

FIȘA DISCIPLINEI

1. Information regarding the programme

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

2. Information regarding the discipline

2.1 Name of the discipline	Module Theory						
2.2 Course coordinator	Assoc.Prof.PhD. Simion Breaz						
2.3 Seminar coordinator	Assoc.Prof.PhD. Simion Breaz						
2.4. Year of study	1	2.5 Semester	2	2.6. Type of evaluation	E	2.7 Type of discipline	Compulsory

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

3.1 Hours per week	2	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:					hours
Learning using manual, course support, bibliography, course notes					14
Additional documentation (in libraries, on electronic platforms, field documentation)					14
Preparation for seminars/labs, homework, papers, portfolios and essays					14
Tutorship					
Evaluations					23
Other activities:					0
3.7 Total individual study hours			75		
3.8 Total hours per semester			150		
3.9 Number of ECTS credits			3		

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	<ul style="list-style-type: none"> ◆ Adapting mathematical content with different levels of difficulty in specific situations; ◆ Making connections between results and specific notions of specialized branches of mathematics (algebra, calculus, etc.). ◆ Acquisition of skills about preparing a presentation.
Transversal competencies	<p>Handling various mathematical objects in theoretical or practical situations; Acquiring practical skills related to self-study; Ability to apply specific mathematical results in other areas of theoretical or practical.</p>

7. Objectives of the discipline (outcome of the acquired competencies)

7.1 General objective of the discipline	The students will be able to manage notions, results, and techniques related to Module Theory over non-commutative rings
2 Specific objective of the discipline	<p>The students will:</p> <ul style="list-style-type: none"> ◆ understand notions as direct sum, direct product, tensor product; ◆ construct new objects; ◆ use the injective hull and the projective cover; ◆ use various classes of submodules/supromodules.

8. Content

8.1 Course	Teaching methods	Remarks
1. Basic notions: rings, modules, submodules, homomorphisms	Exposure: description, explanation, examples, discussion of case studies	
2. Direct sum; Direct summand	Exposure: description, explanation, examples, discussion of case studies	
3. Direct product	Exposure: description, explanation, examples, discussion of case studies	
4. Free and projective modules	Exposure: description, explanation, examples, discussion of case studies	
5. Injective modules	Exposure: description, explanation, examples,	

	discussion of case studies	
6. Semi-simple rings and modules	Exposure: description, explanation, examples, discussion of case studies	
7. Finiteness conditions	Exposure: description, explanation, examples, discussion of case studies	
8. Noetherian/artinian modules	Exposure: description, explanation, examples, discussion of case studies	
9. Tensor product.	Exposure: description, explanation, examples, discussion of case studies	
10. Flat modules	Exposure: description, explanation, examples, discussion of case studies	
11. Pure submodules	Exposure: description, explanation, examples, discussion of case studies	
12. Modules over PID	Exposure: description, explanation, examples, discussion of case studies	
13. Rings and modules of fractions	Exposure: description, explanation, examples, discussion of case studies	
14. Nonsingular rings and modules	Exposure: description, explanation, examples, discussion of case studies	

References

1. Anderson, F.W., Fuller, K.R.: **Rings and Categories of Modules, Graduate Texts in Math. Vol. 13, Springer-Verlag, 1992.**
2. Lam, T.Y.: **Lectures On Modules and Rings, Graduate Texts in Math. Vol. 189, Springer-Verlag,**

1999.

3.Lam, T.Y.: A First Course in Noncommutative rings, Graduate Texts in Math. Vol. 131, Springer-Verlag, 1991.

8.2 Seminar / laborator	Metode de predare	Observații
1. Basic notions: rings, modules, submodules, homomorphisms	Exposure: description, explanation, examples, discussion of case studies	
2. Direct sum; Direct summand	Exposure: description, explanation, examples, discussion of case studies	
3. Direct product	Exposure: description, explanation, examples, discussion of case studies	
4. Free and projective modules	Exposure: description, explanation, examples, discussion of case studies	
5. Injective modules	Exposure: description, explanation, examples, discussion of case studies	
6. Semi-simple rings and modules	Exposure: description, explanation, examples, discussion of case studies	
7. Finiteness conditions	Exposure: description, explanation, examples, discussion of case studies	
8. Noetherian/artinian modules	Exposure: description, explanation, examples, discussion of case studies	
9. Tensor product.	Exposure: description, explanation, examples, discussion of case studies	
10. Flat modules	Exposure: description, explanation, examples, discussion of case studies	

11. Pure submodules	Exposure: description, explanation, examples, discussion of case studies	
12. Modules over PID	Exposure: description, explanation, examples, discussion of case studies	
13. Rings and modules of fractions	Exposure: description, explanation, examples, discussion of case studies	
14. Nonsingular rings and modules	Exposure: description, explanation, examples, discussion of case studies	
1. Anderson, F.W., Fuller, K.R.: Rings and Categories of Modules, Graduate Texts in Math. Vol. 13, Springer-Verlag, 1992. 2. Lam, T.Y.: Exercices in Classical Ring Theory, Problem Books in Mathematics, Springer-Verlag, 1995. 3. Lam, T.Y.: Exercices in Modules and Rings, Problem Books in Mathematics, Springer-Verlag, 2007.		

9. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

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

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	Theoretic notions and results (with proofs),	Test+ Final exam	50%
	Definitions, statements, examples	Final exam	25%
10.5 Seminar/laborator	Solving specific exercises and problems	Final exam	25%
10.6 Minimum performance standards			
<ul style="list-style-type: none"> At the final exam the grade should be at least 5 			

Date

Signature of course coordinator

Signature of seminar coordinator

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Date of approval

Signature of the head of department

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