Додаток 2
До Процедури розробки та періодичного перегляду освітніх програм

1. General Information	
Faculty	Faculty of Foreign Students; Faculty of Medicine No. 2
Programme	22 Healthcare, 222 General Medicine, the 2nd (master) level of higher education, full-time
Academic year	2023-2024
Subject	Modern problems of biophysics 1.30 Kaf_biophysics@meduniv.lviv.ua
Department	Department of Biophysics 79010, Lviv, 3a Shymzeriv tel.: +38 (032) 275-58-76 Kaf_biophysics@meduniv.lviv.ua
Head of the Department	Roman Fafula, Dr.Sci., Professor, Kaf_biophysics@meduniv.lviv.ua
Year	I
Semester	I
Type of the Subject	elective course
Professors	Roman Fafula, Dr.Sci., Professor, fafula_roman@meduniv.lviv.ua
Erasmus	–
Responsible for Syllabus	Roman Fafula, Dr.Sci., Professor, fafula_roman@meduniv.lviv.ua
Credits ECTS	3.0
Hours	In total – 90 h.: lectures — 12 h.; practical classes – 18 h.; individual work – 60 h.
Language of study	English
Consultations	According to the schedule

2. Brief review of the subject

According to the educational and professional program the discipline "Modern problems of biophysics" is one of the fundamental natural science disciplines that form the theoretical basis for the training of highly qualified specialists in medicine.

The subject of study of the discipline “Modern problems of biophysics” (elective course) is the study of the physical properties of macromolecules, biophysical methods of cell research, the physical foundations of methods of biomacromolecule research, modern technologies and systems that use the properties of X-rays, nuclear magnetic resonance and induced radiation used in biomedical practice.

Discipline “Modern problems of biophysics” (elective course) as a fundamental discipline is quite complex, and for its assimilation various forms of lectures, laboratory, practical classes and individual work of students are used.

According to the curriculum, the discipline “Modern problems of biophysics” (elective course) is studied by the first year students. The academic program of the discipline is divided into 2 chapters:

Chapter 1. Fundamentals of molecular biophysics of cells and tissues.

Chapter 2. Application of biophysical technologies in biomedical research

The proposed discipline provides: compliance of the content of industry standards of higher

education through the direct connection of its content with the goals of higher education; compliance with licensing and accreditation conditions and requirements; compliance with "Standards and Guidelines for Quality Assurance in the European Higher Education Area"; the possibility of using the competencies formed by medical and biological physics as a foundation for the formation of professional competencies of the future specialist; unambiguity of criteria for assessing academic achievement.

3. Purpose and objectives of the course

The objective of teaching the discipline "Modern problems of biophysics" (elective course) is introducing students to modern problems of molecular biophysics and the latest achievements in the field of medical and biological physics, prospects for its application in biomedical practice.

The main learning tasks of the discipline "Modern problems of biophysics" (elective course) are:

- ✓ elucidation of the physical mechanisms underlying the biological functions of biomacromolecules;
- ✓ definition of the main methods used to study the structure and activity of biomacromolecules;
- ✓ physical phenomena underlying diagnostic and physiotherapeutic (treatment) methods used in biomedical practice.

Achieving these goals will allow a medical students to master the physical, biophysical, technical and mathematical knowledge and skills which are necessary for training a doctor and for study of other theoretical and clinical disciplines in the higher medical educational establishments and ensure the formation of general and special competencies and learning outcomes.

Integral competence:

The ability to solve complex problems, including those of a research and innovation nature in the field of medicine. Ability to continue learning with a high degree of autonomy.

General competences*:*

GC 1	The ability for abstract thinking, analysis and synthesis.
GC 2	Ability to learn and master modern knowledge.
GC 3	The ability to apply knowledge in practical situations.
GC 4	Knowledge and understanding of the subject area and understanding of the professional activities.
GC 5	Ability to adapt and act in a new situation.
GC 6	Ability to make informed decisions.
GC 7	Ability to work in a team.
GC 8	Interpersonal skills.
GC 9	Ability to communicate in a foreign language.
GC 10	Skills in using information and communication technologies.
GC 11	Ability to search, process and analyze information from various sources.
GC 12	Definiteness and perseverance to the tasks and assumed responsibilities.

Special (professional) competences*:*

PC 2	Ability to determine the required list of laboratory and instrumental studies and evaluate their results.
PC 10	Ability to perform medical procedures.
PC 17	Ability to assess the impact of the environment, socio-economic and biological determinants on the health of the individual, family and population.

Integrative final program learning outcomes (PLO) of the discipline "Modern problems of biophysics" are:

PLO 1. Have thorough knowledge of the structure of professional activity. To be able to carry out professional activities that require updating and integration of knowledge. To take responsibility for professional development, the ability for further professional training with a high level of autonomy (GC1 – GC12, FC2, FC10, FC17).

PLO 2. Understanding and knowledge of fundamental and clinical biomedical sciences at a level sufficient for solving professional tasks in the field of health care (GC4, GC6, GC10 – GC12, FC2, FC10, FC17).

PLO 3. Specialized conceptual knowledge, which includes scientific achievements in the field of

health care and is the basis for research, critical understanding of problems in the field of medicine and related interdisciplinary problems (GC1 – GC3, GC6, GC7, GC9 – CG12, FC2).

PLO 23. Assess the impact of the environment on the state of human health in order to estimate the morbidity pattern of the population (FC17).

PLO 24. Organize the necessary level of individual safety (own and persons cared for) in case of typical dangerous situations in the individual field of activity (CG6).

4. Preliminary requirements

1. Knowledge of basic concepts, laws, essence of phenomena, values of measurement in the course of high school physics.
2. Knowledge of human anatomy and physiology in the course of high school biology.
3. Knowledge of the electronic structure of the atom and the nature of chemical bonds in high school chemistry.
4. Be able to think abstractly, analyze and the ability to synthesize knowledge.
5. Be able to apply knowledge in practice.
6. Ability to search, process and analyze information from various sources.

5. Final program learning outcomes

Learning outcomes

Code	**Outcomes**	Matrix of competencies
ЗН-1	general physical and biophysical regularities that underlie human life;	*PLO 1, PLO 2, PLO 3*
ЗН-2	the physical bases and biophysical mechanisms of external factors (fields) effects on the human body systems;	*PLO 23, PLO 24*
ЗН-3	physical phenomena that underlie diagnostic and physiotherapeutic (therapeutic) methods used in medical practice;	*PLO 1, PLO 2, PLO 3, PLO 23, PLO 24*
УМ-1	analyze physical processes in the body, using physical laws and phenomena;	*PLO 1, PLO 2, PLO 3*
УМ-2	to analyze the mechanisms of interaction of physical factors of the external environment with the human body;	*PLO 23, PLO 24*
УМ-3	demonstrate the ability to choose the method of instrumental research according to the task;	*PLO 1, PLO 2, PLO 3, PLO 23, PLO 24*
УМ-4	demonstrate skills in working with medical equipment used for medical imaging and therapy, including ultrasound diagnostics, electrocardiography, rheography, audiometry, physiotherapy devices, optical and quantum-mechanical devices and systems, radiometric and dosimetric control devices;	*PLO 1, PLO 2, PLO 3, PLO 23, PLO 24*
УМ-5	explain the principle of operation of medical equipment.	*PLO 1, PLO 2, PLO 3, PLO 23, PLO 24*
К-1	ability to apply knowledge in practical situations;	*PLO 1, PLO 2, PLO 3, PLO 23, PLO 24*
К-2	ability to carry out research at the appropriate level.	
АВ-1	experience of individual subject activity, educational-cognitive, analytical, ability to synthesis of knowledge;	*PLO 1, PLO 2, PLO 3, PLO 23, PLO 24*
АВ-2	ability to self-study and continue professional development;	

AB-3	ability to control, self-control of learning outcomes.	

6. Course content

Course	full-time form of study	
Classes	**Hours**	**Number of groups**
Lectures (L)	12	1
Practical classes (PC)	18	1
Individual work (IW)	60	1

7. Course content

Code	**Topic**	**Content**	**Code**	**Professors**
L-1	Biological macromolecules in solutions.	Biological macromolecules in solution. Conformation of macromolecules. Intramolecular interactions in biological macromolecules. Hydrophobic interactions and water structure. Viscosity of solutions of biomacromolecules. Diffusion of macromolecules. Quasi-elastic scattering of light. Interaction between macromolecules in saline solution.	ЗН-1 УМ-1	Roman Fafula
L-2	Biophysics of proteins and nucleic acids.	Biophysics of proteins. Kinetics of enzymatic reactions. Activation energy. Biophysics of nucleic acids. Hyperchromic effect.	ЗН-1 УМ-1	Roman Fafula
L-3	Modern research methods for determining the structure of biomacromolecules.	Biophysical methods of biopolymer research. Electrophoresis of macromolecules. Sedimentation of macromolecules. Centrifugation. Chromatographic method: gel filtration. Dispersion of optical rotation and circular dichroism. Differential scanning microcalorimetry.	ЗН-1 ЗН-3 УМ-1 УМ-2 УМ-3 УМ-4 УМ-5	Roman Fafula
L-4	Biophysical principles of X-ray diagnostics.	X-ray computed tomography (CT). Image reproduction in CT. Spatial resolution of CT. Three-dimensional image. A side effect of a CT scan.	ЗН-2 ЗН-3 УМ-1 УМ-2 УМ-3 УМ-4 УМ-5	Roman Fafula
L-5	Biophysical principles of magnetic resonance imaging and positron emission tomography.	The phenomenon of nuclear magnetic resonance (NMR). Relaxation. Biophysical bases of magnetic resonance diagnostics. The concept of NMR spectroscopy. Magnetic resonance imaging: scanning and image reconstruction; image parameters. Diagnostic capabilities of NMR tomography. Biophysical principles of positron emission tomography.	ЗН-2 ЗН-3 УМ-1 УМ-2 УМ-3 УМ-4 УМ-5	Roman Fafula
L-6	Biophysical basis of application of laser technologies in medicine.	Basic properties of laser radiation. High power lasers and their interaction with biological tissues. Interaction of powerful lasers with biological tissues. The thermal effect of laser radiation on biological	ЗН-1 ЗН-2 ЗН-3 УМ-1 УМ-2	Roman Fafula

		tissues. Low power lasers. Cellular mechanisms of photobiomodulation. Cell reaction to radiation. Classification of lasers and safety requirements. Types of damage to biological tissues. Laser technologies in biomedical practice: laser-induced fluorescence; laser profilometry.	УМ-3 УМ-4 УМ-5	
PC-1	Fundamentals of molecular biophysics.	Biological macromolecules in solution. Conformation of macromolecules. Intramolecular interactions in biological macromolecules. Hydrophobic interactions and water structure. Viscosity of solutions of biomacromolecules. Diffusion of macromolecules. Quasi-elastic scattering of light. Interaction between macromolecules in saline solution	ЗН-1 УМ-1	Roman Fafula
PC-2	Biophysics of proteins and nucleic acids.	Biophysics of proteins. Kinetics of enzymatic reactions. Activation energy. Biophysics of nucleic acids. Hyperchromic effect.	ЗН-1 УМ-1	Roman Fafula
PC-3	Sedimentation and electrophoresis of biological macromolecules.	Biophysical methods of biopolymer research. Electrophoresis of macromolecules. Sedimentation of macromolecules. Centrifugation.	ЗН-1 УМ-2	Roman Fafula
PC-4	X-ray structural analysis of biological macromolecules.	Biophysical methods of studying the structure of macroparticles. X-ray structural analysis.	ЗН-1 УМ-2	Roman Fafula
PC-5	Molecular spectroscopy of macromolecules. Fluorescence spectroscopy.	Biophysical methods of studying the structure of macroparticles. Molecular spectroscopy of macromolecules. Fluorescence spectroscopy.	ЗН-1 УМ-2 УМ-3	Roman Fafula
PC-6	Modern methods of electron microscopy.	Electron microscopy. The working principle of the electron microscope. The main types of electron microscopes. Methods of preparing samples and obtaining contrast images. Application of modern electron microscopes in medicine. Study of the surface of isolated cells. Electron microscopy of viruses and bacteria.	ЗН-1 УМ-2 УМ-3 УМ-5	
PC-7	Biophysical principles of X-ray diagnostics.	X-ray computed tomography (CT). Image reproduction in CT. Spatial resolution of CT. Three-dimensional image. A side effect of a CT scan.	ЗН-1 ЗН-3 УМ-2 УМ-3 УМ-4 УМ-5	Roman Fafula
PC-8	Biophysical principles of magnetic resonance diagnostics.	The phenomenon of nuclear magnetic resonance (NMR). Relaxation. Biophysical bases of magnetic resonance diagnostics. The concept of NMR spectroscopy. Magnetic resonance imaging: scanning and	ЗН-1 ЗН-3 УМ-2 УМ-3 УМ-4	Roman Fafula

		image reconstruction; image parameters. Diagnostic capabilities of NMR tomography. Biophysical principles of positron emission tomography.	УМ-5	
PC-9	Biophysical principles of laser diagnostics and therapy.	Basic properties of laser radiation. High power lasers and their interaction with biological tissues. Interaction of powerful lasers with biological tissues. The thermal effect of laser radiation on biological tissues. Low power lasers. Cellular mechanisms of photobiomodulation. Cell reaction to radiation. Classification of lasers and safety requirements. Types of damage to biological tissues. Laser technologies in biomedical practice: laser-induced fluorescence; laser profilometry.	ЗН-1 ЗН-3 УМ-1 УМ-3 УМ-4 УМ-5	Roman Fafula
IW-1	Objects of research in molecular biophysics.	Biological macromolecules in solution. Conformation of macromolecules.	ЗН-1 УМ-1	Roman Fafula
IW-2	Intermolecular interactions and forces stabilizing the structure of biomacromolecules.	Intramolecular interactions in biological macromolecules. Hydrophobic interactions and water structure. Viscosity of solutions of biomacromolecules. Diffusion of macromolecules. Quasi-elastic scattering of light. Interaction between macromolecules in saline solution.	ЗН-1 УМ-1	Roman Fafula
IW-3	The main types of interactions that form biological membranes.	Intramolecular interactions in biological macromolecules. Hydrophobic interactions and water structure. Viscosity of solutions of biomacromolecules. Diffusion of macromolecules. Quasi-elastic scattering of light. Interaction between macromolecules in saline solution.	ЗН-1 УМ-1	Roman Fafula
IW-4	Rheometry of biomacromolecules.	Rheometry of nucleic acids and proteins.	ЗН-1 УМ-1	Roman Fafula
IW-5	Dispersion of optical rotation and circular dichroism.	Dispersion of optical rotation and circular dichroism.	ЗН-1 ЗН-3 УМ-1 УМ-4 УМ-5	Roman Fafula
IW-6	Chromatographic method in the study of biomacropolymers.	Chromatographic method: gel filtration.	ЗН-1 УМ-1 УМ-13	Roman Fafula
IW-7	Application of modern methods of electron microscopy in medicine.	Electron microscopy. The working principle of the electron microscope. The main types of electron microscopes. Methods of preparing samples and obtaining contrast images. Application of modern electron microscopes in medicine. Study of the surface of isolated cells. Electron microscopy of viruses and bacteria.	ЗН-1 УМ-1 УМ-5	Roman Fafula
IW-8	Study of biopolymers by differential	Differential scanning microcalorimetry.	ЗН-1 УМ-1	Roman Fafula

	scanning microcalorimetry.		УМ-5	
IW-9	Physical principles of X-ray transmission computed tomography.	Physical principles of X-ray transmission computed tomography.	ЗН-2 ЗН-3 УМ-2 УМ-3 УМ-4 УМ-5	Roman Fafula
IW-10	Laser microspectral analysis in research.	Laser microspectral analysis in research.	ЗН-2 ЗН-3 УМ-2 УМ-3 УМ-4 УМ-5	Roman Fafula

The following *teaching methods are used during practical classes*: verbal methods (lecture, discussion); visual methods (illustration, demonstration, frontal experiment); practical methods (laboratory work and solving of problems with professional content); individual work of students with comprehension and learning of material; use of control and training computer software in the discipline; use of project method for interdisciplinary integration.

8. Verification of results

Current control is realized on the basis of the control of theoretical knowledge, skills and abilities. Forms of current control: oral survey (frontal, individual, combined survey), practical test of formed professional skills, test control (open and closed tests).

Individual work of students is evaluated on practical classes and is part of the final grade of the student. The final grade for the current educational activity is set on a 4-point (traditional) scale.

Criteria of evaluation

- ✓ grade 5/"excellent" – the student has mastered the theory flawlessly, demonstrates deep and comprehensive knowledge of the certain topic or academic discipline, the main theses of scientific papers and recommended literature, thinks logically and gives an answer, freely uses the acquired theoretical knowledge when analyzing practical material, expresses his attitude to certain problems, demonstrates a high level of mastery of practical skills;
- ✓ grade 4/"good" – the student has mastered the theoretical material well, knows the main aspects from primary sources and recommended literature, presents it in a reasoned way; has practical skills, expresses his thoughts on certain issues, but certain inaccuracies and errors are assumed in the logic of the presentation of theoretical content or in the performance of practical skills;
- ✓ grade 3/"satisfactory" – the student has basically mastered the theoretical knowledge of the topic or discipline, orients himself in primary sources and recommended literature, but answers unconvincingly, confuses concepts, additional questions cause the student uncertainty or lack of stable knowledge; when answering questions of a practical nature, reveals inaccuracies in knowledge, does not know how to evaluate facts and phenomena, relate them with future activities, makes mistakes when performing practical skills;
- ✓ grade 2/"unsatisfactory" – the student has not mastered the material of the topic (discipline), does not know scientific facts, definitions, hardly orients himself in primary sources and recommended literature, lacks scientific thinking, practical skills are not formed.

Code	Code	Verification	Criteria
ЗН-1 – ЗН-3, УМ-1 – УМ-5, К-1 – К-2 АВ-1 – АВ-2	L-1-6, PC-1-9, IW-1-10.	Test control on the MISA platform (10-15 test tasks with one correct answer); Oral survey and/or written control – theoretical questions (including questions on individual	**Test control**: 50-69% – satisfactory; 70-89% – good; 90-100% – excellent. **Oral survey and/or written control:** evaluation according to

		work) and tasks of medical and biological content Practical skills / report on laboratory work.	evaluation criteria . **Practical skills / report on laboratory work**: passed / failed
The final test			
General evaluation system	Participation on practical classes during the semester is 100% on a 200-point scale.		
Scales	Traditional 4-point scale, 200-points scale, ECTS		
The conditions of access to the differential test	The student attended all practical (laboratory) classes and received at least 120 points for current educational activity.		
Type of a final examination	**Verification**		**Criteria**
Criteria of evaluation for the pass-fail test			
Pass-fail test	**Pass-fail test** is a form of the final control, which consists in assessing the student's mastery of educational material in the discipline on the basis of the average score of the results of current control and scores for individual control tasks in the final lesson. All topics submitted for current control must be included. Grades from a 4-point scale are converted into points on a multi-point (200-point) scale in accordance with the Regulation "Criteria, rules and procedures for evaluating the results of students' educational activities".		

The highest possible score points which a student can obtain for the current educational activity is 200 points.

Minimal number of score points which a student must obtain for current educational activity is 120 points.

Calculation of the points number is based on grades received by student by the traditional scale (by calculation of the arithmetic mean (AM) rounded to two decimal places). The resulting value is converted into points by multi-points scale as follows:

$$x = \frac{AM \times 200}{5}$$

For convenience, the table of recalculation on a 200-point scale is given:

Conversion of the average grade for current educational activity to the point scale for discipline which is finished with exam

4-бальна шкала	200-бальна шкала	4-бальна шкала	200-бальна шкала	4-бальна шкала	200-бальна шкала	4-бальна шкала	200-бальна шкала
5	200	4.45	178	3.92	157	3.37	135
4.97	199	4.42	177	3.89	156	3.35	134
4.95	198	4.4	176	3.87	155	3.32	133
4.92	197	4.37	175	3.84	154	3.3	132
4.9	196	4.35	174	3.82	153	3.27	131
4.87	195	4.32	173	3.79	152	3.25	130
4.85	194	4.3	172	3.77	151	3.22	129
4.82	193	4.27	171	3.74	150	3.2	128

4.8	192	4.24	170	3.72	149	3.17	127
4.77	191	4.22	169	3.7	148	3.15	126
4.75	190	4.19	168	3.67	147	3.12	125
4.72	189	4.17	167	3.65	146	3.1	124
4.7	188	4.14	166	3.62	145	3.07	123
4.67	187	4.12	165	3.57	143	3.02	121
4.65	186	4.09	164	3.55	142	3	120
4.62	185	4.07	163	3.52	141	Менше 3	Недостатньо
4.6	184	4.04	162	3.5	140		
4.57	183	4.02	161	3.47	139		
4.52	181	3.99	160	3.45	138		
4.5	180	3.97	159	3.42	137		
4.47	179	3.94	158	3.4	136		

Students obtain a semester credit if the average grade for current academic activity during the semester is at least "3" (120 points on a 200-point scale).

Points on discipline are converted regardless both in ECTS scale and a 4-point scale. Scores of ECTS scale can not be converted into 4-point scale and vice versa. Scores of students taking into account the number of points on the discipline are ranked on a ECTS scale so that:

Grade in ECTS	**Statistical index**
A	Top 10% of students
B	The next 25% of students
C	The next 30% of students
D	The next 25% of students
E	The last 10% of students

Ranking with assigning grades of “A”, “B”, “C”, “D”, “E” is held for the students of one course, studying one specialty and successfully completed the academic discipline. Students who have received grades FX, F (“2”) are not recorded to the list of students for ranking. Students who have received grade FX after repassing automatically get grade “E”.

For students who completed the program successfully the points on discipline are converted into a traditional 4-point scale by absolute criteria, which are listed in the table below:

Points on discipline	**Grade in 4-point scale**
From170 to 200 points	5
From 140 to 169 points	4
From 122 to 139 points	3
Lower than minimum number of points that a student must score	2

9. Course policy

Student attendance is required.

The missed practical class are making up according to an appropriate schedule agreed on the department.

The policy of academic integrity.

Use any material or aid (including cell phone etc) during the period of test/exam is prohibited.

The policy of academic discipline is based on the principles of academic integrity. The student is obliged to fully master the knowledge, skills, practical skills and competencies of this discipline.

Policy on compliance with the principles of academic integrity of students of higher education:

- ✓ individual performance of educational tasks of current and final controls without using external sources of information, except for cases permitted by the teacher;
- ✓ cheating during control is prohibited (including using mobile devices).

Educational policy:

- ✓ attendance at all classes is mandatory for the purpose of current and final assessment of

knowledge (except for respectable reason);
- ✓ missed classes are reworked according to the approved schedule;
- ✓ repass the topic for which the student received a negative grade is carried out at a time convenient for the teacher and the student;
- ✓ it is not allowed to repass the topic in order to impove the grade during the current and final control.

10. Books

Main sources:

1. Chalyi A.V., Tsekhmister Ya.V., Agapov B.T. Medical and Biological Physics: textbook for the students of higher medical institutions of the IV accreditation level. – Vinnytsia, Nova Knyha, 2010. – 480 p.
2. Davidovits P. Physics in biology and medicine. 5th ed. – Amsterdam: Elsevier Academic Press, 2019. – 377 p.
3. Herman I.P. Physics of the Human Body. Springer, 2008. – 860 p.
4. Hobie R.K., Roth B.J. Intermediate Physics for Medicine and Biology. Springer, 2007. – 616 p.
5. Medical and Biological Physics: Laboratory Manual for students of higher medical institutions of the IV accreditation level // Lychkovsky E., Fafula R., Fedorovych Z., Makar N., Odnorih L. – Lviv, Danylo Halytsky Lviv National Medical University, 2014. – 300 p.
6. Newman J. Physics of the Life Sciences. Springer, 2008. – 718 p.

Additional sources:

1. Cotterill R. Biophysics. An introduction. J. Wiley & Sons, 2002. – 396 p.
2. Glaser R., Biophysics, Springer, 2004.
3. Hendee W., Ritenour R. Medical imaging physics. J.Wiley&Sons, 2002.

11. Equipment, and software of the discipline / subject

- ✓ academic program of the discipline;
- ✓ lecture notes on discipline (thesis);
- ✓ lecture presentations;
- ✓ guidelines for lecturers/instructors;
- ✓ guidelines for practical classes for students;
- ✓ guidelines for individual students' work;
- ✓ test and control tasks for practical classes;
- ✓ questions and tasks for the final control (exam).

12. Additional information

Curriculum coordinator – Oksana Malanchuk, PhD, Associate Professor, oksana.malan@gmail.com
Responsible for students' science club of department – Marianna Paykush, Dr.Sci., Associate Professor, marianna.gron@gmail.com

Web page of the department: https://new.meduniv.lviv.ua/en/kafedry/kafedra-biofizyky/

Responsible for Syllabus
Roman Fafula, Dr.Sci., Professor

Head of the Department
Roman Fafula, Dr.Sci., Professor