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. Radu Fechete	
2.3 Teachers in charge of seminars/ laboratory/ project				Lect. Dr. Dumitrita Corpodean	
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, www).

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	**C1 –** Operating with basic Mathematical, Engineering and Computer Science concepts **C1.1 -** Recognizing and describing specific concepts to calculability, complexity, programming paradigms and modeling of computing and communication systems **C1.2 -** Using specific theories and tools (algorithms, schemes, models,

	protocols, etc.) for explaining the structure and the functioning of hardware, software and communication systems **C1.3 -** Building models for various components of computing systems **C1.4 -** Formal evaluation of the functional and non-functional characteristics of computing systems **C1.5 -** Providing theoretical background for the characteristics of the designed systems
6.2 Cross competences	N/A

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. 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	Teams
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		Teams
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		Teams
C4. Dynamics: 1^{st}, 2^{nd} and 3^{rd} principles of dynamics. Inertial mass. Force. Linear momentum. Mechanic work. Power. Energy (kinetic, potential, total).	2		Teams
C5. Momentum of force. Angular momentum. Conservations laws of: linear momentum, kinetically momentum, energy.	2		Teams
C6. Oscillatory motion: Linearly harmonically oscillator. Dumped oscillations. Forced oscillations, resonance.	2		Teams
C7. Waves. Wave function. Differential equation, Characteristic phenomena: reflection, refraction, interference, diffraction.	2		Teams

Standing waves.		observe,identify and classifyphysical laws and types of motions.	
C8. Acoustics: Definition. Sound sources. Fundamental sound and superior harmonics. Sounds quality. Closed chambers acoustics, sound reverberation, reverberation time.	2		Teams
C9. Electricity. Introduction. Electric charge. Coulombian Force. Electric Field. Electric Field intensity. Electric Flux. Gauss law for the electric field. Electric field work.	2		Teams
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		Teams
C11. Magnetism: Magnetic field. Sources of the magnetic field. Lorentz force.	2		Teams
C12. Magnetic flux. Gauss law for the magnetic field. Element of current. Magnetic force (Laplace force). Biot-Savart law.	2		Teams
C13. Magnetic field produced by a liner conductor. Magnetic field produced by a loop. Ampere's law. Electromagnetic induction. Faraday's law.	2		Teams
C14. Maxwell's equations (differential and integral forms). Electromagnetic waves: Maxwell's equations without sources, velocity, transversally, intensity, and range	2		Teams

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. I.Ardelean, Fizica pentru ingineri, Ed. UTPres, 2005.
5. I. Coroiu, E. Culea, Fizica I, Ed. UT. Press, 1999.

Multimedia teaching aids

6. Microsoft Encarta Encyclopedia.
7. Encyclopedia Britannica.

8.2 Applications – Seminars/Laboratory/Project	Hours	Teaching methods	Notes
L1. Work Protection. The study of thermoelectrically effect.	1	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.	OnSite/OnLine
L2. Longitudinal and transverse standing waves.	1		OnSite/OnLine
L3. Optical spectroscopy.	1		OnSite/OnLine
L4. The study of photoelectric effect.	1		OnSite/OnLine
L5. The determination of the energy gap of a semiconductor.	1		OnSite/OnLine
L6. The study of Hall Effect.	1		OnSite/OnLine
L7. Polarizations of light.	1		OnSite/OnLine

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

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	Teams' Quiz (16 questions; 5 answers/question)	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:	**Titulari**	**Titlu Prenume NUME**	**Semnătura**
	Course	Prof.dr.fiz. Radu Fechete	
	Applications	Lect. Dr. 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. Liviu Miclea