SYLLABUS

1. Information about the program

1.1 Higher education institution	UNIVERSITY POLITEHNICA OF TIMISOARA
1.2 Faculty[1]/ Department [2]	ELECTRONICS, TELECOMUNICATON AND INFORMATION TECHNOLOGIES/BFI
1.3 Field of study (name/code[3])	ELECTRONIC ENGINEERING, TELECOMUNICATION AND INFORMATION TECHNOLOGIES
1.4 Study cycle	License
1.5 Study program (name/code/qualification)	TST-ENG/20/20/10/100/10/TST-ENG

2. Information about the discipline

2.1 Name of discipline/ formative category[4]			Physics/DF				
2.2 Coordinator (holder) of course activities			Pretorian Simona				
2.3 Coordinator (holder) of applied activities[5]			Pretorian Simona				
2.4 Year of study[6]	1	**2.5** Semester	1	**2.6** Type of evaluation	E	**2.7** Regime of discipline[7]	DI

3. Total estimated time – hours / semester: direct teaching activities (fully assisted or partly assisted) and individual training activities (unassisted) [8]

3.1 Number of fully assisted hours / week	5 of which:	**3.2** course	3	**3.3** seminar / laboratory / project	1/1/0
3.1* Total number of fully assisted hours / semester	70 of which:	**3.2*** course	42	**3.3*** seminar / laboratory / project	14/14/0
3.4 Number of hours partially assisted / week	of which:	**3.5** training		**3.6** hours for diploma project elaboration	
3.4* Total number of hours partially assisted / semester	of which:	**3.5*** training		**3.6*** hours for diploma project elaboration	
3.7 Number of hours of unassisted activities / week	3.93 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			1
		hours of individual study after manual, course support, bibliography and notes			1.5
		training seminars / laboratories, homework and papers, portfolios and essays			1.43
3.7* Number of hours of unassisted activities / semester	55 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			14
		hours of individual study after manual, course support, bibliography and notes			21
		training seminars / laboratories, homework and papers, portfolios and essays			20
3.8 Total hours / week [9]	8.93				
3.8* Total hours /semester	125				
3.9 Number of credits	5				

4. **Prerequisites** (where applicable)

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[1] The name of the faculty which manages the educational curriculum to which the discipline belongs
[2] The name of the department entrusted with the discipline, and to which the course coordinator/holder belongs.
[3] The code provided in HG - on the approval of the Nomenclature of fields and specializations / study programs, annually updated.
[4] Discipline falls under the educational curriculum in one of the following formative disciplines: Basic Discipline (DF), Domain Discipline (DD), Specialist Discipline (DS) or Complementary Discipline (DC).
[5] Application activities refer to: seminar (S) / laboratory (L) / project (P) / practice/training (Pr).
[6] Year of studies in which the discipline is provided in the curriculum.
[7] Discipline may have one of the following regimes: imposed discipline (DI) or compulsory discipline (DOb)-for the other fundamental fields of studies offered by UPT, optional discipline (DO) or optional discipline (Df).
[8] The number of hours in the headings 3.1 *, 3.2 *, ..., 3.8 * is obtained by multiplying by 14 (weeks) the number of hours in headings 3.1, 3.2, ..., 3.8. The information in sections 3.1, 3.4 and 3.7 is the verification keys used by ARACIS as: (3.1) + (3.4) ≥ 28 hours / wk. and (3.8) ≤ 40 hours / wk.
[9] The total number of hours / week is obtained by summing up the number of hours in points 3.1, 3.4 and 3.7.

4.1 Curriculum	• Mathematical analysis, Algebra and geometry (may be taken concurrently)
4.2 Competencies	• Algebraic, vectorial, integral and differential calculus, basic high school physics

5. Conditions (where applicable)

5.1 of the course	• large classroom, laptop, projector, internet access, blackboard/whiteboard, ONLINE: computer with camera and microphone, internet, platform for materials and communication, platform for meeting, storage space for records, cohort of students enrolled on platforms, graphics tablet
5.2 to conduct practical activities	• lab with specific experimetal stands and devices, computers with specific softwares, blackboard/whiteboard, • in addition for ONLINE storage space for recordings, images, collaborative work platform, meeting platform, cohort of students enrolled on platforms, graphics tablet

6. Specific competencies acquired through this discipline

Specific competencies	• Ability to process and network physical phenomena using fundamental laws of physics in order to understand technical issues, multidisciplinary technological aspects; • Ability of applying the most appropriate mathematical techniques –algoritms for modeling physical phenomena at the formal interface between physics and engineering; solve simple numerical exercises based on physics laws; • Ability to obtain experimental information, organize them, analyze and interpret, draw conclusions
Professional competencies ascribed to the specific competencies	• Use of fundamentals in terms of devices, circuits, systems, instrumentation and electronics technology. • Application of basic methods for signal acquisition and processing. Application of knowledge, concepts and basic methods related to computer system architecture, microprocessors, microcontrolers, programming languages and techniques. • Solving technological problems in fields of applied electornics.
Transversal competencies ascribed to the specific competencies	• Methodical analysis of field-related problems aimed at identifying acknowledged solutions, thus ensuring the accomplishment of professional tasks. • Definition of activity stages and their distribution to subordinates in terms of responsabilities, providing effective exchange of information and interpersonal communication. • Adaptation to new technologies, professional and personal development through continuous training, using printed documentation sources, specialized software and electronic resources in Romanian and at least one foreign language.

7. Objectives of the discipline (based on the grid of specific competencies acquired - pct.6)

7.1 The general objective of the discipline	• Understand and use argued techniques, concepts and fundamental principles of physics to explain, interpret and solve problems-aspects of engineering
7.2 Specific objectives	• Knowledge of the main physical quantities, principles and laws of Physics • Understand and use physical fundamental quantities, principles, theorems and laws • Acquire the notions in the field of physics necessary to understand some disciplines taught later. • Solve simple problems involving knowledge of physics in imposed conditions, using analytical and numerical methods presented in the course and applied to seminar and laboratory activity • Development of practical skills using laboratory equipment by measuring, analyzing and interpreting the results, as well as by using software packages for the analysis and processing of data obtained experimentally

8. Content [10]

[10] It details all the didactic activities foreseen in the curriculum (lectures and seminar themes, the list of laboratory works, the content of the stages of project preparation, the theme of each practice stage). The titles of the laboratory work carried out on the stands shall be accompanied by the notation "(*)".

8.1 Course	Number of hours	Teaching methods [11]
1. INTRODUCTION Models and physical quantities; Unit systems	1	lecture, explanations, examples, demonstrations, simulations, benchmarking, problematization for individual study
2. NEWTONIAN MECHANICS Kinematics of the mass point -position vector, velocity and acceleration; equations and laws of motion; Newton's laws; General theorems of the dynamics of the material point (linear momentum, torque; moment of inertia, angular momentum; mechanical work; kinetic energy; potential energy; power; conservation theorems and laws). Gravitational force, friction force. Rotational movement (quantities specific to translational and rotational movements). Equilibrium conditions, center of mass. The movement of mass point in a field of forces (throw in a constant gravitational field, movement on an orbit - cosmic velocities);	11	
3. OSCILLATIONS AND ELASTIC WAVES Simple Harmonic Motion; Superposition of two simple harmonic oscillations; Damped and Forced Oscillations; Resonance Waves equations (the differential equations of waves and the linearly polarized solution); Energy of elastic wave; Waves-characteristic phenomena (interference, reflection and refraction, total reflection, attenuation, dispersion, polarization; (Doppler effect)); Elements of acoustic	12	
4. THERMODYNAMICS Laws of themodynamics;Thermodynamic processes for ideal gas.	3	
5. ELECTROMAGNETIC FIELD. ELECTROMAGNETIC WAVES Electric charge-Coulomb's law Electric field - characteristic quantities (strength, potential, flux, Gauss's law); Electric current; Ohm's law for the material and for a simple circuit; Magnetic field (electric current source of magnetic field, induction-Biot-Savart law, flux, Gauss's law, Faraday's law); Electromagnetic waves-characteristic phenomena The energy density of the electromagnetic field	9	
6. BASICS OF QUANTUM MECHANICS Thermal radiation, Planck's constant; Photoelectric effect; Compton effect; Wave-particle dualism; Simple quantum systems	3	
7. PHYSICS OF THE SOLID STATE Band theory of solids; Semiconductors; The semiconductor diode; Visible light sources emission based on band theory of solids	3	

Bibliography [12] https://cv.upt.ro/course/view.php?id=3223

V.Dorobanţu, S.Pretorian , *Physics Between Fear and Respect*, Politehnica Publishing House, Timisoara 2009

HyperPhysics site, Georgia State University, http://hyperphysics.phy-astr.gsu.edu/hbase/index.html

Paul Tipler, Gene Mosca, Physics for Scientists and Engineers – Sixth Edition, Ed. W. H. Freeman and Company, 2008

R. P. Feynman, R.B. Leighton, M. Sands, *The Feynman lectures on physics ,* Addison-Wesley 1963,Caltech's Division of Physics, Mathematics and Astronomy and The Feynman Lectures Website online edition 2013

[11] Presentation of the teaching methods will include the use of new technologies (e-mail, personalized web page, electronic resources etc.).

[12] At least one title must belong to the discipline team and at least one title should refer to a reference work for discipline, national and international circulation, existing in the UPT library.

8.2 Applied activities [13]	Number of hours	Teaching methods
Seminar: 1. Scalar and vector physical quantities-examples, symbolic and numerical calculus. Calculus and graphs for motion laws, velocity laws, accelerations, forces; 2.The movement of a mass point under the action of weight; 3. Applications for forces, work, kinetic energy, potential energy, conservation laws; 4. Calculus and problematization for simple harmonic motion and superposition of two simple harmonic oscillations; 5. Planar elastic waves-calculus and interpretation of the main characteristic quantities; Phenomena of waves -characteristic calculus. 6. Thermodynamic transformations; Calculus of electric field and magnetic field for simple cases; 7.Numerical applications, estimations for pioneering results of modern physics	14	Seminar: Examples, discussion, explanations, problematization, homework Lab: Preparatory laboratory report for performing measurements on Campus. Discussions on methods, physical laws involved, individual or team measurements. software packages for the analysis and processing of data obtained experimentally
Lab 1. Errors and graphical representation applied to: The elastic constant for a spring. 2. The simple pendulum oscillations. Determination of gravitational acceleration. 3. Photoelectric effect. 4. Temperature Dependence of Semiconductor Resistance. 5. Current-voltage characteristic of LEDs. Determination of Planck's Constant. 6. ExperimentariumTM - experiments and applications based on fundamental physics laws 7. Results revision and final discussions/ Lab recover: The electron's specific charge	14	
Bibliography [14] https://cv.upt.ro/course/view.php?id=3223 Sears and Zemansky's, *University Physics*, 12th edition, 2008, Pearson Education (Sears, Zemansky and Young, *Fizică* (in Romanian),Editura Didactică şi Pedagogică, Bucureşti, 1983 -in UPT' Library); S. Pretorian, Elemente de fizică în probleme rezolvate şi propuse, Politehnica Publishing House, Timişoara, 2005 - selective translation https://cv.upt.ro/course/view.php?id=3223		

9. Corroboration of the content of the discipline with the expectations of the main representatives of the epistemic community, professional associations and employers in the field afferent to the program

- Knowledge of the main principles, laws and methods of physics develop necessary skills to understand, explain (using also analogies) and interpret problems in electronics and telecommunications engineering and for multidisciplinary technological situations

10. Evaluation

[13] Types of application activities are those specified in footnote 5. If the discipline contains several types of applicative activities then they are sequentially in the lines of the table below. The type of activity will be in a distinct line as: "Seminar:", "Laboratory:", "Project:" and / or "Practice/training".
[14] At least one title must belong to the discipline team.

Type of activity	**10.1** Evaluation criteria [15]	**10.2** Evaluation methods	**10.3** Share of the final grade
10.4 Course	Knowledge of the main principles and laws of physics and ability to process and network physical phenomena using fundamental laws of physics	Face to face Written exam: 2 broader theoretical subjects with numerical aplications and 4 short questions, aiming to state physical laws, with the appropriate formula, indicating units of measure, verifying dimensional relationships and numerical connections	2/3
10.5 Applied activities	**S:** Ability to solve known problems of engineering physics, to address some with finality still open, to argue;	2 tests +bonus for answers and blackboard activity during the seminar	½ of 1/3
	L: Theoretical knowledge of the laws of physics involved in the experiments and the working method; Ability to properly use measuring devices, to organize experimental data, to analyze and interpret	Each laboratory report is marked with a grade, then the average. Bonus for essay on Experimentarium experiments	½ of 1/3
	P[16]**:**		
	Pr:		
10.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified [17])			
• Knowledge of the main principles and laws of physics; • • Seminar: Ability to solve known problems of engineering physics taught in class; • Lab: Ability to properly use measuring devices, to organize experimental data and to calculate errors			

Date of completion	**Course coordinator (signature)**	**Coordinator of applied activities (signature)**
20.06.2023		

Head of Department (signature)	**Date of approval in the Faculty Council** [18]	**Dean (signature)**
	14.09.2023	

[15] Syllabus must contain the procedure for assessing the discipline, specifying the criteria, methods and forms of assessment, as well as specifying the weightings assigned to them in the final grade. The evaluation criteria shall be formulated separately for each activity foreseen in the curriculum (course, seminar, laboratory, project). They will also refer to the forms of verification (homework, papers, etc.)

[16] In the case where the project is not a distinct discipline, this section also specifies how the outcome of the project evaluation makes the admission of the student conditional on the final assessment within the discipline.

[17] It will not explain how the promotion mark is awarded.

[18] The endorsement is preceded by the discussion of the board's view of the study program on the discipline record.