

SYLLABUS

1. Information about the program

1.1 Higher education institution	Politehnica University Timisoara
1.2 Faculty ¹ / Department ²	Chemical Engineering, Biotechnologies and Environmental Protection / CAICAM
1.3 Field of study (name/code ³)	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 ⁴	Chemistry I / DF						
2.2 Coordinator (holder) of course activities	Associate Professor Eng. Raluca Vodă						
2.3 Coordinator (holder) of applied activities ⁵	Associate Professor Eng. Raluca Vodă						
2.4 Year of study ⁶	I	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	2	3.3 seminar / laboratory / project	2/1/0
3.1* Total number of fully assisted hours / semester	70 of which:	3.2* course	28	3.3* seminar / laboratory / project	28/14/0
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			0.9
		hours of individual study after manual, course support, bibliography and notes			1.5
		training seminars / laboratories, homework and papers, portfolios and essays			1.5
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			13
		hours of individual study after manual, course support, bibliography and notes			21
		training seminars / laboratories, homework and papers, portfolios and essays			21
3.8 Total hours / week ⁹	8.93				
3.8* Total hours /semester	125				
3.9 Number of credits	5				

4. Prerequisites (where applicable)

4.1 Curriculum	• General chemistry
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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.

4.2 Competencies	•
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5. Conditions (where applicable)

5.1 of the course	<ul style="list-style-type: none"> • Medium-sized room, support materials: laptop, projector, blackboard. • Students will not attend class, seminars/laboratories with their cell phones open.
5.2 to conduct practical activities	<ul style="list-style-type: none"> • Medium-sized seminar room, support materials: laptop, projector, blackboard. • Laboratory with specific equipment, computer, blackboard. •

6. Specific competencies acquired through this discipline

Specific competencies	•
Professional competencies ascribed to the specific competencies	<ul style="list-style-type: none"> • - Analyse production processes for improvement; • - Manage chemical testing procedures; • - Test materials; • - Write technical reports • -Performs chemical experiments • -Approve engineering design • -Assess environmental impact

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	<ul style="list-style-type: none"> • Acquiring the basic notions of inorganic chemistry, training skills and abilities for carrying out experiments in the laboratory of inorganic chemistry, training and developing the scientific thinking of students.
7.2 Specific objectives	<ul style="list-style-type: none"> • Definition of notions, concepts, theories and basic models in the field of chemistry and engineering and their appropriate use in professional communication. The use of basic knowledge in the field of chemistry and chemical engineering to explain and interpret engineering phenomena. Identification and application of concepts, methods and theories for solving typical chemical engineering problems under conditions of qualified assistance. Critical analysis and the use of working principles, methods and techniques for the quantitative and qualitative evaluation of chemical engineering processes.

8. Content¹⁰

8.1 Course	Number of hours	Teaching methods ¹¹
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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 "(*)".

1.1. Acids and bases. Acid-base reactions. Protolitic theory	4	Lecture, PPT presentations, conversations, examples, explanations.
1.2. Reactions with the formation of coordination compounds (complex combinations). Stability of coordination compounds	3	
1.3. Reactions with formation of precipitates. Dissolving electrolytes in water. Slightly soluble electrolytes	2	
1.4. Redox reactions. Relative strength of oxidants and reducers. Redox potentials	3	
2. The electronic structure of atoms. Atomic models. Periodic classification of elements	6	
3. Chemical bonds (interatomic interactions). Chemical bond in the mechanical-wave conception: the valence bond method, the molecular orbital method	5	
4. Stereochemistry of chemical species: establishing the type of hybridization of the central atom and correlation with the geometry of the species	5	
Bibliography ¹² 1. M. Niculescu, Raluca Dumitru (Vodă), Reactions of inorganic substances. Principles and applications, Politehnica Publishing House, Timisoara, 2008. 2. D. F. Shriver, P. W. Atkins, Inorganic Chemistry, Oxford University Press, 5 th or later Edition, 2010.		
8.2 Applied activities ¹³	Number of hours	Teaching methods
Seminar	28	Numerical applications, explanations
1. Types of chemical reactions. Applications	20	
1.1. Reactions with proton transfer (acid-base). Domains of predominance of protoliths		
1.2. Reactions with the formation of coordination compounds. The influence of different factors on complexation equilibria		
1.3. Reactions with formation of precipitates. Solubility equilibria. The influence of different factors on the solubility balance		
1.4. Electron transfer reactions. The factors that determine the variation of the redox potential. Consequences on the development of redox reactions		
2. The electronic shell of atoms. Applications	4	
2.1. The electronic configuration of atoms		
2.2. Classification of elements		
3. Stereochemistry of chemical species. Applications	4	
Laboratory	14	Discussing the theoretical aspects of the laboratory works, conversations, examples, explanations, experimental determinations; interpretation of the results. Work in groups of 2-3 students.
1. Acid-base reactions, types of protoliths Estimation of the pH of aqueous solutions of salts, protonation of weak and very weak bases.	4	
2. Reactions with the formation of coordination compounds Precipitation of slightly soluble halogens and their dissolution by halogenocomplexation; Precipitation of the hydroxides of some metals with NH ₃ and their dissolution by aminocomplexation; Hot decomposition of complex combinations with volatile ligands; Decomposition of complexes by ligand substitution; Decomposition of complexes by substitution of the central ion;	4	

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.

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".

<p>The influence of pH on complexation equilibria.</p> <p>3. Solubility of inorganic substances Precipitation of slightly soluble electrolytes (PbCl₂); The influence of the excess of precipitating ion on the precipitation equilibria, the dissolution by complexation of slightly soluble electrolytes; The influence of pH on solubility balances. BaCO₃ precipitation and solubilization of the precipitate by protonation of the anion; Verification of the amphoteric character of some metal hydroxides.</p> <p>4. Redox reactions. Redox balances The reaction of metals with H₃O⁺ ions (diluted solutions of acids); Reduction of oxygenated anions in an acidic environment. The influence of the concentration of protons, respectively of the temperature, on the development of redox reactions; Reduction of oxygenated anions in a basic environment; The influence of the concentration of protons, of the pH, on the development of redox reactions; The influence of the concentration of the reduced form simultaneously with the influence of the concentration of protons on the redox reactions.</p>	<p>3</p> <p>3</p>	
<p>Bibliography ¹⁴ 1. M. Niculescu, Raluca Dumitru (Vodă), Reactions of inorganic substances. Principles and applications, Politehnica Publishing House, Timisoara, 2008.</p> <p>2. D. F. Shriver, P. W. Atkins, Inorganic Chemistry, Oxford University Press, 5th or later Edition, 2010.</p>		

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

<ul style="list-style-type: none"> The subject content – Chemistry I, is in agreement with similar subjects in the country and abroad as well as with the expectations of professional associations and representative employers in the field.

10. Evaluation

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 basic concepts in the field of inorganic chemistry. The capacity for practical application of the concepts taught in the course.	Written exam 3 hours, 2 theoretical subjects and 6 applications	0.66
10.5 Applied activities	S: Practical applications in the form of problems in order to deepen the theoretical concepts taught	Testing students based on some problems in order to complete the activity along the way.	0.17
	L: The degree of involvement in the performance of the works, the interpretation of the results and the presentation of the reports. Seriousness, punctuality.	Discussions with students, evaluation of laboratory reports. Noting how to solve problems received as homework.	0.17
	P ¹⁶ :		
	Pr:		
<p>10.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified ¹⁷)</p>			
<ul style="list-style-type: none"> Promotion conditions: correct performance of all laboratory work, completion of seminar and laboratory activities with a minimum grade of 5, acquisition of the fundamental notions of inorganic chemistry. The minimum amount of knowledge 			

¹⁴ At least one title must belong to the discipline team.

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.

required is reached if the students obtained at least grade 5 in each of the subjects received in the exam.

Date of completion

**Course coordinator
(signature)**

Associate Professor Eng. Raluca Vodă

**Coordinator of applied activities
(signature)**

Associate Professor Eng. Raluca Vodă

**Head of Department
(signature)**

Conf..dr.ing. Andrea
KELLENBERGER

Date of approval in the Faculty Council ¹⁸

**Dean
(signature)**

Ș.L..dr.ing. Mircea Laurențiu DAN

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