	2	3.3 seminar / laboratory	2
3.4 To Total hours in the curriculum	56	of which: 3.5 course	28	3.6 seminar / laboratory	28

Distribution of time	hours
Manual, lecture material and notes, bibliography	25
Supplementary study in the library, online specialized platforms and in the field	5
Preparation for seminars / laboratories, homework, reports, portfolios and essays	11
Tutoring	
Exams and tests	3
Other activities:	0

3.7 Total hours of individual study	44
3.8 Total hours per semester	100
3.9 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1 curriculum	Basic background in Physics from High school
4.2 competence	Basic knowledge of Math from High school

5. Requirements (where appropriate)

5.1. for the course	Amphitheatre, Cluj-Napoca

5.2. for the seminars / laboratories / projects	The presence at the seminaries is compulsory.

6. Specific competences

Professional competences	Theoretical	- Basic elements of general physics from high school in the following areas: Mechanics, Thermodynamics and Heat, Electricity and Magnetism, Optics, Atomic and Nuclear Physics. - Specific theoretical knowledge related to fundamental concepts: force, Energy, Conservation laws. - Elementary knowledge in Math: Linear Algebra, Differential an Integral calculus, function representation and analysis.
	Acquired skills (what the student is able to	After completing the discipline, the students will be able to: - Manipulate fundamental concepts in Physics: force, elements of mechanical movement, energy, momentum, conservation laws, periodic motion and periodic phenomena, resonance. - Extrapolate the basic concepts of mechanics for electric phenomena in electronic circuits: transitory regime, oscillating circuits, damped and forced oscillators and specific elements (quality factor, relaxation time, resonance, logarithmic decrement of damping,etc). - Extrapolate the knowledge of Physics, Math, technics of measuring, data analysis in applied electronics area. - Solve problems based on a general algorithm with the following steps: Analyze the formulation and identify the relevant concepts, Set-up the problem (given the concepts identify the known and target quantities and write down the relevant equations, drive the relevanct sketch), Execute the solution, Evaluate and discuss the answer.
Cross competences		

7. Discipline objectives (as results from the key competences gained)

7.1 General objective	Developing the competences and knowledge related to Elementary Physics useful for Electronics and Applied Electronics.
7.2 Specific objectives	1. Understanding and application of basic concepts in Physics, combined with Math. 2. Developing skills necessary for solving simple and complex problems of Physics. Developing skills for the analysis of fundamental phenomena in nature and technics which are transposed as problems in the Engineering domain.

8. Contents

8.1 Lecture (syllabus)	Teaching methods	Notes
1. Introduction. Kinematic and dynamic physical quantities	Presentation, heuristic conversation, exemplification, problem presentation, teaching exercise, case study, formative evaluation, learning by discovery	Mainly use the blackboard, the projector used only for presentation of some movies with recorded experiments of physics.
2. Principles of Newtonian mechanics. Mechanical work. Power. Kinetic and potential energy.		
3. Circular motion. Torque. Angular momentum. Conservation of angular momentum.		
4. Systems of material points. Elements of the kinematics and dynamics of a rigid solid. Inertia. Equilibrium conditions. Rotational energy of a rigid solid.		
5. Periodic motion. Simple Harmonic Motion. Damped Oscillations		
6. Forced Oscillations and Resonance. Applications to electronic circuits		
7. Overlaped oscillations. Parrallel oscilations of the same frequency but different amplitude. Parrallel oscilations of the same amplitude but different phase.		
8. Elastic waves. Equation of an harmonic plane wave. The energy of a harmonic plane wave. Wave intensity. Velocities of waves propagating through gases, liquids and solids.		
9. Wave interference. Doppler effect. Standing waves. Phase and group velocity. Diffraction of waves.		
10. The principle of Fermat. Reflexion and refraction of waves. Optical fiber.		
11. Sound waves. Sound pressuse. Sound intensity. Sound intensity level. The energy flux.		
12. Sound attenuation. Absorbtion of sound. Geometrical attenuation of sound. Reverberation of sound.		
13. Elements of ultra-acoustics. Ultrasound generation. Applications of ultrasounds.		
14. Heat transport phenomena. Thermal conduction. Thermal convection. Thermal radiation.		

Bibliography

1. H. D. Young, R. A. Freedman - Sears and Zemansky's University Physics with Modern Physics Technology Update (lb. engleza), Pearson - 2013.
2. D. Halliday, R. Resnik, Physics, John Willey et sons (any edition)
3. http://hyperphysics.phy-astr.gsu.edu
4. I.Ardelean, Fizica pentru ingineri, Ed. U.T. PRES, Cluj-Napoca, 2005
5. I. Ardelean, Fizica-note de curs, 2020 (https://utclujnmr.weebly.com/teaching.html)

8.2 Seminar / laboratory / project	Teaching methods	Notes
1/ Introduction. Vectors	Didactic and experimental proof, didactic exercise, conversation, observation and analysis, individual and team work	Use of white/magnetic board, computers and computer programs for data analysis.
2/ 1D Kinematics		
3/ 3 D Kinematics		
4/ Force and Potential Energy		
5/ Free falling of bodies. Projectile motion.		
6/ Collisions		
7/ Circular motion. Gravitation		
8/ Single Harmonic Oscillator		

9/ Damped Oscillations. Electrical analogy: RLC oscilator		
10/ Mechanical waves		
11/ Sound Waves		
12/ Sound intensity level and sound attenuation.		
13/ Laboratory test of standing waves		
14/ Recapitulation. Preparation for the final exam.		

Bibliography

1. H. D. Young, R. A. Freedman - Sears and Zemansky's University Physics with Modern Physics Technology Update (lb. engleza), Pearson - 2013.
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9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The discipline content and the acquired skills agree with the expectations of the professional organizations and the employers in the field, where the students carry out the internship stages and/or occupy a job (in the field of *electronics and communications technologies*), and the expectations of the national organization for quality assurance (ARACIS).

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	The level of acquired theoretical knowledge and practical skills, logical coherence, skills of operating with acquired knowledge in individual complex activities.	Fformative evaluation tests (sets of problems solving) -Summative evaluation written exam (theory and problems)	*80%*
10.5 Seminar/ Laboratory	The level of acquired theoretical knowledge and abilities for problems analysis and solving	- Continuous formative evaluation - seminary individual work	*20%*
10.6 Minimum standard of performance			

Minimum knowledge at the quality level:
- Knowledge of the main physical dynamic and kinematic quantities and principles of dynamics;
- Knowledge of the principles of conservation of energy and momentum;
- Basics of periodic phenomena (harmonic oscillations, elastic waves
- Basics of thermal transport phenomena

Minimum skills:
- Application in various situations of the principles of dynamics;
- Application in various situations of the principles of conservation of energy and momentum;
- Graphical and analytical determination of physical quantities describing harmonic oscillations, harmonic waves;

Quantitative level:
- Correct answers to at least 3 questions in the test and obtaining 2 marks for the seminar activity (Grade 5).

Date of filling in:	Responsible	Title Surname NAME	Signature
20.06.2024	Course	Prof. dr. Ioan Ardelean	
	Applications	Prof. dr. Ioan Ardelean	
		Asist. dr. Mihai Rusu	

Date of approval in the Council of Department AE 26.06.2024	Head of Department of Applied Electronics Prof. Dorin PETRUȘ, Ph.D.
Date of approval in the Council of Faculty ETTI 11.07.2024	Dean Prof. Ovidiu POP, Ph.D.