FIŞA DISCIPLINEI

1. Information regarding the programme

1.1 Higher education institution	**Babeş Bolyai University**
1.2 Faculty	**Faculty of Mathematics and Computer Science**
1.3 Department	Mathematics
1.4 Field of study	**Mathematics**
1.5 Study cycle	**Master**
1.6 Study programme /	**Mathematics**

2. Information regarding the discipline

2.1 Name of the discipline		Special topics in modern algebra			
2.2 Course coordinator		Assoc.Prof.PhD. Simion Breaz			
2.3 Seminar coordinator		Assoc.Prof.PhD. Simion Breaz			
2.4 Year of the study	2	2.5 Semester	3	2.6. Type of evaluation	Exam	2.7 Type of discipline	optional

3. Timpul total estimat (ore pe semestru al activităţilor didactice)

3.1 Hours per week	3	Of which: 3.2 course	2	3.3 seminar/laboratory	1
3.4 Total hours in the curriculum	42	Of which: 3.5 course	28	3.6 seminar/laboratory	14

Time allotment:	ore
Learning using manual, course support, bibliography, course notes	42
Additional documentation (in libraries, on electronic platforms, field documentation)	28
Preparation for seminars/labs, homework, papers, portfolios and essays	42
Tutorship	-
Evaluations	29
Other activities: tests	17

3.7 Total individual study hours	158
3.8 Total hours per semester	200
3.9 Number of ECTS credits	8

4. Prerequisites (if necessary)

4.1. curriculum	
4.2. competencies	

5. Conditions (if necessary)

5.1. for the course	
5.2. for the seminar /lab activities	

6. Specific competencies acquired

Professional competencies	• Using notions connected with some generalizations for module categories; • Solving exercises and problems; • Connections between results and notions which are specific to various domains in modern mathematics (algebra, mathematical analysis, topology etc.)
Transversal competencies	• Using math objectis in various situations; • Abilities for individual study; • Abilities to apply mathematical results to other domains.

7. Obiectivele disciplinei (reieşind din grila competenţelor acumulate)

7.1 Obiectivul general al disciplinei	• To present the basic notions and results about categories;
7.2 Obiectivele specifice	The course presents basic notions and results about the theory of categories, functors and natural transformations with direct connections to concrete examples:sets, groups, abelian groups, modules, topology, partial ordered sets.

8. Conţinuturi

8.1 Course	Metode de predare	Observaţii
1. Categories: definition, examples and special homomorphisms.	Exposure: description, explanation, examples, discussion of case studies	
2. Special homomorphisms, subobjects.	Exposure: description, explanation, examples, discussion of case studies	
3. Pullback/Pushout, image.	Exposure: description, explanation, examples, discussion of case studies	
4. Null homomorphisms and objects. Kernels	Exposure: description, explanation, examples, discussion of case studies	
5. Normal categories. Exact categories.	Exposure: description, explanation, examples, discussion of case	

	studies	
6. Product and coproduct	Exposure: description, explanation, examples, discussion of case studies	
7. Limits and colimits	Exposure: description, explanation, examples, discussion of case studies	
8. Additive categories.	Exposure: description, explanation, examples, discussion of case studies	
9. Abelian categories.	Exposure: description, explanation, examples, discussion of case studies	
10. Functors and natural transformations.	Exposure: description, explanation, examples, discussion of case studies	
11. Adjoint functors.	Exposure: description, explanation, examples, discussion of case studies	
12. Echivalences of categories.	Exposure: description, explanation, examples, discussion of case studies	
13. Grothendieck categories.	Exposure: description, explanation, examples, discussion of case studies	
14. Derived functors	Exposure: description, explanation, examples, discussion of case studies	

References
1. S. Mac Lane, Categories for the Working Mathematician. Graduate Texts in Math, No. 5. Second Edition, 1997.
2. B. Mitchell, Theory of Categories. Pure and Applied Math, No. 17. Academic Press, 1965.
3. I. Purdea, Tratat de Algebra Moderna, vol. 2, Editura Academiei, 1982.

8.2 Seminar / laborator	Metode de predare	Observaţii
1. Categories: definition, examples and special homomorphisms.	Exposure: description, explanation, examples, discussion of case studies	
2. Special homomorphisms, subobjects.	Exposure: description, explanation, examples, discussion of case studies	

3. Pullback/Pushout, image.	Exposure: description, explanation, examples, discussion of case studies	
4. Null homomorphisms and objects. Kernels	Exposure: description, explanation, examples, discussion of case studies	
5. Normal categories. Exact categories.	Exposure: description, explanation, examples, discussion of case studies	
6. Product and coproduct	Exposure: description, explanation, examples, discussion of case studies	
7. Limits and colimits	Exposure: description, explanation, examples, discussion of case studies	
8. Additive categories.	Exposure: description, explanation, examples, discussion of case studies	
9. Abelian categories.	Exposure: description, explanation, examples, discussion of case studies	
10. Functors and natural transformations.	Exposure: description, explanation, examples, discussion of case studies	
11. Adjoint functors.	Exposure: description, explanation, examples, discussion of case studies	
12. Echivalences of categories.	Exposure: description, explanation, examples, discussion of case studies	
13. Grothendieck categories.	Exposure: description, explanation, examples, discussion of case studies	
14. Derived functors	Exposure: description, explanation, examples, discussion of case studies	

References
1 S. Mac Lane, Categories for the Working Mathematician. Graduate Texts in Math, No. 5. Second Edition, 1997.
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3. I. Purdea, Tratat de Algebra Moderna, vol. 2, Editura Academiei, 1982.

9. Coroborarea conţinuturilor disciplinei cu aşteptările reprezentanţilor comunităţii epistemice, asociaţiilor profesionale şi angajatori reprezentativi din domeniul aferent programului

The course respects the standards used by many universities; The course exists in the studying program of all major universities in Romania and abroad;

10. Evaluare

Tip activitate	10.1 Criterii de evaluare	10.2 metode de evaluare	10.3 Pondere din nota finală
10.4 Course	Theoretic notions and results (with proofs),	Final exam	30%
	Definitions, statements, examples	Test	30%
10.5 Seminar/laborator	Solving specific exercises and problems	Final exam	40%
10. Minimum performance standards			
At the final exam the grade should be at least 5			

Date   Signature of course coordinator   Signature of seminar coordinator

Date of approval   Signature of the head of department