

# SYLLABUS

## 1. Information about the program

1.1 Higher education institution	Politehnica University Timisoara
1.2 Faculty <sup>1</sup> / Department <sup>2</sup>	Chemicals Engineering, Biotechnologies and Environmental Protection / CAICON + CAICAM
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>	Materials Science / DD						
2.2 Coordinator (holder) of course activities	Ș.L.dr.ing. Sorina BORAN / Conf.dr.ing. Radu LAZĂU						
2.3 Coordinator (holder) of applied activities <sup>5</sup>	Ș.L.dr.ing. Sorina BORAN / Conf.dr.ing. Radu LAZĂU						
2.4 Year of study <sup>6</sup>	I	2.5 Semester	1	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	0/2/0
3.1* Total number of fully assisted hours / semester	70 of which:	3.2* course	42	3.3* seminar / laboratory / project	0/28/0
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 <sup>9</sup>	8.93				
3.8* Total hours /semester	125				
3.9 Number of credits	5				

## 4. Prerequisites (where applicable)

4.1 Curriculum	<ul style="list-style-type: none"> <li>General Physics and Chemistry notions</li> </ul>
4.2 Competencies	<ul style="list-style-type: none"> <li></li> </ul>

<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.

## 5. Conditions (where applicable)

5.1 of the course	<ul style="list-style-type: none"> <li>• Medium-sized room equipped with blackboard, computer and video projector</li> </ul>
5.2 to conduct practical activities	<ul style="list-style-type: none"> <li>• Laboratory with specific equipment, blackboard. Students are to wear a lab coat.</li> </ul>

## 6. Specific competencies acquired through this discipline

Specific competencies	<ul style="list-style-type: none"> <li>•</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.

<ul style="list-style-type: none"> <li>•</li> </ul>
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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"> <li>• Sharing basic knowledge regarding the production and properties of oxide, metallic and polymeric materials</li> </ul>
7.2 Specific objectives	<ul style="list-style-type: none"> <li>• Competence formation regarding the ability to choose the right materials according to their destination</li> </ul>

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

8.1 Course	Number of hours	Teaching methods <sup>11</sup>
1. Ceramic materials: definition, classification, raw materials, physical-chemical processes during the firing step, specific properties.	6	Lecture Conversation Problematization Case study
2. Glass and glass products: composition, structure, types of glass, specific properties	3	
3. Inorganic binding materials: cement, lime, plaster and construction materials based on the above-mentioned.	6	
4. Advanced oxide materials. Composite materials.	1,5	
5. Structure and physical and mechanical properties of metals	1,5	
6. Chemical properties of metals, reactivity series	3	

<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.).

7. Metal alloys. Formation conditions and properties. Examples.	3	
8. Obtaining ferrous and non-ferrous metals. Cast iron and steel. Aluminum.	3	
9. Corrosion of metals and alloys.	3	
10. Fundamentals of macromolecular compounds. Classification of polymers.	3	
11. Nomenclature of polymers. Physical states and phase states in polymers. Polymer transition temperatures.	3	
12. Amorphous polymers. Semicrystalline polymers. Natural polymers.	3	
13. The main fields of use of polymers. Elastomers. Plastomeres. Threads and fibers.	3	
14. Properties of macromolecular compounds. Waste recovery	2	

Bibliography <sup>12</sup>

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- G. Akovali, Plastics, rubber and health, Smithers Rapra Technology Ltd., Sawbury, 2007

8.2 Applied activities <sup>13</sup>	Number of hours	Teaching methods
1. Crystalline and vitreous state. Examples of materials, discussion on crystalline networks, visit to the Faculty's mineralogy museum.	2	- Experimental method - Practical work
2. Preparation of raw materials mixtures, melting them and obtaining low temperature glasses (1250°C) colored with transition metal cations.	2	- Modeling methods
3. Characterization of clayey raw materials mixtures for the ceramic industry. Determination of plasticity and drying shrinkage.	2	
4. Determination of water absorption rate during the casting process of ceramic slips. Obtaining ceramic products by casting in different variants.	2	
5. Determination of the mixing water to obtain the normal consistency paste. Determinations of the setting time for the plaster.	2	
6. Obtaining lime by calcining limestone. Lime slaking. Determination of CaCO <sub>3</sub> content for different specific raw materials.	2	

<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".

7. Physical properties of metals.	2	
8. The behavior of metals in acidic and basic environments.	2	
9. Reciprocal reactivity of metals according to the reactivity series.	2	
10. Characterization of thermoplastic and thermosetting polymers	3	
11. Processing methods of thermoplastic polymers: injection, extrusion, thermoforming	4	
12. Thermosetting polymer processing procedures	3	

Bibliography<sup>14</sup>

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12. Ionel Manoviciu, Geza Bandur, Culegere de probleme de Chimia Compusilor Macromoleculari, 1994, Centrul de multiplicare Universitatea “Politehnica” Timisoara
13. Ionel Manoviciu, Virginia Manoviciu, Rozalia Ciopor, Liviu Mirci, Edith Schuster, Indrumator de lucrari practice pentru chimica si tehnologia Compusilor, partea I , 1970, Institutul Politehnic Timisoara
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15. Thierry Hamaide, Michel Bartholin, Exercitii si probleme de chimie macromoleculara, 2005, Editura PIM

**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**

- The content of the discipline is in accordance with the training needs of chemical engineers. The content of the subject is correlated with the syllabus of the corresponding subjects from other faculties in the country and abroad and is periodically discussed with the colleagues who are the holders of the respective subjects.

**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 theoretical notions the discipline operates with. The ability to apply the learned theories in practice	Written exam, available time 2 hours: - Oxide materials – 3 questions with essay-type answers - Metallic materials – 3 questions with essay-type answers - Polymeric materials - The written exam consists of solving 4 subjects. The final grade can be calculated only if the students achieve 3 grades out of 4 higher or equal to 5, for the individual subjects and the arithmetic average of the grades in the 4 subjects is higher or equal to 5.	0,66

<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.)

		OR Online multiple choice test on the UPT Virtual Campus platform.	
<b>10.5 Applied activities</b>	<b>S:</b>		
	<b>L:</b> Ability to work in a team. Timely resolution of the imposed tasks	Oxide and metallic materials - Written test, 10 questions with multiple choice answers, 10 minutes duration. Polymeric materials - Verification of reports that include the interpretation of experimental results, graphic determinations, for each laboratory work performed	0,34
	<b>P<sup>16</sup>:</b>		
	<b>Pr:</b>		
<b>10.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified <sup>17</sup>)</b>			
<ul style="list-style-type: none"> <li>• Grade 5 - Arithmetic average of grades obtained in the three sections: oxide, metallic and polymeric materials.</li> <li>• Carrying out all laboratory work and presenting reports with the obtained results. The grade for the course activity can only be awarded if the student has fully participated in the associated laboratory work and handed in the related reports.</li> </ul>			

**Date of completion**

**Course coordinator  
(signature)**

**Coordinator of applied activities  
(signature)**

Conf. Dr. ing Lazău Radu Ioan/  
Ș.I. Dr. ing. Boran Sorina

Conf. Dr. ing Lazău Radu Ioan/  
Ș.I. Dr. ing. Boran Sorina

**Head of Department  
(signature)**

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

**Dean  
(signature)**

Conf..dr.ing. Andrea  
KELLENBERGER  
Ș.L.dr.ing. Andra TĂMAȘ

Ș.L. dr.ing. Mircea Laurențiu DAN

<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.

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