SYLLABUS

1. Data about the program of study

1.1 Institution	The Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Automation and Computer Science
1.3 Department	Computer Science
1.4 Field of study	Computer Science and Information Technology
1.5 Cycle of study	Bachelor of Science
1.6 Program of study / Qualification	Computer science / Engineer
1.7 Form of education	Full time
1.8 Subject code	6.

2. Data about the subject

2.1 Subject name				***Physics***	
2.2 Course responsible/lecturer				Prof. dr. fiz. Fechete Radu - Radu.FECHETE@phys.utcluj.ro	
2.3 Teachers in charge of seminars / laboratory / project				Lect. dr. Corpodean Dumitrița - Dumitrita.MOLDOVAN@phys.utcluj.ro	
2.4 Year of study	I	2.5 Semester	1	2.6 Type of assessment (E - exam, C - colloquium, V - verification)	C
2.7 Subject category	*DF – fundamentală, DD – în domeniu, DS – de specialitate, DC – complementară*				DF
	DI – Impusă, DOp – opțională, DFac – facultativă				DI

3. Estimated total time

3.1 Number of hours per week	3	of which:	Course	2	Seminars	-	Laboratory	1	Project	-
3.2 Number of hours per semester	42	of which:	Course	28	Seminars	-	Laboratory	14	Project	-
3.3 Individual study:										
(a) Manual, lecture material and notes, bibliography										16
(b) Supplementary study in the library, online and in the field										10
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										14
(d) Tutoring										10
(e) Exams and tests										3
(f) Other activities:										5
3.4 Total hours of individual study (suma (3.3(a)…3.3(f)))										58
3.5 Total hours per semester (3.2+3.4)										100
3.6 Number of credit points										4

4. Pre-requisites (where appropriate)

4.1 Curriculum	Good knowledge in high school physics Good knowledge in high school mathematics
4.2 Competence	Some knowledge in operating computers (Word, Power Point, Excel, HTML, JavaScript).

5. Requirements (where appropriate)

5.1. For the course	N/A
5.2. For the applications	N/A

6. Specific competence

6.1 Professional competences	The students will be able to: • Manipulate the main physical quantities and measurement unit by using the fundamental physical laws characteristic to the studied phenomena during the solving of the home work problems (the seminar is missing).

	• Use the measurement devices during the laboratory time, like: ammeter, voltmeter, ohmmeter, thermometer, thermocouple, spectroscope, microscope, luxmeter. • Evaluate the measurement errors, the absolute and the relative errors. • To define and apply some basics concepts, physically principles and theory applied to computer science and engineering. • To identify and analyze specific problems and to elaborate strategies to solve them. To be able to identify diverse physical systems, to describe their properties and relations/interactions between the system components.
6.2 Cross competences	The students will be able to: • Draw graphics of the variation of a specific quantity function of various parameters which are measured experimentally. • Plot the graphics using computer scientific software like Origin. • Operate with units with different order of magnitude and with the physical constants Write a paper into a scientifically form using a MS Word template.

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

7.1 General objective	• Introduction of the most important physical quantities that are encountered in automation engineering. • Introduction of the main laws of physics that play a central role in automation engineering applications.
7.2 Specific objectives	• Understanding of the most important laws of classical mechanics • Knowledge of the oscillatory and wave phenomena • Knowledge of the sound characteristics and transfer phenomena • Knowledge of the electrical, magnetically and electromagnetic phenomena. • Knowledge of the quantum mechanical phenomena. • The ability to document alone in a given scientific problem using the books library and the Internet. • The ability to elaborate and to present a report on a given scientific problem • The ability to represent graphically the physical quantities. • The ability to use commercial computer programs for interpretation of the experimental data. • The ability to solve a given physical problem and to express it in a mathematical form. • The ability to work in a team for solving real physical problems

8. Contents

8.1 Lectures	Hours	Teaching methods	Notes
C1. Introduction in Physics. Fundamental and derivate physical quantities and their measurement units. Basics of kinematics:	2	Didactic discourse, exposure and explanation of curricular subjects, narrative-story related to the physics history and association with real life facts. Didactic conversation (heuristics and catechetic) in which the students are involved.	
C2. Elements of motion (reference system, trajectory, space). Velocity. Linear motions with constant velocity. Acceleration. Linear motion with constant acceleration. Kinematics: Curvilinear motions (trajectory, velocity and acceleration).	2		
C3. Circular motion (angle, circular velocity, circular acceleration, law of motion with uniform angular velocity, law of motion with uniform angular acceleration). Relations between linear and circular quantities. Specific measurement units.	2		
C4. Dynamics: 1st, 2nd and 3rd principles of dynamics. Inertial mass. Force. Linear momentum. Mechanic work. Power. Energy (kinetic, potential, total).	2		

C5. Momentum of force. Angular momentum. Conservations laws of: linear momentum, kinetically momentum, energy.	2	Demonstration of physical laws in mathematical form and using objects to represents the physical phenomena at reduced scale. Demonstration with actions performed by students which are asked to: extract from problem the significant data, to observe,identify and classifyphysical laws and types of motions.	
C6. Oscillatory motion: Linearly harmonically oscillator. Dumped oscillations. Forced oscillations, resonance.	2		
C7. Waves. Wave function. Differential equation, Characteristic phenomena: reflection, refraction, interference, diffraction. Standing waves.	2		
C8. Acoustics: Definition. Sound sources. Fundamental sound and superior harmonics. Sounds quality. Closed chambers acoustics, sound reverberation, reverberation time.	2		
C9. Electricity. Introduction. Electric charge. Coulombian Force. Electric Field. Electric Field intensity. Electric Flux. Gauss law for the electric field. Electric field work.	2		
C10. Electric current. Definition. Electric current intensity. Density of the electric current. Ohm's law. Electrons in solids. Electrically conductibility. Elements of electric circuit.	2		
C11. Magnetism: Magnetic field. Sources of the magnetic field. Lorentz force.	2		
C12. Magnetic flux. Gauss law for the magnetic field. Element of current. Magnetic force (Laplace force). Biot-Savart law.	2		
C13. Magnetic field produced by a liner conductor. Magnetic field produced by a loop. Ampere's law. Electromagnetic induction. Faraday's law.	2		
C14. Maxwell's equations (differential and integral forms). Electromagnetic waves: Maxwell's equations without sources, velocity, transversally, intensity, and range	2		

Bibliography: In UTC-N library

1. R. Fechete, Fundamental physics for engineers, course notes.
2. E. Culea, S. Nicoara, Fundamentals of Physics, RISOPRINT, Cluj-Napoca 2004
3. R. Fechete, Elemente de Fizica pentru Ingineri, Ed. UTPress, 2008.
4. Simona Nicoara, Codruta Badea, Radu Fechete, Problems and Applications of PHYSICS for Students of Engineering, U.T. PRESS, Cluj - Napoca, ISBN 978-606-737-619-7, pg. 154, (2022).
5. I.Ardelean, Fizica pentru ingineri, Ed. UTPres, 2005.
6. I. Coroiu, E. Culea, Fizica I, Ed. UT. Press, 1999.

Multimedia teaching aids

7. Microsoft Encarta Encyclopedia.
8. Encyclopedia Britannica.

8.2 Applications - Seminars / Laboratory / Project	Hours	Teaching methods	Notes
L1. Work Protection. The study of thermoelectrically effect.	2	Heuristic discovery In laboratory of some physical phenomena. Problematization (problematize) presentations of laws and principles of general physics with situations from real life, and situations from the future work of students.	
L2. Longitudinal and transverse standing waves.	2		
L3. Optical spectroscopy.	2		
L4. The study of photoelectric effect.	2		
L5. The determination of the energy gap of a semiconductor.	2		
L6. The study of Hall Effect.	2		
L7. Polarizations of light.	2		

Bibliography:

1. R. Fechete, R. Chelcea, D. Moldovan, S. Nicoara, I. Coroiu, C. Badea, E. Culea, I. Cosma, N. Serban, Fizica: Indrumator de laborator, UT. PRESS, Cluj-Napoca, ISBN 978-973-662-952-5, (2014).
2. https://phys.utcluj.ro/resurse/Laboratoare/LabOnline/ThermoelectricEffect/
3. https://phys.utcluj.ro/resurse/Laboratoare/LabOnline/StandingWaves/
4. https://phys.utcluj.ro/resurse/Laboratoare/LabOnline/AtomicSpectra/
5. https://phys.utcluj.ro/resurse/Laboratoare/LabOnline/PhotoelectricEffect/
6. https://phys.utcluj.ro/resurse/Laboratoare/LabOnline/HallEffect/
7. https://phys.utcluj.ro/resurse/Laboratoare/LabOnline/EnergyGap/
8. https://phys.utcluj.ro/resurse/Laboratoare/LabOnline/PolarizationOfLight/
9. http://www.phys.utcluj.ro/resurse/Facultati/Calculatoare/2020-2021/AnICalculatoareEng_2020-2021.html

*Se vor preciza, după caz: tematica seminariilor, lucrările de laborator, tematica și etapele proiectului.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

10. Evaluation

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	Theoretical Knowledges accumulated at class, individual study	Written test (9 questions, each one 1 p)	70%
Seminar	-	-	-
Laboratory	Practical knowledges (abilities) accumulated in TUCN Laboratory + Individual study (essays on a general Physics subject or practical)	Essay, Practical Presentation, PPT presentation, written Problems, Numeric simulations of physical processes. On Line Assessment	30%
Project	-	-	-
Minimum standard of performance: 2.75/10 points (2.75 mark + (2.75 student – 1 default = 1.5) total 4.5 rounded to 5) + all laboratories			

Date of filling in:	**Responsible**	**Title, First name Last name**	**Signature**
26.02.2025	Course	Prof.dr.fiz. Radu FECHETE	
	Applications	Lect.dr.eng. fiz. Dumitrita CORPODEAN	

Date of approval in the department	Head of Department, Prof.dr. ing. Rodica Potolea
Date of approval in the Faculty Council	Dean, Prof.dr.ing. Vlad Mureșan