Strada Transilvaniei, nr. 6, sector 1, București, ROMÂNIA
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DISCIPLINE SHEET
Academic year 2025-2026

1. About the program

1.1 Higher education institution	University of Bucharest
1.2 Faculty	Faculty of Interdisciplinary Studies
1.3 Department	Interdisciplinary School of Doctoral Studies – ISDS-UB
1.4 Field of study	-
1.5 Study cycle	Doctorate
1.6 Study program / Qualification	***Broad Interdisciplinarity***

2. About the discipline

2.1 Name of the discipline				***Observing and imaging by spectroscopy***			
2.2 Holder of the course				**Prof. Dr. Paul Vasos**			
2.3 Holder of the seminar				**Prof. Dr. Paul Vasos**			
2.4 Study year	I	2.5 Semester	II	2.6 Evaluation type	E	2.7 Discipline regime	

3. Total estimated time

3.1 Number of weekly hours		3.2 out of which course:		3.3 seminar/laboratory	
3.4 Total hours in the curriculum	32	.5 out of which course:	16	3.6 seminar/laboratory	16
Distribution of time:					**hours**
Study according to the textbook, course material, bibliography and notes					50
Additional documentation in the library, on specialized electronic platforms and in the field					20
Preparation of seminars/laboratory, assignments, papers, portfolios and essays					30
Tutoring					8
Examinations					10
Others……					

3.7. Total hours of individual study	**118**
3.8. Total hours per semester	**150**
3.9. Number of credits	**6**

4. Preconditions (where applicable)

4.1 curriculum	Basic sciences, general background
4.2 skills	Synthesis of informations, Presentation

5. Conditions (where applicable)

5.1 course delievery	Room with multimedia equipment (video projector, smart board)
5.2 conducting the seminar/laboratory	Room with multimedia equipment (video projector, smart board)

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6. Learning outcomes

Knowledge	LO1. Demonstrate familiarity with research methodology in the reseach field and related areas and specific methods in the main research field: how research methodology is developed in a variety of areas; specific methods in spectroscopic analysis and imaging, including medical imaging.
Skills	LO1. Demonstrate the capacity for analysis of gaps in existing scholarship in the field and identify an original question/problem for study worthy of peer-review/examination
Responsibility and autonomy	LO1. Demonstrate the capacity to identify the need for further knowledge. LO2. Demonstrate ability to learn, adapt and work in varied intredisciplinary and multi-national environments so as to analyse findings and perspectives found in other disciplines that contribute to greater understanding in their field.

7. Contents

8.1 Course	**Methods**	**Observations**
• Introduction: spectroscopy and imaging in everyday life: from artwork and literature to medical diagnostic; theories on light: Newton, Goethe, Schpenhauer; Charles Chros and color in photography; light and molecules - colours in paitings; experiments: emission, absoption, interference; • Chromophores and vision in different animal species;	Lecture, explanation	5 hours
• How do we observe matter and the living: Spectroscopy in the visible, ultra-violet and infra-red domains; Electron paramagnetic resonance; Nuclear magnetic resonance; Magnetic resonance imaging;	Lecture, explanation, conversation	6 hours
• Different types of imaging and their role in medical diagnostic: Ultrasound, Doppler imaging, X-ray, positron imaging via radioactive tracers PET-CT, magnetic resonance NMR/MRI – diffusion and relaxation contrast, functional MRI (blood oxygen imaging - BOLD, molecular functional imaging).	Lecture, explanation, conversation	5 hours

References:

R. Weissleder, B. D. Ross, A. Rehemtulla et al., *Molecular Imaging Principles and Practice*, Academic Press, 2019

J. L. Steinfeld, *Molecules and Radiation*, Dover Publications, 2005 (second edition)

P.A. Cox, Collection OCP, *Introduction to Quantum Theory and Atomic Structure,* Oxford University Press (1998)

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A.K. Bridson, Collection OCP, *Inorganic Spectoscopy Methods,* Oxford University Press (1998).

D.W. Brown, A.J. Floyd and M. Sainsbury, *Organic Spectroscopy,* John Wiley and sons (1988)

J. M. Brown, *Molecular Spectroscopy*, Oxford University Press, 1998

8.2 Seminar/laboratory	**Methods**	**Observations**
Applications: • Biomolecular structure • Biomolecular imaging • Genomics, Proteomics, Metabolomics • Structural imaging • Functional imaging of the brain and the body	Presentation, discussion	6 hours
Discussion of a paper in your field: spectroscopy in archeology, photography, artwork restoration, etc.	Presentation, discussion	5 hours
Discussion of a paper in your field using imaging	Presentation, discussion	5 hours

References

Ralph Weissleder Brian D. Ross Alnawaz Rehemtulla Sanjiv S. Gambhir Ralph M. Feather Jr *Molecular Imaging Principles and Practice,* Academic Press (2019)

J. Michael Hollas, *Modern Spectroscopy*, fourth edition, Wiley (2003)

8. Correlating the content of the discipline with the expectations of representatives of the epistemic community, professional associations and representative employers in the field related to the program

Imaging and spectroscopy are used in fields ranging from art to medical diagnostic.

9. Assessment

Type of activity	Assessment criteria	Evaluation methods	Weight in the final grade
Course	Proactivity, understanding	Discussion	50 %
Seminar / laboratory	Presenting skills, scientific article understanding	Discussion, student presentations	50 %
Minimum performance standard	5/10 points		

Fill in date: 6.II.2026 Holder of the course Prof. Dr Paul Vasos

Director ISDS-UB,
Conf. Dr. Habil. Mihaela MATACHE