SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	*Babeş-Bolyai University, Cluj-Napoca*
1.2 Faculty	*Physics*
1.3 Department	*Condensed Matter Phyiscs and Advanced Technologies*
1.4 Field of study	*Physics*
1.5 Study cycle	*Master*
1.6 Study programme / Qualification	*Solid State Physics/ Computational Physics*

2. Information regarding the discipline

2.1 Name of the discipline	*Symmetries and structures in solid state physics*						
2.2 Course coordinator	*Lect. Dr. Roxana Dudric*						
2.3 Seminar coordinator	*Lect. Dr. Roxana Dudric*						
2.4. Year of study	*I*	2.5 Semester	*I*	2.6. Type of evaluation	*E*	2.7 Type of discipline	*C*

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

3.1 Hours per week	2	Of which: 3.2 course	1	3.3 seminar/laboratory	1
3.4 Total hours in the curriculum	28	Of which: 3.5 course	14	3.6 seminar/laboratory	14
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					25
Additional documentation (in libraries, on electronic platforms, field documentation)					20
Preparation for seminars/labs, homework, papers, portfolios and essays					20
Tutorship					7
Evaluations					3
Other activities:					-

3.7 Total individual study hours	75
3.8 Total hours per semester	103
3.9 Number of ECTS credits	4

4. Prerequisites (if necessary)

4.1. curriculum	• *Solid State Physics*
4.2. competencies	• *Identification and use of the main laws and principles of physics in a given context*

5. Conditions (if necessary)

5.1. for the course	• *Lectures hall with video projector and blackboard*
5.2. for the seminar /lab activities	• *Seminar hall with blackboard*

6. Specific competencies acquired

Professional competencies	• *The advanced using of the theoretical and experimental concept of the solid state physics.* • *At the end of this course, students should have the conceptual and mathematical tools to read current research papers in solid state physics and to understand the physical process underlying many solid state devices.* • *The development of some algorithms based on advanced models/theories to solve problems.*
Transversal competencies	• *Identification of the advanced continuous formation opportunities and effective exploitation of learning techniques for the own development.* • *Effective use of information sources and communication resources and training assistance, both in Romanian and in a foreign language*

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

7.1 General objective of the discipline	• *The course extends the ideas developed in the introductory course Solid State Physics. It will develop the basic knowledge underlining the relationship between the crystal structure and the physical properties of solids.*
7.2 Specific objective of the discipline	• *Students will learn how to express symmetry and crystal structure.* • *Understanding the crystallography and the related subjects such as structural phase transition and macroscopic physical properties of solids.*

8. Content

Course (1h) and Seminar (1h)	Teaching methods	Remarks
1. Introduction (Outline, Scope of lecture, Crystal binding and crystal structure)	Presentation, debate, lecture	2 hours
2. Defects in Solids		2 hours
3. The Crystal Structure of Solids		2 hours
4. Symmetry Elements in Crystals		2 hours
5. Symmetry Operations in Crystals		2 hours
6. Tensor properties of crystals		2 hours
7. 2D Bravais lattices		2 hours
8. 3D Bravais lattices		2 hours
9. Close-packed structures		2 hours
10. Space groups and International tables		2 hours
11. The Reciprocal Lattice		2 hours
12. Miller indices		2 hours
13. X-Ray Diffraction		2 hours
14. Neutron Crystallography		2 hours

Bibliography

[1] C. Kittel, Introduction to Solid State Physics, 7th ed., Wiley, 1996.
[2] Ashcroft N. W., Mermin N. D., Solid State Physics, Holt-Saunders International Editions Tokyo, 1981.
[3] J. F. Nye, Physical properties of crystals: Their representation by tensors and matrices, Oxford University Press, 1985.
[4] Handouts

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

• *The content of the discipline is in accordance with the subjects who are studied in the same field in romanian and foreign universities and with the specific demands of research institutes, economy and labour market.*

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	*degree of a student's knowledge and understanding of concepts and principles*	- Written evaluation	70
10.5 Seminar	*the ability to work with the gained knowledge: depth and quality of background research, correctness of analysis*	- Active presence in seminars - homeworks	30
10.6 Minimum performance standards			
• To be present at minimum 75% of seminars • Basic knowledge of theory and ability to solve simple problems			

Date
20.03.2023

Signature of course coordinator

Signature of seminar coordinator

Date of approval

23.03.2023

Signature of the head of department

Prof. Dr. Romulus Tetean