

# SYLLABUS

## 1. Information about the program

1.1 Higher education institution	Politehnica University Timisoara
1.2 Faculty <sup>1</sup> / Department <sup>2</sup>	Chemical Engineering, Biotechnologies and Environmental Protection / BFI
1.3 Field of study (name/code <sup>3</sup> )	Chemical Engineering / 10.30.50
1.4 Study cycle	License
1.5 Study program (name/code/qualification)	Chemical Engineering / 10.30.50.60 /engineer

## 2. Information about the discipline

2.1 Name of discipline/ formative category <sup>4</sup>	Physics / DF						
2.2 Coordinator (holder) of course activities	Lecturer Marius COSTACHE						
2.3 Coordinator (holder) of applied activities <sup>5</sup>	Lecturer Marius COSTACHE						
2.4 Year of study <sup>6</sup>	I	2.5 Semester	2	2.6 Type of evaluation	E	2.7 Regime of discipline <sup>7</sup>	DI

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

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
		training seminars / laboratories, homework and papers, portfolios and essays			1.93
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			14
		training seminars / laboratories, homework and papers, portfolios and essays			27
3.8 Total hours / week <sup>9</sup>	8.93				
3.8* Total hours /semester	125				
3.9 Number of credits	5				

## 4. Prerequisites (where applicable)

4.1 Curriculum	• Mathematical Analysis, Algebra
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<sup>1</sup> The name of the faculty which manages the educational curriculum to which the discipline belongs

<sup>2</sup> The name of the department entrusted with the discipline, and to which the course coordinator/holder belongs.

<sup>3</sup> The code provided in HG - on the approval of the Nomenclature of fields and specializations / study programs, annually updated.

<sup>4</sup> 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).

<sup>5</sup> Application activities refer to: seminar (S) / laboratory (L) / project (P) / practice/training (Pr).

<sup>6</sup> Year of studies in which the discipline is provided in the curriculum.

<sup>7</sup> 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).

<sup>8</sup> 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.

<sup>9</sup> The total number of hours / week is obtained by summing up the number of hours in points 3.1, 3.4 and 3.7.

4.2 Competencies	• High School Physics, vectorial, integral and differential calculation
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### 5. Conditions (where applicable)

5.1 of the course	• Lecture hall with projector, computer, whiteboard
5.2 to conduct practical activities	• Seminar hall, laboratory

### 6. Specific competencies acquired through this discipline

Specific competencies	<ul style="list-style-type: none"> <li>• Identification and definition of physics concepts used in the field of engineering sciences</li> <li>• Description and proper use of physics concepts in the field of engineering sciences</li> <li>• Selection of principles, methods and research procedures in physics, aiming at solving problems specifically for the engineering field</li> <li>• Expression through written and oral communication, using a technical language, of the basic concepts of physics in the field of engineering sciences</li> <li>• Efficient usage of different ways and learning techniques – learning to acquire information from bibliographic and electronic databases</li> <li>• Integration in a work team, respecting moral and ethical values</li> <li>• Accomplishing professional tasks, respecting the deadlines</li> </ul>
Professional competencies ascribed to the specific competencies	<ul style="list-style-type: none"> <li>• - Analyse production processes for improvement;</li> <li>• - Manage chemical testing procedures;</li> <li>• - Test materials;</li> <li>• - Write technical reports</li> <li>• -Performs chemical experiments</li> <li>• -Approve engineering design</li> <li>• -Assess environmental impact</li> </ul>

Transversal competencies ascribed to the specific competencies

- - Conduct quality control;
- - Apply scientific, technological and engineering knowledge;
- - Uses equipment, instruments or technological equipment accurately.

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

7.1 The general objective of the discipline	• Understanding of the concepts of physics and acquirement of the basic principles of physics
7.2 Specific objectives	<ul style="list-style-type: none"> <li>• Development of mathematical skills to solve physics problems</li> <li>• Acquisition of practical skills needed for other disciplines which use the principles and laws of physics</li> <li>• Application of the theoretical and practical knowledge acquired so as to solve problems in the field of the engineering sciences</li> </ul>

### 8. Content<sup>10</sup>

8.1 Course	Number of hours	Teaching methods <sup>11</sup>
1. Introductory concepts 1.1 Measurement units. Dimensional analysis 1.2. Physical meaning of some mathematical concepts	3	Interactive lecturing with the aid of the projector, sustained by

<sup>10</sup> 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 "(\*)".

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

2. Basic concepts of classical mechanics 2.1 Cynematics and dynamics 2.2 The principles of classical mechanics 2.3 Conservation laws in mechanics 2.4 Mechanical oscillations 2.5 Elastic waves. The Sound	12	demonstrations and problem solving
3. Physics of Fluids 3.1 Surface phenomena. Capillary phenomena 3.2 Fluids' statics. Pascal's law. Archimedes' law 3.3 Fluids' dynamics	3	The teaching methods will aim at learning through logical thinking
4. Thermodynamics 4.1 Reversible transformations of ideal gases 4.2 The principles of thermodynamics 4.3 Calorimetry	3	
5. Electricity and Magnetism 5.1 Electric Field 5.2 Electric current. Ohm's laws 5.3 Energy and electric power 5.4 Magnetic field 5.5 The electromagnetic induction	6	
6. Electromagnetic waves 6.1 The characteristics of the electromagnetic waves 6.2 Absorption, interference and polarization of light	3	
7. Geometrical optics 7.1 Reflexion and refraction of light 7.2 Mirrors and lenses 7.3 The optical prism 7.4 Optical devices	6	
8. Basics of Quantum mechanics 8.1 Photoelectric effect 8.2 Thermal radiation	3	
9. Atomic physics 9.1 The structure of the atom. Atomic models. Energy levels 9.2 X-Rays. Applications 9.3 Nuclear reactions. The nuclear reactor	3	
Bibliography <sup>12</sup> Richard P. Feynman, Robert B. Leighton, Matthew Sands, The Feynman lectures on physics , Addison-Wesley 1963; Sears and Zemansky's, University Physics, 12 <sup>th</sup> edition, 2008 Paul A. Tipler, Gene Mosca, Physics – for scientists and engineers, Freeman & Company, New York, 2008 Cristea M., Popov D., Barvinschi F., Damian I., Luminosu I., Zaharie I., Physics – basic concepts (Fizica – elemente fundamentale), Politehnica Publishing House, Timisoara, 2010		
<b>8.2 Applied activities</b> <sup>13</sup>	Number of hours	Teaching methods
Seminar 1. Units of measurement. Vectorial calculation 2. Classical Mechanics 3. Fluid Physics 4. Thermodynamics 5. Electricity and magnetism 6. Optics 7. Quantum effects	14	Problem solving on the whiteboard, using different methods and proposal of themes for individual study
Laboratory 1. Gravity Pendulum. Determination of the gravitational acceleration 2. Density determination with Arhimede's law	14	Experiments carried in

<sup>12</sup> 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.

<sup>13</sup> 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".

3. Calorimetry. Determination of the efficiency of an electric heater 4. <i>ExperimentariumTM</i> – experiments and explanations 5. Ohm's laws. Electrical resistance and electric power. 6. Optical lens. Determination of the focal length of a lens 7. Refraction of light. Determination of the refractive index		the Physics laboratory and at ExperimentariumTM

#### Bibliography <sup>14</sup>

Luminosu I, Pop N, Chiritoiu V, Costache Marius – Physics. Theory, problems and quiz tests (Fizica. Teorie, probleme si teste grila), Politehnica Publishing House, Timisoara, 2017

Pretorian S, Costache Marius, Chiritoiu V, Physics – basic concepts. Applications (Fizică – Elemente fundamentale. Aplicatii), Politehnica Publishing House, Timisoara, 2006

### 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, analysis and application of the basic concepts of physics is necessary for the working processes of several equipment in the field of the engineering sciences
- It has been aimed at the development of operational skills in the field of mathematics while solving application problems and also at the acquisition of practical skills necessary for other sciences which use the principles and laws of physics
- The studied material and the applied problem solving methods have been chosen according to the necessities of the employers and the technical communities

### 10. Evaluation

Type of activity	10.1 Evaluation criteria <sup>15</sup>	10.2 Evaluation methods	10.3 Share of the final grade
10.4 Course	- Knowledge of the basic concepts, of the fundamental units and of the principles of physics - Development of operational skills in the field of mathematics while solving problems	Written exam at the end of the semester	2/3
10.5 Applied activities	<b>S:</b> Ability to apply principles and methods of physics while solving application problems	Continuous evaluation throughout the semester ending in one final degree for the seminar activity	1/6
	<b>L:</b> - Understanding of physical phenomena - Development of working skills while using different devices - Interpretation of experimental results	Continuous evaluation throughout the semester ending in one final degree for the lab activity	1/6
	<b>P</b> <sup>16</sup> :		
	<b>Pr:</b>		
<b>10.6</b> Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified <sup>17</sup> )			
<ul style="list-style-type: none"> <li>• Correct answers at elemental questions and the solving of some applicative part, from which should result the acquisition of a fundamental knowledge of physics</li> <li>• The degrees from the written exam and from the applicative activity throughout the semester must be higher or equal to 5</li> </ul>			

<sup>14</sup> At least one title must belong to the discipline team.

<sup>15</sup> 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.)

<sup>16</sup> 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.

<sup>17</sup> It will not explain how the promotion mark is awarded.

**Date of completion**

**Course coordinator  
(signature)**

Lecturer Marius COSTACHE

**Coordinator of applied activities  
(signature)**

Lecturer Marius COSTACHE

**Head of Department  
(signature)**

Conf.univ. dr. ing. Marian  
GRECONICI

**Date of approval in the Faculty Council <sup>18</sup>**

**Dean  
(signature)**

Ş.L.dr.ing. Mircea Laurenţiu DAN

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<sup>18</sup> The endorsement is preceded by the discussion of the board's view of the study program on the discipline record.