

# SYLLABUS<sup>1</sup>

## 1. Information about the program

1.1 Higher education institution	Politehnica University Timisoara
1.2 Faculty <sup>2</sup> / Department <sup>3</sup>	Mechanical Engineering
1.3 Chair	—
1.4 Field of study (name/code <sup>4</sup> )	Materials Engineering /40
1.5 Study cycle	Master
1.6 Study program (name/code/qualification)	Advanced Materials and Technologies / 10

## 2. Information about the discipline

2.1 Name of discipline	Amorphous and nanocrystalline materials						
2.2 Coordinator (holder) of course activities	Prof. Dr. Eng. SERBAN Viorel-Aurel						
2.3 Coordinator (holder) of applied activities <sup>5</sup>	Lecturer Dr.Eng. CDREAN Cosmin						
2.4 Year of study <sup>6</sup>	I	2.5 Semester	1	2.6 Type of evaluation	E	2.7 Type of discipline	Mandatory

## 3. Total estimated time (hours / semester of didactic activities)

3.1 No. of hrs. / week	4 , of which:	3.2 course	2	3.3 seminar/laboratory/ project/training	2
3.4 Total no. of hrs. in the education curricula	56 , of which:	3.5 course	28	3.6 applied activities	28
3.7 Distribution of time for individual activities related to the discipline					hrs.
Study using a manual, course materials, bibliography and lecture notes					30
Additional documentation in the library, on specialized electronic platforms and on the field					20
Preparation for seminars / laboratories, homeworks, assignments, portfolios, and essays					12
Tutoring					5
Examinations					3
Other activities					
<b>Total hrs. of individual activities</b>					<b>70</b>
3.8 Total hrs. / semester <sup>7</sup>	126				
3.9 No. of credits	10				

## 4. Prerequisites (where applicable)

4.1 Curriculum	<ul style="list-style-type: none"> <li>Materials Science</li> </ul>
4.2 Competencies	<ul style="list-style-type: none"> <li>The association of knowledge, principles and methods of technical sciences domain with graphics for solving specific tasks</li> </ul>

## 5. Conditions (where applicable)

5.1 of the course	<ul style="list-style-type: none"> <li>Lecture room equipped with whiteboard, projector and projection screen</li> </ul>
5.2 to conduct practical activities	<ul style="list-style-type: none"> <li>Laboratory of developing amorphous and nanocrystalline materials; laboratory for characterization of amorphous and nanocrystalline materials</li> </ul>

## 6. Specific competencies acquired

<sup>1</sup> The form corresponds to the Syllabus promoted by OMECTS 5703/18.12.2011 (Annex3).

<sup>2</sup> The name of the faculty which manages the educational curriculum to which the discipline belongs.

<sup>3</sup> The name of the department entrusted with the discipline, and to which the course coordinator / holder belongs.

<sup>4</sup> Fill in the code provided in GD no. 493/17.07.2013.

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

<sup>6</sup> The year of study to which the discipline is provided in the curriculum.

<sup>7</sup> It is obtained by summing up the number of hrs. from 3.4 and 3.7.

Professional competencies <sup>8</sup>	<ul style="list-style-type: none"> <li>The course develops skills in advanced materials, phase transformations and specific structures.</li> </ul>
Transversal competencies	<ul style="list-style-type: none"> <li></li> </ul>

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

7.1 General objective of the discipline	<ul style="list-style-type: none"> <li>Knowledge acquisition on amorphous and nanocrystalline materials and correlation between atomic arrangement - structure - properties for this class of advanced materials.</li> </ul>
7.2 Specific objectives	<ul style="list-style-type: none"> <li>The course aims also present the methods for processing, characterization of amorphous and nanocrystalline and application areas.</li> </ul>

### 8. Content

8.1 Course	No. of hours	Teaching methods
1. Introduction to amorphous and nanocrystalline materials. Definitions, classification, development	2	The teaching methods used are: lecture, demonstration, presentation slides, open discussion
2. Common vitreous materials: Ceramic and polymeric materials, structure, processing methods, properties and applications	8	
3. Advanced vitreous materials: Advanced technical glass, amorphous alloys, structure, processing methods, properties and applications	10	
4. Nanocrystalline materials: Categories, structure, processing methods, properties and applications	8	

<sup>8</sup> The professional competencies and the transversal competencies will be treated according to the Methodology of OMECTS 5703/18.12.2011. The competencies listed in the National Register of Qualifications in Higher Education [Registrul Național al Calificărilor din Învățământul Superior RNCIS] ([http://www.rncis.ro/portal/page?\\_pageid=117,70218&\\_dad=portal&\\_schema=PORTAL](http://www.rncis.ro/portal/page?_pageid=117,70218&_dad=portal&_schema=PORTAL)) will be used for the field of study from 1.4 and the program of study from 1.6 of this form, involving the discipline.

Bibliography <sup>9</sup> 1. Codrean C., Șerban V.A., Utu D., Amorphous and nanocrystalline alloys, VDM Verlag Dr. Mueller Aktiengesellschaft&Co.KG, 2009. 2. Guozhong Cao, Nanostructures and Nanomaterials. Synthesis, Properties and Applications, Ed. World Scientific, 2004. 3. Richerson, D. W. – Modern ceramic engineering, Marcel Dekker Inc. NY, 2006.		
<b>8.2 Applied activities<sup>10</sup></b>	<b>No. of hours</b>	<b>Teaching methods</b>
1. Structural analysis of amorphous and nanocrystalline materials by modern methods of investigation	6	The teaching methods used are: lecture, demonstration, presentation slides, demonstration experiment, open discussion
2. The structure and the properties of vitreous ceramic materials	4	
3. Testing and selecting methods of advanced vitreous materials	4	
4. Obtaining and characterization of amorphous alloys	8	
5. Obtaining and characterization of nanocrystalline alloys	6	
Bibliography <sup>11</sup> 1. Codrean C., Șerban V.A., Utu D., Amorphous and nanocrystalline alloys, VDM Verlag Dr. Mueller Aktiengesellschaft&Co.KG, 2009. 2. Guozhong Cao, Nanostructures and Nanomaterials. Synthesis, Properties and Applications, Ed. World Scientific, 2004. 3. Richerson, D. W. – Modern ceramic engineering, Marcel Dekker Inc. NY, 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**

- The course provides understanding and using concepts on the development and characterization of amorphous and nanocrystalline materials, so allows the student to assess and solve technical problem regarding processed materials

**10. Evaluation**

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share of the final grade
<b>10.4 Course</b>	Note 5 is granted for 50% knowledge of each subject and grade 10 for 100% knowledge of each subject	Written exam	66%
<b>10.5 Applied activities</b>	<b>S:</b>		
	<b>L:</b> Note 5 is granted for the correct answer to 50% of questions and 10 for the correct answer to all questions	Periodically testing by means of questionnaires	34%
	<b>P:</b>		
	<b>Pr:</b>		
<b>10.6 Minimum performance standard</b> (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is			

<sup>9</sup> At least one title must belong to the department staff teaching the discipline, and at least 3 titles must refer to national and international works relevant for the discipline, and which can be found in the Politehnica University Library.

<sup>10</sup> The types of applied activities are those specified in footnote 5. If the discipline contains several types of applied activities, then these will be written consecutively in the lines of the table below. The type of activity will be written in a distinct line, as „Seminar:”, „Laboratory:”, „Project:” and/or „Practice/Training:”.

<sup>11</sup> At least one title must belong to the staff teaching the discipline.

verified)

- Passing the exam requires a minimum amount of knowledge of 50% of the total volume of knowledge

**Date of completion**

**Course coordinator  
(signature)**

**Coordinator of applied activities  
(signature)**

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**Head of Department  
(signature)**

**Date of approval in the Faculty  
Council<sup>12</sup>**

**Dean  
(signature)**

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<sup>12</sup> Avizarea este precedată de discutarea punctului de vedere al board-ului de care aparține programul de studiu cu privire la fișa disciplinei.