UNIVERSITY OF BUCHAREST
FACULTY OF CHEMISTRY
DOCTORAL SCHOOL ON CHEMISTRY

DISCIPLINE SHEET

Course name: M5 - Mass spectrometry
The holder of the course activities: Prof. Dr. Andrei Medvedovici
Year of study: I

Number of hours per week / Verification / Credits		
course	**Form of examination**	**Credits**
16	Exams	4

A. DISCIPLINE OBJECTIVES (Objectives are formulated in terms of professional skills):

The general objective of the discipline	• Acquisition of general, theoretical and practical knowledge of mass spectrometry in general and its use as a structural confirmation detection system for separation chromatographic techniques, in particular. • Learning the basics related to the ionization of molecules and their fragmentation under various conditions.
Specific objectives:	• Understanding the need to apply mass spectrometry as an analytical technique for investigating the structure of organic compounds. • Understanding the need to apply mass spectrometry as a detection system for separation chromatographic techniques. • Understanding the operation of ionization sources, mass analyzers and detectors used in analytical practice. • Understanding the ways of exploiting the various architectures dedicated to mass spectrometry and tandem couplings MS. • Understanding the mechanisms of ionization and fragmentation of organic structures. • Applications of mass spectrometry in modern chemistry.

B. CONDITIONS (where applicable)

of the course	• During the course, students will have their mobile phones switched off. Attendance at a minimum of 3 courses is mandatory.

C. ACCUMULATED SPECIFIC COMPETENCES (Aims at the competencies provided by the study program of which the discipline is part)

Professional skills	• Creative application of the general knowledge acquired • Increased ability to solve problems related to the structural characterization of organic and organo-metallic compounds by mass spectrometry • Ability to understand the basic operation of complex devices and how to operate them • Ability to critically interpret the results of investigations and experimental results • Ability to understand and apply new information quickly and correctly

	• Ability to make correlations with other studied structural investigation techniques • Ability to develop new applications using the techniques studied
Transversal skills	• Oral and written communication skills • Respect and development of professional values and ethics • Adaptation to new methods • Professional and personal development through continuous training

D. DISCIPLINE CONTENT

a) Course

Chapter	content	Nr. hours
1.	Mass spectrometry: aspects of principle; Use of mass spectrometry as a structural confirmation detector in chromatographic techniques; Gas phase ionization (electronic impact ionization - EI; chemical ionization - CI); Condensed phase ionization (atmospheric pressure ionization sources: ESI, APCI, MPI for liquid phase and MALDI and SIMS for solid phase).	4
2.	Mass analyzers, operating principles: dual focusing (electrical and magnetic sector), flight time analyzer (ToF), flight distance analyzer (DoF), magnetic quadrupole (Q), ion traps (IT, ILO, LIT), cyclotronic ionic resonance (ICR). Low resolution mass analyzers versus high resolution mass analyzers. Detection in mass spectrometry. Ways of operating the mass analyzers (complete scan, monitoring of a single mass channel, simultaneous monitoring of several mass channels). MS and MSn tandem architectures staggered in time or space. Collision cells. Ways of exploiting the tandem MS architecture (Product Ion Scan, Precursor Ion Scan, Neutral Scan Loss, Selected Ion Monitoring, Multiple Reaction Monitoring).	4
3.	Modern aspects of mass spectrometry: Ion mobility mass spectrometry (IMMS). SIFT-MS - Selected Ion Flow Tube Mass Spectrometry. Real - time direct analysis (DART) ionization sources. Operational qualification of mass spectrometers. Effects of matrix on liquid phase ionization in mass spectrometry.	4
4.	Ionization / fragmentation processes in electronically ionized mass spectrometry. Interpretation of mass spectra.	4
	Total hours	**16**

E. ASSESSMENT (Specify the methods, forms of assessment and their weight in establishing the final grade. Indicate the minimum performance standards, related to the competencies defined in point A. Course objectives)

Activity type	Evaluation criterias	Evaluation methods	Share of final grade
course	-Accuracy and quality of treatment of exam subjects	Verification by: -Written exam	100

	-Awareness of the knowledge acquired in the course		
The results of the evaluation of the discipline are expressed by the following grades: "Very good"; "Good"; "Satisfactorily"; "Unsatisfactory". The grades "Very good", "Good" and "Satisfactory" allow the doctoral student to obtain the credits.			

F. METHODOLOGICAL REFERENCES

Lecture combined with dialogue. Use of modern means of training (ppt). Course support.

G. CORRIBORATION OF DISCIPLINE CONTENTS WITH THE EXPECTATIONS OF COMMUNITY REPRESENTATIVESI EPISTEMICS, PROFESSIONAL ASSOCIATIONS AND REPRESENTATIVE EMPLOYEES IN THE FIELD OF THE PROGRAM

- The discipline enriches the fundamental and practical knowledge on modern methods of structural investigation of chemical compounds, in accordance with the expectations of the epistemic community.
- Familiarization with the methods of investigation / structural confirmation of chemical compounds is ensured. Graduates are provided with additional useful knowledge for a quick and easy integration in highly specialized and high-performance fields of activity (chemical structure studies, structure / stability / properties correlations, structural confirmation).

H. BIBLIOGRAPHY

1. A. Medvedovici, Chapter "Mass Spectrometry" in Monitoring Environmental Pollution, (AF Dăneț Ed.), Pro Act Birotic Publ., ISBN 973-0-03918-6 (2005).
2. WMA Niessen, Liquid chromatography - Mass Spectrometry, CRC Press, Taylor and Francis Group, Boca Raton (2006).
3. KL Busch, A glossary for Mass Spectrometry, Mass Spectrometry, 17 (6S), S26-S34 (2002).
4. JR Chapman (Ed.) - Mass Spectrometry of Protein and Peptides, vol.146 in Methods in molecular Biology, Humana Press Inc. (2000).
5. FW McLafferty, F. Turecek, Interpretation of Mass Spectra, 4th Edition, University Science Books (1993)

Course holder — **Director of the Doctoral School**

Prof. Dr. Andrei Medvedovici — **Prof. Dr. Camelia Bala**

UNIVERSITY OF BUCHAREST
FACULTY OF CHEMISTRY
DOCTORAL SCHOOL ON CHEMISTRY

DISCIPLINE SHEET

Discipline name: Structural characterization of the solid
Course activities holder: Prof. Vasile I. Parvulescu
Year of study: I

Number of hours per week / Verification / Credits		
course	**Form of examination**	**Credits**
16	Exams	4

A. DISCIPLINE OBJECTIVES (Objectives are formulated in terms of professional skills):

The general objective of the discipline	• Acquisition of general, theoretical and practical knowledge on solid characterization techniques using the concept of 'operando'
Specific objectives:	• Understanding the need for the combined application of characterization methods by diffraction and spectroscopy in the characterization of materials. • Understanding the theoretical models to be used to capitalize on experimental results • Understanding the relationship between material ownership and characterization techniques

B. CONDITIONS (where applicable)

of the course	•

C. ACCUMULATED SPECIFIC COMPETENCES (Aims at the competencies provided by the study program of which the discipline is part)

Professional skills	• Increased ability to solve various problems • Ability to prepare scientific papers and experimental reports • Ability to critically interpret research results • Ability to understand and evaluate new information quickly and correctly • Ability to identify alternative solutions and the ability to demonstrate / support the relevance of these alternatives
Transversal skills	• Teamwork skills • Oral and written communication skills • Respect and development of professional values and ethics • Adaptation to new technologies, professional and personal development, through continuous training

D. DISCIPLINE CONTENT

a) Course

Chapter	**content**	**Nr. hours**

1.	Diffractometric characterization techniques; Assembling them in an "operando" model with analytical techniques	4
2.	Spectral characterization techniques; Assembling them in an "operando" model with analytical techniques	4
3.	Ways of adapting the experiment to conditions of temperature, vacuum, pressure, etc.	4
4.	Case discussions for solids with applications in various fields	4
	Total hours	**16**

E. ASSESSMENT (Specify the methods, forms of assessment and their weight in establishing the final grade. Indicate the minimum performance standards, related to the competencies defined in point A. Course objectives)

Activity type	**Evaluation criterias**	**Evaluation methods**	**Share of final grade**
course	-Accuracy and quality of treatment of exam subjects - Acquiring the knowledge acquired during the course	Verification by: -Written exam	100
The results of the evaluation of the discipline are expressed by the following grades: "Very good"; "Good"; "Satisfactorily"; "Unsatisfactory". The grades "Very good", "Good" and "Satisfactory" allow the doctoral student to obtain the credits.			

F. METHODOLOGICAL REFERENCES

Lecture combined with dialogue. Use of modern means of training (ppt). Course support.

G. CORRIBORATION OF THE CONTENTS OF THE DISCIPLINE WITH THE EXPECTATIONS OF THE REPRESENTATIVES OF THE EPISTEMIC COMMUNITY, PROFESSIONAL ASSOCIATIONS AND REPRESENTATIVE EMPLOYERS IN THE FIELD RELATED TO THE PROGRAM

- The discipline ensures a wide fund of fundamental and practical knowledge regarding the modern and sustainable methods of characterization of solid materials with applications in the construction of equipment and machines, in constructions, in the chemical, petrochemical and metallurgical industry, in transports, etc.
- The discipline offers basic elements that help the doctoral student in the specialties of chemistry and materials science in the realization of the experimental part.

H. BIBLIOGRAPHY

1. **MA Bañares, Operando methodology: combination of in situ spectroscopy and simultaneous activity measurements under catalytic reaction conditions**, - Catalysis today, 2005 - Elsevier
2. **M. Che**, **JC Védrine**, **Characterization of Solid Materials and Heterogeneous Catalysts: From Structure to Surface Reactivity**, Wiley, 2012.
3. BM Weckhuysen, In-situ Spectroscopy of Catalysts, American Scientific Publishers, 2004

Course holder — **Director of the Doctoral School**

Prof. Dr. Vasile I. Parvulescu — **Prof. Dr. Camelia Bala**

DISCIPLINE SHEET

Discipline name: Compounds functionalized with paramagnetic species
The holder of the course activities: prof. Dr. Petre Ioniță
Year of study: I

Number of hours per week / Verification / Credits		
course	**Form of examination**	**Credits**
	Exam	4

A. DISCIPLINE OBJECTIVES (Objectives are formulated in terms of professional skills):

The general objective of the discipline	• **.....**
Specific objectives:	• Familiarizing students with problems ..... • Familiarizing students with the concepts of ..... • Demonstrating the need and viability of methods ..... • Developing students' ability to evaluate a reaction ..... • Developing students' ability to think critically and discuss constructively ..... • Developing students' abilities to learn, to operate with the concepts and methodology specific to the field, to relate and communicate, to find the specific notions and to perform the analysis and synthesis of data from the content of specialized works.

B. terms (where applicable)

of the course	•.....

C. ACCUMULATED SPECIFIC COMPETENCES (Aims at the competencies provided by the study program of which the discipline is part)

Professional skills	• Increased ability to solve various problems • Ability to prepare scientific papers and experimental reports • Ability to critically interpret research results • Ability to understand and evaluate new information quickly and correctly • Ability to identify alternative solutions and the ability to demonstrate / support the relevance of these alternatives
Transversal skills	• Teamwork skills • Oral and written communication skills • Respect and development of professional values and ethics • Adaptation to new technologies, professional and personal development, through continuous training

D. DISCIPLINE CONTENT

a) Course

Chapter	**content**	**Nr. hours**
	-	

	Total hours	**16**

E. ASSESSMENT (Specify the methods, forms of assessment and their weighting in establishing the final grade. Indicate the minimum performance standards, related to the competencies defined in point A. Course objectives)

Activity type	Evaluation criterias	Evaluation methods	Share of final grade
course	-Accuracy and quality of treatment of exam subjects - Acquiring the knowledge acquired in the course	Verification by: - Written exam	100
The results of the evaluation of the discipline are expressed by the following grades: "Very good"; "Good"; "Satisfactorily"; "Unsatisfactory". The grades "Very good", "Good" and "Satisfactory" allow the doctoral student to obtain the credits.			

F. METHODOLOGICAL REFERENCES

Lecture combined with dialogue. Use of modern means of training (ppt). Course support.

G. CORRIBORATION OF THE CONTENTS OF THE DISCIPLINE WITH THE EXPECTATIONS OF THE REPRESENTATIVES OF THE EPISTEMIC COMMUNITY, PROFESSIONAL ASSOCIATIONS AND REPRESENTATIVE EMPLOYEES IN THE FIELD OF THE PROGRAM

- The discipline ensures a wide fund of fundamental and practical knowledge regarding: ....
- By mastering the theoretical-methodological concepts and approaching the practical aspects included in the discipline ..... students acquire a consistent knowledge, in accordance with the partial competencies required for the possible occupations provided in Grid 1 - RNCIS.
- The course is designed and structured to allow the student, through the knowledge gained, to conduct research in any field of chemistry at a high quality level.

H. BIBLIOGRAPHY

1.....
2.....

Course holder — **Director of the Doctoral School**

Prof. Dr. Petre Ioniță — **Prof. Dr. Camelia Bala**

DISCIPLINE SHEET

Discipline name: Sustainable development in chemistry: methods and strategies
The holder of the course activities: Prof. Dr. Simona Margareta Coman
Year of study: I

Number of hours per week / Verification / Credits		
course	**Form of examination**	**Credits**
16	Exams	4

A. DISCIPLINE OBJECTIVES (Objectives are formulated in terms of professional skills):

The general objective of the discipline	• Acquiring general, theoretical and practical knowledge on the principles of green chemistry, the operating tools of green chemistry / engineering and sustainable development in chemistry, in order to form professional skills (cognitive and functional-action) and transversal (role and personal and professional development) of the student.
Specific objectives:	• Familiarizing students with current global problems caused by pollution and chemical waste • Familiarizing students with the concepts of "green chemistry", "green engineering" and "sustainable development" • Demonstration of the need and viability of methods (green chemistry and green engineering) / their application strategies for sustainable development in chemistry • Develop students' ability to evaluate a reaction or chemical process and find green alternatives • Developing students' ability to think critically and discuss constructively the impact of chemical processes on the ecosystem • Developing students' abilities to learn, to operate with the concepts and methodology specific to the field, to relate and communicate, to find the specific notions and to perform the analysis and synthesis of data from the content of specialized works.

B. CONDITIONS (where applicable)

of the course	• It's not necessary

C. ACCUMULATED SPECIFIC COMPETENCES (Aims at the competencies provided by the study program of which the discipline is part)

Professional skills	• Increased ability to solve various problems • Ability to prepare scientific papers and experimental reports • Ability to critically interpret research results • Ability to understand and evaluate new information quickly and correctly • Ability to identify alternative solutions and the ability to demonstrate / support the relevance of these alternatives
Transversal skills	• Teamwork skills • Oral and written communication skills • Respect and development of professional values and ethics

	• Adaptation to new technologies, professional and personal development, through continuous training

D. DISCIPLINE CONTENT

a) Course

Chapter	content	Nr. hours
1. Introductory notions. The need for sustainable development in chemistry	- Introduction to current global issues related to pollution, climate change, energy demand, waste and limited natural resources - Adverse effects of solvents (destruction of the stratospheric ozone layer, global warming, formation of photochemical smog, formation of ozone in the troposphere) - Use of hazardous chemicals. Case study: the Bhopal disaster - Concepts of process development and manufacture of chemicals with low impact on the environment: green chemistry, green engineering, sustainable development	4
2. Notions of green chemistry	- Introduction to green chemistry - Concepts and terms - The principles of green chemistry - Evaluation of the green degree of chemical reactions: Mass parameters: efficiency, atom economy, factor E, reaction mass efficiency, atom efficiency, carbon efficiency, effective mass efficiency, mass intensity. Advantages and disadvantages of applying mass parameters in evaluating the degree of green. Energy parameters: energy intensity of the process, energy consumption in waste treatment, energy consumption in solvent recovery / recycling	4
3. Analysis of the green degree of chemical processes	- Radial Pentagon. Design, analysis and interpretation. - EcoScale analysis for laboratory processes. Basic principles, calculation, analysis and interpretation. - Green solvents: solvent-free chemical processes, water as reaction solvent, supercritical fluids, ionic liquids, fluorinated biphasic systems	4
4. Petrochemistry versus biorefinery / Notions of green engineering	- Biomass composition: chemistry, introduction to carbohydrate chemistry - The concept of biorefinery - Environmental issues related to wood ethanol production - Cellulose and lignin chemicals - Design of solid catalysts for biomass conversion - Platform molecules and value-added products - Notions of green engineering, economic importance of recycling reusable materials (plastics, paper, metals, etc.) worldwide; recycling in chemical processes (unprocessed raw materials, intermediates and additives). Linear economy versus circular economy: elementary sustainability.	4
	Total hours	**16**

E. ASSESSMENT (Specify the methods, forms of assessment and their weight in establishing the final grade. Indicate the minimum performance standards, related to the competencies defined in point A. Course objectives)

Activity type	Evaluation criterias	Evaluation methods	Share of final grade
course	-Accuracy and quality of treatment of exam subjects - Acquiring the knowledge acquired during the course	Verification by: -Written exam	100
The results of the evaluation of the discipline are expressed by the following grades: "Very good"; "Good"; "Satisfactorily"; "Unsatisfactory". The grades "Very good", "Good" and "Satisfactory" allow the doctoral student to obtain the credits.			

F. METHODOLOGICAL REFERENCES

Lecture combined with dialogue. Use of modern means of training (ppt). Course support.

G. CORRIBORATION OF THE CONTENTS OF THE DISCIPLINE WITH THE EXPECTATIONS OF THE REPRESENTATIVES OF THE EPISTEMIC COMMUNITY, PROFESSIONAL ASSOCIATIONS AND REPRESENTATIVE EMPLOYERS IN THE FIELD OF PROGRAMULUI

- The discipline provides a wide range of fundamental and practical knowledge on:
  - assessing the impact of chemical processes on the ecosystem
  - modern and sustainable methods for achieving green chemical syntheses as alternatives to polluting and waste-generating chemical syntheses
  - chemical transformation of renewable resources into value-added products on the consumer market
- By mastering the theoretical-methodological concepts and approaching the practical aspects included in the discipline Sustainable development in chemistry: methods and strategies, students acquire a consistent knowledge, in accordance with the partial competencies required for possible occupations provided in Grid 1 - RNCIS.
- The course is designed and structured to allow the student, through the knowledge gained, to conduct research in any field of chemistry at a high quality level, in accordance with the fundamental concept of the 21st century - sustainable development.

H. BIBLIOGRAPHY

1. Green Chemistry: An introductory text, Mike Lancaster (Ed.), The Royal Society of Chemistry, 2002.
2. Handbook of Green Chemistry & Technology, J. Clark and D. Macquarrie (Eds.), Blackwell Publishing, 2002
3. Chemistry In Alternative Reaction Media, DJ Adams, PJ Dyson, SJ Tavener (Eds), John Wiley & Sons Ltd, 2004
4. The Role of Catalysis for the Sustainable Production of Bio-Fuels and Bio-Chemicals, KS Triantafyllis, AA Lappas, M. Stoecker (Eds.), Elsevier BV (2013)

Course holder **Director of the Doctoral School**

Prof. Dr. Simona Margareta Coman **Prof. Dr. Camelia Bala**

DISCIPLINE SHEET

Discipline name: Ethics, academic integrity and scientific authorship
The holder of the course activities: Prof. Marius Andruh
Year of study: I
Semester: II

Number of hours per week / Verification / Credits		
course	**Form of examination**	**Credits**
16	Verification	4

A. DISCIPLINE OBJECTIVES (Objectives are formulated in terms of professional skills):

The general objective of the discipline	• Familiarizing students with the correct methodological and deontological realization of a scientific paper • Acquiring general, theoretical and practical knowledge on writing a scientific paper
Specific objectives:	• Knowledge of explicit norms (texts with normative value) or implicit ones (customs, practices) that regulate the correct academic conduct; • Knowledge of the policies of scientific journals and large publishing houses; • Learning how to write a scientific paper (Communication, Full paper, Review). • Students learn the methodology of elaboration and writing of a scientific project.

B. CONDITIONS (where applicable)

of the course	•

C. ACCUMULATED SPECIFIC COMPETENCES (Aims at the competencies provided by the study program of which the discipline is part)

Professional skills	• Increased ability to solve various problems • Ability to prepare scientific papers and experimental reports • Ability to critically interpret research results • Ability to understand and evaluate new information quickly and correctly • Ability to identify alternative solutions and the ability to demonstrate / support the relevance of these alternatives
Transversal skills	• Teamwork skills • Oral and written communication skills • Respect and development of professional values and ethics • Adaptation to new technologies, professional and personal development, through continuous training

D. DISCIPLINE CONTENT

a) Course

Chapter	**content**	**Nr. hours**

1.	Principles of ethics in scientific research. Plagiarism; Autoplagiarism; Cosmeticization and falsification of scientific results.	5
2.	Publishing houses and chemistry journals. Types of articles and their writing. Correct citation of the literature. Understanding the peer-review system.	6
3.	Writing a scientific project. Discussing in detail the structure and content of each chapter in a research project	4
4.		
	Total hours	**16**

E. ASSESSMENT (Specify the methods, forms of assessment and their weight in establishing the final grade. Indicate the minimum performance standards, related to the competencies defined in point A. Course objectives)

Activity type	Evaluation criterias	Evaluation methods	Share of final grade
course	- Acquiring the knowledge acquired during the course by elaborating a scientific paper that will include the results of one's own research activity	- Colloquium	100
The results of the evaluation of the discipline are expressed by the following grades: "Very good"; "Good"; "Satisfactorily"; "Unsatisfactory". The grades "Very good", "Good" and "Satisfactory" allow the doctoral student to obtain the credits.			

F. METHODOLOGICAL REFERENCES

Lecture combined with dialogue. Use of modern means of training (ppt).

G. CORRIBORATION OF THE CONTENTS OF THE DISCIPLINE WITH THE EXPECTATIONS OF THE REPRESENTATIVES OF THE EPISTEMIC COMMUNITY, PROFESSIONAL ASSOCIATIONS AND REPRESENTATIVE EMPLOYEES IN THE FIELD OF THE PROGRAM

- The discipline ensures a wide fund of fundamental and practical knowledge regarding the research activity and the correct capitalization of its results.

H. BIBLIOGRAPHY

1. L. Papadima (editor): Academic Deontology (University of Bucharest, 2017.

Course holder — Pro. Marius Andruh

Director of the Doctoral School — **Prof. Dr. Camelia Bala**

DISCIPLINE SHEET

Discipline name: Management of scientific research in chemistry
The holder of the course activities: prof. dr. Camelia Bala
Year of study: I

Number of hours per week / Verification / Credits		
course	**Form of examination**	**Credits**
8	Verification	4

A. DISCIPLINE OBJECTIVES (Objectives are formulated in terms of professional skills):

The general objective of the discipline	Acquiring some general, theoretical and practical knowledge regarding the management of scientific research in chemistry
Specific objectives:	-Development of the capacities of doctoral students to learn, to operate with the concepts and methodology specific to the field, to relate and communicate, to find the specific notions and to perform the analysis and synthesis of data from the content of specialized works.

B. CONDITIONS (where applicable)

of the course	• It's not necessary

C. ACCUMULATED SPECIFIC COMPETENCES (Aims at the competencies provided by the study program of which the discipline is part)

Professional skills	• Ability to write a research proposal • Ability to understand and evaluate new information quickly and correctly • Ability to identify alternative solutions and the ability to demonstrate / support the relevance of these alternatives
Transversal skills	• Teamwork skills • Oral and written communication skills • Respect and development of professional values and ethics • Adaptation to new technologies, professional and personal development, through continuous training

D. DISCIPLINE CONTENT

a) Course

Chapter	**content**	**Nr. hours**
1.	The Nature of Research and Innovation; Funding of science; The Life Cycle of a Project; How to Plan and Manage a Project;	4
2.	Critical path method; Gantt chart; Communicating Research; Case Studies	4
	Total hours	**8**

E. ASSESSMENT (Specify the methods, forms of assessment and their weight in establishing the final grade. Indicate the minimum performance standards, related to the competencies defined in point A. Course objectives)

Activity type	Evaluation criterias	Evaluation methods	Share of final grade
course	-Accuracy and quality of treatment of exam subjects - Acquiring the knowledge acquired during the course	Verification	100
The results of the evaluation of the discipline are expressed by the following grades: "Very good"; "Good"; "Satisfactorily"; "Unsatisfactory". The grades "Very good", "Good" and "Satisfactory" allow the doctoral student to obtain the credits.			

F. METHODOLOGICAL REFERENCES

Lecture combined with dialogue. Use of modern means of training (ppt). Course support.

G. CORROBORATION OF THE CONTENTS OF THE DISCIPLINE WITH THE EXPECTATIONS OF THE REPRESENTATIVES OF THE EPISTEMIC COMMUNITY, PROFESSIONAL ASSOCIATIONS AND REPRESENTATIVE EMPLOYERS IN THE FIELD RELATED TO THE PROGRAM

- The discipline provides a wide range of fundamental and practical knowledge on modern and sustainable methods of biomolecule analysis.

H. BIBLIOGRAPHY

1. Planning and Managing Scientific Research, Kennett, Brian, ANU Press, 2014.
2. The International Journal of Conflict Management, M. A. Rahim, 2002, 13(3), 206-235.
3. Self-Directed R&D Teams: What Makes Them Effective?, G. L. Taylor, L. J. Snyder, K. F. Dahnke, G. Kuether, Research Technology Management, 1995, 38(6), 19-23.
4. The Discipline of Teams, Harvard Business Review, J. R. Katzenbach, D. K. Smith, March-April, 1993

Course holder **Director of the Doctoral School**

Prof. Dr. Camelia Bala **Prof. Dr. Camelia Bala**

DISCIPLINE SHEET

Discipline name: Biosurface analysis techniques
The holder of the course activities: prof. Dr. Camelia Bala
Year of study: I

Number of hours per week / Verification / Credits		
course	**Form of examination**	**Credits**
16	Exams	4

F. DISCIPLINE OBJECTIVES (Objectives are formulated in terms of professional skills):

The general objective of the discipline	- Acquiring some general, theoretical and practical knowledge regarding the operating principles of some techniques for the analysis of bio-surfaces, in order to form the professional and transversal competencies of the doctoral student.
Specific objectives:	-Development of the capacities of doctoral students to learn, to operate with the concepts and methodology specific to the field, to relate and communicate, to find the specific notions and to perform the analysis and synthesis of data from the content of specialized works. -Understanding the criteria for choosing the techniques for characterizing biomolecules deposited on different types of surfaces. -Understanding the theoretical models that must be used to capitalize on the experimental results -Understanding the relationship of biomolecule properties - characterization techniques.

G. CONDITIONS (where applicable)

of the course	• It's not necessary

H. ACCUMULATED SPECIFIC COMPETENCES (Aims at the competencies provided by the study program of which the discipline is part)

Professional skills	• Increased ability to solve various problems • Ability to prepare scientific papers and experimental reports • Ability to critically interpret research results • Ability to understand and evaluate new information quickly and correctly • Ability to identify alternative solutions and the ability to demonstrate / support the relevance of these alternatives
Transversal skills	• Teamwork skills • Oral and written communication skills • Respect and development of professional values and ethics • Adaptation to new technologies, professional and personal development, through continuous training

I. DISCIPLINE CONTENT

a) Course

Chapter	content	Nr. hours
1.	Atomic force microscopy in the investigation of biomolecules	4
2.	Confocal microscopy - principles and applications	4
3.	Surface Plasmon Resonance (SPR) - principle and applications	4
4.	Fluorescence Correlation Spectroscopy - principle and applications	4
	Total hours	**16**

J. ASSESSMENT (Specify the methods, forms of assessment and their weight in establishing the final grade. Indicate the minimum performance standards, related to the competencies defined in point A. Course objectives)

Activity type	Evaluation criterias	Evaluation methods	Share of final grade
course	-Accuracy and quality of treatment of exam subjects - Acquiring the knowledge acquired during the course	Verification	100
The results of the evaluation of the discipline are expressed by the following grades: "Very good"; "Good"; "Satisfactorily"; "Unsatisfactory". The grades "Very good", "Good" and "Satisfactory" allow the doctoral student to obtain the credits.			

I. METHODOLOGICAL REFERENCES

Lecture combined with dialogue. Use of modern means of training (ppt). Course support.

J. CORRIBORATION OF THE CONTENTS OF THE DISCIPLINE WITH THE EXPECTATIONS OF THE REPRESENTATIVES OF THE EPISTEMIC COMMUNITY, PROFESSIONAL ASSOCIATIONS AND REPRESENTATIVE EMPLOYERS IN THE FIELD RELATED TO THE PROGRAM

- The discipline provides a wide range of fundamental and practical knowledge on modern and sustainable methods of biomolecule analysis.

K. BIBLIOGRAPHY

5. STM and AFM of bio / organic molecules and structures, A. Ikai, Surface Science Reports, 26 (1997), 261-332
6. Atomic force microscopy: a powerful tool to observe biomolecules at work, A. Engel, Y. Lyubchenko, DJ Müller, Trends Cell Biol. 9 (1999) 77-80
7. Fluorescence Correlation Spectroscopy: Past, Present, Future, Elliot L. Elson, Biophys J. 101 (12), 2011, 2855–2870.
8. Handbook of Surface Plasmon Resonance 2nd edition, Richard BM Schasfoort (Editor), RSC, 2017, 500 p.
9. Techniques in Confocal Microscopy, 1st Edition, P. Michael Conn, Academic Press, 2010, 544.

Course holder — **Director of the Doctoral School**

Prof. Dr. Camelia Bala — **Prof. Dr. Camelia Bala**