# SYLLABUS

**1. Data about the program of study**

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| 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**

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| 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**

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|---|---|---|---|---|---|---|---|---|---|---|
| 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 |

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| 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)**

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| 4.1 Curriculum | Good knowledge in high school physics<br>Good knowledge in high school mathematics |
| 4.2 Competence | Some knowledge in operating computers (Word, Power Point, Excel, www). |

**5. Requirements (where appropriate)**

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

**6. Specific competence**

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| 6.1 Professional competences | **C1 –** Operating with basic Mathematical, Engineering and Computer Science concepts<br>**C1.1 -** Recognizing and describing specific concepts to calculability, complexity, programming paradigms and modeling of computing and communication systems<br>**C1.2 -** Using specific theories and tools (algorithms, schemes, models, |

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| | protocols, etc.) for explaining the structure and the functioning of hardware, software and communication systems<br>**C1.3 -** Building models for various components of computing systems<br>**C1.4 -** Formal evaluation of the functional and non-functional characteristics of computing systems<br>**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*)**

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| 7.1 General objective | • Introduction of the most important physical quantities that are encountered in automation engineering.<br>• 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<br>• Knowledge of the oscillatory and wave phenomena<br>• Knowledge of the sound characteristics and transfer phenomena<br>• Knowledge of the electrical, magnetically and electromagnetic phenomena.<br>• Knowledge of the quantum mechanical phenomena.<br>• The ability to document alone in a given scientific problem using the books library and the Internet.<br>• The ability to elaborate and to present a report on a given scientific problem<br>• The ability to represent graphically the physical quantities.<br>• The ability to use commercial computer programs for interpretation of the experimental data.<br>• The ability to solve a given physical problem and to express it in a mathematical form.<br>• 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 |

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| 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**

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**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 | |

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| **Date of approval in the department** | Head of department<br>Prof.dr.ing. Rodica Potolea |
| **Date of approval in the Faculty Council** | Dean<br>Prof.dr.ing. Liviu Miclea |