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 / CAICON
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]			Biopolymers and biocomposites / DS				
2.2 Coordinator (holder) of course activities			S.L.dr.ing. Gerlinde RUSU				
2.3 Coordinator (holder) of applied activities[5]			S.L.dr.ing. Gerlinde RUSU				
2.4 Year of study[6]	III	**2.5** Semester	5	**2.6** Type of evaluation	D	**2.7** Regime of discipline[7]	DO

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	3 of which:	**3.2** course	1.5	**3.3** seminar / laboratory / project	0/1.5/0
3.1* Total number of fully assisted hours / semester	42 of which:	**3.2*** course	21	**3.3*** seminar / laboratory / project	0/21/0
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	2.27 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			0.7
		hours of individual study after manual, course support, bibliography and notes			0.87
		training seminars / laboratories, homework and papers, portfolios and essays			0.7
3.7* Number of hours of unassisted activities / semester	33 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			10
		hours of individual study after manual, course support, bibliography and notes			13
		training seminars / laboratories, homework and papers, portfolios and essays			10
3.8 Total hours / week [9]	5.27				
3.8* Total hours /semester	75				
3.9 Number of credits	3				

4. **Prerequisites** (where applicable)

4.1 Curriculum	• Organic Chemistry, Material Science

[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	•

5. Conditions (where applicable)

5.1 of the course	• Appropriately equipped classroom (blackboard, video projector, internet connection)
5.2 to conduct practical activities	• Appropriately equipped laboratory for polymer synthesis and characterisation; The students will have lab coat on and their mobile phones turned off, they will be trained to respect the labor protection and PSI rules; They will elaborate a laboratory report after each laboratory work

6. Specific competencies acquired through this discipline

Specific competencies	• Understanding basic concepts related to polymers synthesis and characterization
Professional competencies ascribed to the specific competencies	• - 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.

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

7.1 The general objective of the discipline	• Ensuring the acquisition of basic knowledge regarding the synthesis and characterization of polymers
7.2 Specific objectives	• The use of basic knowledge in the field of chemistry and chemical engineering in the field of macromolecular compounds

8. Content [10]

8.1 Course	Number of hours	Teaching methods [11]
1. Introduction, Structure of Biopolymers, Biopolymer Synthesis, Copolymers, Methods of Polymerization	3	Interactive lecture
2. Mechanical properties, Hygroscopic effects (swelling, moisture-softening, the dependence of creep rate on moisture content etc.)	3	
3. Manufacturing processes Theory of elasticity and viscoelasticity Mechanical models for linear viscoelastic response Creep, stress relaxation and dynamic mechanical testing	5	
4. Degradation of Polymers: Primary means of Polymer Degradation,	4	

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

Chain Scissions by Hydrolysis and Oxidation, Other means of Degradation (Enzyme catalyzed Degradation) Biodegradable Polymers		
5. Biopolymers in Controlled-Release Delivery Systems: Drug Loading and Release, Temperature- Sensitive Hydrogels, Polymer- Drug Interactions	3	
6. Biocomposite materials Introduction Mechanical properties and applications, Manufacturing and testing, Biodegradation and recycling	3	

Bibliography [12] 1 . M. Rusu, C. Mihailescu, Polimeri si materioale compozite biodegradabile, Editura Gh. Asachi, Iasi, 2002
2. C. Simionescu, V. Gorduza, Polimeri biocompatibili si biologic activi, Editura ACADEMIEI, Bucuresti, 1980
3. H.N. Cheng, R.A. Gross, Green polymer chemistry: biocatalysis and biomaterials, Academic Chemical Society, Washington, 2010
4. G. Akovali, Plastics, rubber and health, SmithersRapra Technology Ltd., Sawbury, 2007
Richard Wool, X. Susan Sun, Bio-Based Polymers and Composites Elsevier Inc. 2005
5. Helena L. Chum, Polymers from biobased materials, NOYES DATA CORPORATION, 1991
6. Leon P.B.M. Janssen and Leszek Moscicki Thermoplastic Starch: A Green Material for Various Industries,2009 Wiley-VCH Verlag GmbH & Co. KGaA

8.2 Applied activities [13]	Number of hours	Teaching methods
Work safety training. Presentation of laboratory works	3	Experimental method Modeling and simulation method Practical works method
Determination of the average molar mass by viscosimetric methods	3	
Starch-based plastics	3	
Crosslinked polyvinyl alcohol	3	
Synthesis of aliphatic polyesters using butyric alcohol and succinic acid	3	
Polymer swelling. Determination of the solubility parameter	3	
Presentation of laboratory reports	3	

Bibliography [14] 1. Sanjib Sau, Subhankar Pandit, Sarathi Kundu, Crosslinked poly (vinyl alcohol): Structural, optical and mechanical properties, Surfaces and Interfaces Volume 25, August 2021, 101198
2. Gerlinde Rusu, Știința Polimerilor naturali și sintetici – Aplicații practice, Editura Politehnica Timișoara, 2018
3. Edward A. Collins, Jan Bares, Fred W. Billmeyer Jr., 1973, Experiments in Polymer Science, Wiley Interscience
4. D. Braun, H. Cherdron, M. Rehahn, H. Ritter, B. Voit, Polymer Synthesis: Theory and Practice, Fundamentals, Methods, Experiments 2005, Fourth Edition, Springer-Verlag
5. Manas Chanda, Salil K. Roy, *Plastic technology Handbook, Fourth edition,* 2007, CRC Press

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 to the formation requirements of chemical engineers

10. Evaluation

[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".
[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 basic theoretical notions covered by the discipline. Ability to apply the theoretical notions learned	Written exam, 1 h evaluations, containing four questions (3 theoretical questions and 1 application question	67%
10.5 Applied activities	**S:**		
	L: Ability to carry a team work; In-time solving of the designed tasks	Written reports for each laboratory work, containing the processed experimental results recorded. 1 numeric application solved	33%
	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])			
• 5 grade at the written test. Performing of all the laboratory works and presentation of the written results.			

Date of completion	**Course coordinator (signature)** Ș.L.dr.ing. Gerlinde RUSU	**Coordinator of applied activities (signature)** Ș.L.dr.ing. Gerlinde RUSU
Head of Department (signature) S.L.dr.ing. Andra TĂMAȘ	**Date of approval in the Faculty Council** [18]	**Dean (signature)** Ș.L.dr.ing. Mircea Laurențiu DAN

[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.