

## Biotechnology

1st Semester Fall Term	Foreign Language	Introduction to Professional Activity	Mathematics	Social-Political Studies Module	Succeeding as a Global Wildcat / Leadership and Innovation	Fundamentals of Scientific Research / Anti-Corruption Culture, etc. (selective disciplines)	Basics of Economics, Entrepreneurship and Financial Literacy / Basics of Law and Legal Regulation
2nd Semester Spring Term	Kazakh Language	History of Kazakhstan	English Language	General Biology / Introduction to Biology	General Chemistry	Fundamentals of Scientific Research / Organization and Planning of Research Activity	Succeeding as a Global Wildcat 2 / Leadership and Innovation 2
3rd Semester Fall Term	Kazakh Language	Foreign Language Workshop 1	Theoretical Foundations of Inorganic Chemistry	Biology with Basics of Ecology / Evolutionary and Ecological Biology		Physics 1	
4th Semester Spring Term	Fundamentals of Artificial Intelligence	Foreign Language Workshop 2	Statistics	Organic Chemistry 1 / Theoretical Foundations of Organic Chemistry	Microbiology / Cell Biology with Fundamentals of Histology and Embryology	Agrobiotechnology	
5th Semester Fall Term	Foreign Language Workshop 3	Organic Chemistry 2/ The chemistry of functional derivatives of organic molecules	Biochemistry	Introduction to Biotechnology		Philosophy	
6th Semester Spring Term	Physics 2	Food Biotechnology / Fermentation of Food and Beverages	Plant Biotechnology/ Technology of Storage and Processing of Crop Production	Plant and Animal Genetics		Microbial Genetics	
7th Semester Fall Term	Core Concepts in Molecular Microbiology	Biotechnology Laboratory	Industrial Biotechnology	Scientific Writing for Environmental, Agricultural and Life Sciences	Microbial Genetics Laboratory	Statistical Foundations of the Information Age/ Dealing with Data	
8th Semester Spring Term	Introduction to Theater	Features of Entrepreneurial Activity	Plant Genetics and Genomics	Pre-Diploma Practice/ Production Practice 2		Final Presentation of Writing and Defending a Diploma Thesis/ Preparing and Passing a complex exam	

# 1st Semester

Fall Term 2025/2026

Course number <b>IYa1101</b>	Course name <b>Foreign Language</b>		
Type of course Core discipline	Semester / 2025/2026 Fall Term	Student capacity: 60	
Teaching methods Interactive language classes, group projects, self-study.	Prerequisites for attendance None	Language English	
<b>Type of examination (Final Grade Composition)</b>  Written exam (100%) (100 minutes)		<b>ECTS (+Workload in hrs)</b> 10 (240 contact hrs in class +60 hrs of self-study (together 300 hrs)	
Module coordinator Senior Instructor: Tokisheva Shnar		Semester week hours: 16	
Additional teacher involved: Zhaksylykova Ekaterina Karaulova Aliya			
<b>Syllabus</b> Content Description The course is aimed at understanding a foreign language to a sufficient extent to solve problems of interpersonal and intercultural interaction within the framework of four types of speech activity (reading, listening, writing, speaking).			
<b>Learning goals and qualifications in this module students learn to (national or international):</b>  - <b>Knowledge:</b> Recall and use key English vocabulary and grammar structures for communication. - <b>Comprehension:</b> Understand main ideas in spoken and written academic texts. - <b>Application:</b> Write short essays, summaries, and reports in English. - <b>Analysis:</b> Evaluate and discuss scientific texts using appropriate terminology. - <b>Synthesis:</b> Integrate reading, writing, and speaking skills in professional contexts. - <b>Evaluation:</b> Assess own language performance and identify strategies for improvement.			
<b>Core readings:</b>  <b>Bailey, S. (2018). Academic Writing: A Handbook for International Students. Routledge.</b> – A practical guide for improving academic English writing and communication.  <b>Jordan, R. R. (2020). English for Academic Purposes: A Guide and Resource Book for Teachers. Cambridge University Press.</b> – Focus on academic English learning strategies and classroom practice.  <b>Hyland, K. (2019). Second Language Writing. Cambridge University Press.</b> – Insights into writing in academic contexts and applied linguistics.  <b>Nation, I. S. P., &amp; Macalister, J. (2021). Language Curriculum Design. Routledge.</b> – Foundational framework for developing effective English learning curricula.  <b>Swales, J. M., &amp; Feak, C. B. (2021). Academic Writing for Graduate Students. University of Michigan Press.</b> – Genre-based approach to academic writing and reading comprehension.			

Course number VPD1201	Course name <b>Introduction to Professional Activity</b>	
Type of course Basic discipline	Semester / Rotation 2025/2026 / Fall Term	Student capacity: 50
Teaching methods Lecture, seminars, case studies, group projects.	Prerequisites for attendance None	Language English
<b>Type of examination (Final Grade Composition)</b>  Creative Exam - Presentation defense (100%), 100 minutes		<b>Example for ECTS:</b> 4 (47 contact hours in class + 73 hours of self-study (together 120 hrs)
Module coordinator Prof. Dr. Andrea Zucollo		Semester week hours: 3
Additional teacher involved: -		
<b>Syllabus</b> The course studies the prospects of using living organisms and products of their vital activity for the potential accomplishment of technological tasks and the formation of a professional perspective for the students.		
<b>Learning goals and qualifications in this module students learn to (national or international):</b>  <b>Knowledge:</b> Identify the scope and structure of biotechnological activities. <b>Comprehension:</b> Understand ethical and regulatory aspects of biotechnology. <b>Application:</b> Apply knowledge to analyze examples of biotechnological products. <b>Analysis:</b> Distinguish between research and industrial biotechnology applications. <b>Synthesis:</b> Design a simple project plan related to a biotechnological process. <b>Evaluation:</b> Critically evaluate professional responsibilities and biosafety principles.		
<b>Core readings:</b>  <b>Clark, D.P., &amp; Pazdernik, N.J. (2016). Biotechnology: Academic Cell Update Edition. Academic Press.</b> Available via UofA Library eBook Collection. Comprehensive overview of biotechnology applications, ethics, and professional responsibilities.  <b>National Research Council. (2017). Responsible Science: Ensuring the Integrity of the Research Process. National Academies Press.</b> Accessible through UofA Open Access Database. Discusses scientific integrity, professional standards, and responsible conduct in research.  <b>OECD. (2020). Innovation, Productivity and Sustainability in Food and Agriculture: Main Findings from Country Reviews. OECD iLibrary.</b> Licensed in UofA Library policy-oriented text connecting biotechnology innovation with sustainable development.  <b>Martin, M.J. (2019). Ethics and Professionalism in Engineering and Scientific Research. CRC Press.</b> Available through UofA eBooks Central. Framework for ethical reasoning and professional conduct applicable to biotechnology.  <b>Glick, B.R., &amp; Pasternak, J.J. (2010). Molecular Biotechnology: Principles and Applications of Recombinant DNA. ASM Press.</b> Available via UofA Library Access. =Foundational scientific reference for understanding molecular and industrial biotechnology processes.		

Course number Mat1202	Course name <b>Mathematics</b>		
Type of course Basic Discipline	Semester / Rotation 2025/2026 / Fall Term	Student capacity: 130	
Teaching methods Lectures, problem-solving sessions, tutorials, self-study.	Prerequisites for attendance None	Language English	
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>	
Written exam (100%), 100 minutes		6 (62contact hours in class + 118 hours of self-study (together 180hrs)	
Module coordinator Senior Lecturer: Ruslan Astamirov		Semester week hours: 4	
Additional teacher involved: -			
<b>Syllabus</b> This course provides basic mathematical tools for scientific and technical applications: algebra, functions, limits, derivatives, integrals, and basic statistics.			
<b>Learning goals and qualifications in this module students learn to (national or international):</b>			
<ul style="list-style-type: none"> <li>- <b>Knowledge:</b> Recall basic mathematical formulas and operations.</li> <li>- <b>Comprehension:</b> Explain mathematical relationships relevant to natural sciences.</li> <li>- <b>Application:</b> Solve problems involving derivatives, integrals, and equations.</li> <li>- <b>Analysis:</b> Analyze functional relationships and interpret graphs.</li> <li>- <b>Synthesis:</b> Combine mathematical methods to model simple physical or biological processes.</li> <li>- <b>Evaluation:</b> Assess the appropriateness of mathematical models in problem-solving.</li> </ul>			
<b>Core readings:</b>			
<ul style="list-style-type: none"> <li>- Stewart, J. (2015). Calculus: Early Transcendentals. Cengage Learning. – Standard reference for calculus and applied mathematics.</li> <li>-</li> <li>- Strang, G. (2016). Introduction to Linear Algebra. Wellesley–Cambridge Press. – Comprehensive guide to matrix theory and vector spaces.</li> <li>-</li> <li>- Adams, R. A., &amp; Essex, C. (2017). Calculus: A Complete Course. Pearson. – Covers calculus foundations used in engineering and sciences.</li> <li>-</li> <li>- Kreyszig, E. (2019). Advanced Engineering Mathematics. Wiley. – Application of mathematics to physical and biological problems.</li> <li>-</li> <li>- De Veaux, R. D., Velleman, P. F., &amp; Bock, D. E. (2021). Intro Stats. Pearson. – Foundational understanding of applied statistics and data interpretation.</li> </ul>			

Course number MSPZ1103	Course name <b>Social-Political Studies Module</b>		
Type of course Basic Discipline	Semester / Rotation 2025/2026 / Fall Term	Student capacity: 130	
Teaching methods Lectures, discussions, debates, project work.	Prerequisites for attendance None	Language English	
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>	
Written exam (100%), 100 minutes		8 (77 contact hours in class + 163 hours of self-study (together 240hrs)	
Module coordinator Senior Lecturer: Alexey Malikov		Semester week hours: 5	
Additional teacher involved: -			
<b>Syllabus</b> The module provides an overview of social, political, and ethical issues affecting modern society and the development of information systems. It covers political systems, civic responsibility, social institutions, globalization, cultural diversity, and sustainable development. Special attention is given to the role of digital technologies in social change and governance.			
<b>Learning goals and qualifications in this module students learn to (national or international):</b>			
<b>Knowledge:</b> Define basic concepts of political science, sociology, and ethics.			
<b>Comprehension:</b> Explain relationships between society, government, technology and science.			
<b>Application:</b> Apply social and political theories to case studies related to information systems and management.			
<b>Analysis:</b> Critically analyze civic, ethical, and sustainability challenges in professional activity.			
<b>Synthesis:</b> Integrate political, economic, and ethical knowledge to propose civic and organizational solutions.			
<b>Evaluation:</b> Assess social policies and digital initiatives and their impact on sustainable innovation and social justice.			
<b>Core readings:</b>			
Heywood, A. (2021). <i>Political Theory: An Introduction</i> . Palgrave Macmillan. – Explains political systems, ideologies, and governance principles.			
Macionis, J. J., & Plummer, K. (2023). <i>Sociology: A Global Introduction</i> . Pearson. – Overview of social structures and cultural processes.			
Fukuyama, F. (2018). <i>Identity: The Demand for Dignity and the Politics of Resentment</i> . Farrar, Straus and Giroux. – Exploration of identity politics in modern society.			
Sen, A. (2021). <i>Development as Freedom</i> . Oxford University Press. – Interconnection of economy, democracy, and social development.			
United Nations. (2020). <i>Sustainable Development Goals Report</i> . UN Publications. – Global social and political framework for sustainability education.			

Course number SAGW/LIU1107	Course name <b>Succeeding as a Global Wildcat / Leadership and Innovation</b> (one discipline to choose from)		
Type of course Additional type of study	Semester / Rotation 2025/2026 / Fall Term	Student capacity: 130	
Teaching methods Workshops, discussions, teamwork, presentations.	Prerequisites for attendance None	Language English	
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>	
Assessment based on participation and project performance (100%)		1 (10 contact hours in class + 20 hours of self-study (together 30hrs))	
Module coordinator Senior Lecturer: Katelyn Maragi		Semester week hours: 0,5	
Additional teacher involved: -			
<b>Syllabus</b> The course develops leadership and teamwork skills in multicultural and academic environments. Students learn principles of innovation, creativity, and global citizenship.			
<b>Learning goals and qualifications in this module students learn to (national or international):</b>			
<ul style="list-style-type: none"> <li>-<b>Knowledge:</b> Recognize the importance of leadership and collaboration.</li> <li>- <b>Comprehension:</b> Understand principles of innovation and creative thinking.</li> <li>- <b>Application:</b> Apply leadership and teamwork strategies to group projects.</li> <li>- <b>Analysis:</b> Evaluate team dynamics and problem-solving effectiveness.</li> <li>-<b>Synthesis:</b> Propose innovative solutions to community or academic challenges.</li> <li>-<b>Evaluation:</b> Reflect on personal leadership style and growth.</li> </ul>			
<b>Core readings:</b>			
<ul style="list-style-type: none"> <li>- Kotter, J. P. (2012). <i>Leading Change</i>. Harvard Business Review Press. – Classic model of effective leadership and organizational transformation.</li> <li>- Northouse, P. G. (2021). <i>Leadership: Theory and Practice</i>. SAGE Publications. – Comprehensive overview of leadership theories and applications.</li> <li>- Goleman, D. (2020). <i>Emotional Intelligence: Why It Can Matter More Than IQ</i>. Bantam Books. – Development of self-awareness and team effectiveness.</li> <li>- Pink, D. H. (2018). <i>Drive: The Surprising Truth About What Motivates Us</i>. Penguin Books. – Insights into human motivation and innovative work culture.</li> <li>- Maxwell, J. C. (2021). <i>The 21 Irrefutable Laws of Leadership</i>. HarperCollins. – Practical guide for developing personal and professional leadership skills.</li> </ul>			

Course number	Course name: <b>Fundamentals of Scientific Research / Anti-Corruption Culture / Ecology and Sustainable Development / Life Safety / Inclusive Practices / Climate Change</b> (one discipline to choose from)	
Type of course Basic Course	Semester / Rotation 2025/2026 / Fall Term	Student capacity: 130
Teaching methods Workshops, discussions, teamwork, presentations.	Prerequisites for attendance None	Language English
<b>Type of examination (Final Grade Composition)</b>  Written Exam (100%) (100 minutes)		<b>ECTS (+Workload in hrs)</b>  3 (47 contact hours in class + 43 hours of self-study (together 90hrs)
Module coordinator Senior Lecturer:		Semester week hours: 3
Additional teacher involved: -		
<p><b>Syllabus</b></p> <p>This interdisciplinary course fosters students' research literacy, civic ethics, and environmental responsibility as part of their academic and professional development. <b>The Fundamentals of Scientific Research</b> component introduces methods of observation, hypothesis formulation, data collection, and analysis in natural sciences. <b>The Anti-Corruption Culture</b> unit explores legal and ethical norms promoting integrity and transparency in professional environments. <b>Ecology and Sustainable Development</b> highlights environmental challenges, ecosystem dynamics, and sustainability principles in the context of biotechnology. <b>The Life Safety</b> component develops understanding of occupational health, safety, and emergency preparedness. <b>Inclusive Practices</b> train students to create equitable and accessible professional environments. The <b>Climate Change</b>, examines global climatic processes, human impact, and mitigation strategies aligned with the UN Sustainable Development Goals (SDGs).</p>		
<p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <ul style="list-style-type: none"> <li>- <b>Knowledge:</b> Recall basic concepts and terminology of scientific research, ecology, and ethics.</li> <li>- <b>Comprehension:</b> Explain the principles of sustainable development, inclusion, and integrity in scientific practice.</li> <li>- <b>Application:</b> Apply research methods to simple case studies and demonstrate safe and ethical behavior in professional settings.</li> <li>- <b>Analysis:</b> Analyze environmental and ethical issues using evidence-based approaches.</li> <li>- <b>Synthesis:</b> Integrate research, ethics, and sustainability perspectives to design responsible solutions to real-world problems.</li> <li>- <b>Evaluation:</b> Critically assess the social and environmental impact of professional decisions, demonstrating commitment to transparency, safety, and sustainability.</li> </ul>		

**Core readings:**

- Creswell, J. W., & Creswell, J. D. (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE Publications.
- UNESCO. (2020). *Education for Sustainable Development Goals: Learning Objectives*. UNESCO Publishing.
- OECD. (2021). *Integrity and Anti-Corruption in Higher Education*. OECD iLibrary.
- Bell, J., & Waters, S. (2018). *Doing Your Research Project: A Guide for First-Time Researchers*. McGraw-Hill Education.
- IPCC. (2021). *Climate Change 2021: The Physical Science Basis*. Cambridge University Press.

Course number	Course name: Basics of Economics, Entrepreneurship and Financial Literacy / Basics of Law and Legal Regulation (one discipline to choose from)		
Type of course Core Course	Semester / Rotation 2025/2026 / Fall Term	Student capacity: 130	
Teaching methods Lectures, discussions, problem-based learning, case studies, and individual projects.	Prerequisites for attendance None	Language English	
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>	
Written Exam (100%) (100 minutes)		5 (47 contact hours in class + 103 hours of self-study (together 150 hrs))	
Module coordinator Dr. Dimash Shaikin		Semester week hours: 3	
Additional teacher involved: -			
<p><b>Syllabus</b></p> <p><b>Basics of Economics, Entrepreneurship and Financial Literacy</b></p> <p>This course introduces the fundamentals of economics, entrepreneurship, and financial literacy as essential competencies for biotechnology professionals. Students learn the principles of supply and demand, types of market structures, and the role of government in the economy. The entrepreneurship component covers innovation processes, startup creation, and small business management, with emphasis on financial literacy — budgeting, investment, and basic accounting. Case studies are used to connect economic theory to real-world biotech enterprises and sustainable innovation. Students develop analytical and decision-making skills for responsible participation in the bioeconomy.</p> <p><b>Basics of Law and Legal Regulation</b></p> <p>This course provides a foundation in law and legal regulation relevant to professional and scientific activities. It covers the structure of national and international legal systems, key principles of constitutional, civil, and business law, and the protection of intellectual property. Special attention is given to regulatory frameworks governing biotechnology, environmental law, and bioethics. Students learn about anti-corruption mechanisms, compliance procedures, and professional legal responsibility. The course aims to cultivate legal awareness and ethical decision-making in the context of scientific research and entrepreneurship.</p>			
<b>Learning goals and qualifications in this module students learn to (national or international):</b>			
<p><b>Basics of Economics, Entrepreneurship and Financial Literacy</b></p> <ul style="list-style-type: none"> <li>- <b>Knowledge:</b> Define key concepts of economics, entrepreneurship, and finance.</li> <li>- <b>Comprehension:</b> Explain how economic systems and innovation affect biotechnological industries.</li> <li>- <b>Application:</b> Develop a basic financial plan for a small business or project.</li> <li>- <b>Analysis:</b> Analyze market trends and interpret simple financial data.</li> <li>- <b>Synthesis:</b> Integrate economic and entrepreneurial principles to propose innovative business ideas.</li> <li>- <b>Evaluation:</b> Critically assess business sustainability and ethical financial decision-making.</li> </ul> <p><b>Basics of Law and Legal Regulation</b></p>			

- **Knowledge:** Identify the main branches of law and their role in regulating professional and scientific activity.
- **Comprehension:** Explain the relationship between legal norms, ethics, and social responsibility.
- **Application:** Apply legal principles to real-world scenarios involving business or research.
- **Analysis:** Analyze case studies concerning intellectual property or bioethical issues.
- **Synthesis:** Integrate legal and ethical considerations into project planning and innovation management.
- **Evaluation:** Critically evaluate legal risks and propose compliant, ethical solutions in professional practice.

**Core readings:**

- Samuelson, P. A., & Nordhaus, W. D. (2019). *Economics*. McGraw-Hill Education.
- Drucker, P. F. (2014). *Innovation and Entrepreneurship*. Routledge.
- Mankiw, N. G. (2021). *Principles of Economics*. Cengage Learning.
- Osterwalder, A., & Pigneur, Y. (2020). *Business Model Generation*. Wiley.
- OECD. (2020). *Entrepreneurship Education in Europe: Trends and Practices*. OECD iLibrary.
- Beatty, J. F., Samuelson, S. S., & Abril, P. S. (2022). *Introduction to Business Law*. Cengage Learning.
- Tricker, B. (2019). *Corporate Governance: Principles, Policies, and Practices*. Oxford University Press.
- OECD. (2021). *Integrity and Anti-Corruption in Higher Education*. OECD iLibrary.
- Martin, M. J. (2019). *Ethics and Professionalism in Engineering and Scientific Research*. CRC Press.
- UNESCO. (2021). *Recommendation on Open Science*. UNESCO Publishing.

# 2nd Semester

## Winter Term 2025/2026

Course number K(R)Ya1104	Course name: <b>Kazakh Language</b>		
Type of course Core Course	Semester / Rotation 2025/2026 / Winter Term	Student capacity: 130	
Teaching methods interactive classes, practical communication, and self-study.	Prerequisites for attendance None	Language English	
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>	
Computer Testing (100%) (100 minutes)		5 (47 contact hours in class + 103 hours of self-study (together 150hrs)	
Module coordinator Prof. Dr. Zhanar Talaspaeva		Semester week hours: 3	
Additional teacher involved: -			
<p><b>Syllabus</b></p> <p>This course develops communicative competence in Kazakh, focusing on professional and academic vocabulary. It improves reading, writing, and speaking skills required for academic and workplace contexts.</p>			
<p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <ul style="list-style-type: none"> <li>- <b>Knowledge:</b> Recall key linguistic rules and vocabulary relevant to academic and professional settings.</li> <li>- <b>Comprehension:</b> Understand and interpret texts in Kazakh or Russian in the field of biotechnology.</li> <li>- <b>Application:</b> Communicate effectively in oral and written forms in professional contexts.</li> <li>- <b>Analysis:</b> Analyze language structures and stylistic features of professional texts.</li> <li>- <b>Synthesis:</b> Produce coherent reports or presentations integrating technical and linguistic accuracy.</li> <li>- <b>Evaluation:</b> Assess the quality of communication and language use in academic work.</li> </ul>			
<p><b>Core readings:</b></p> <ul style="list-style-type: none"> <li>- Sarsembayeva, N. (2020). Kazakh Language for Academic Purposes. Almaty: KazNU Press.</li> </ul>			

Course number IK1102	Course name: <b>History of Kazakhstan</b>		
Type of course Core Course	Semester / Rotation 2025/2026 / Winter Term	Student capacity: 130	
Teaching methods Lectures, seminars, group discussions, and document analysis.	Prerequisites for attendance None	Language English	
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>	
Written form (State exam) (100%) (100 minutes)		5 (62 contact hours in class + 88 hours of self-study (together 150hrs)	
Module coordinator Senior Lecturer: Alexey Malikov		Semester week hours: 4	
Additional teacher involved: -			
<p><b>Syllabus</b></p> <p>The course examines the historical development of Kazakhstan from ancient times to the present. It covers major political, economic, and cultural milestones, emphasizing national identity and modernization processes.</p>			
<p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <ul style="list-style-type: none"> <li>- <b>Knowledge:</b> Identify key events and figures in Kazakhstan's history.</li> <li>- <b>Comprehension:</b> Explain the relationship between historical events and the country's socio-political development.</li> <li>- <b>Application:</b> Apply historical knowledge to understand national identity and policy evolution.</li> <li>- <b>Analysis:</b> Analyze historical documents and sources critically.</li> <li>- <b>Synthesis:</b> Integrate historical perspectives into understanding modern societal challenges.</li> <li>- <b>Evaluation:</b> Assess historical interpretations and their impact on civic values.</li> </ul>			
<p><b>Core readings:</b></p> <p>- Ministry of Education and Science RK (2022). History of Kazakhstan: Official Textbook. Nur-Sultan: Mektep Press.</p>			

Course number AYa1203	Course name: <b>English Language</b>	
Type of course Basic Course	Semester / Rotation 2025/2026 / Winter Term	Student capacity: 130
Teaching methods Interactive language practice, grammar workshops, and project-based learning.	Prerequisites for attendance None	Language English
<b>Type of examination (Final Grade Composition)</b>  Written form (100%) (100 minutes)		<b>ECTS (+Workload in hrs)</b>  5 (122 contact hours in class + 28 hours of self-study (together 150hrs))
Course coordinator Senior Instructor: Shnar Tokisheva		Semester week hours: 8
Additional teacher involved: -		
<b>Syllabus</b> The course is aimed at developing professional English language skills, enabling future specialists to implement various aspects of their professional activities in order to enhance their level of professional competence.		
<b>Learning goals and qualifications in this module students learn to (national or international):</b> <ul style="list-style-type: none"> <li>-<b>Knowledge:</b> Recall and use key grammar and vocabulary for academic purposes.</li> <li>-<b>Comprehension:</b> Understand academic texts and lectures in English.</li> <li>-<b>Application:</b> Write structured essays and research abstracts.</li> <li>-<b>Analysis:</b> Analyze text organization and coherence in English academic writing.</li> <li>-<b>Synthesis:</b> Integrate reading, writing, and speaking skills in professional contexts..</li> <li>-<b>Evaluation:</b> Assess the effectiveness of written and spoken communication.</li> </ul>		
<b>Core readings:</b> - Swales, J. M., & Feak, C. B. (2021). Academic Writing for Graduate Students. University of Michigan Press.		

Course number OB/VB1206	Course name: General Biology / Introduction to Biology (one discipline to choose from)	
Type of course Basic Course	Semester / Rotation 2025/2026 / Winter Term	Student capacity: 60
Teaching methods Lectures, lab work, field observations, and multimedia demonstrations.	Prerequisites for attendance None	Language English
<b>Type of examination (Final Grade Composition)</b>  Written form (100%) (100 minutes)		<b>ECTS (+Workload in hrs)</b>  8 (92 contact hours in class + 148 hours of self-study (together 240hrs))
Course coordinator: Prof. Dr. Andrea Zucollo		Semester week hours: 8
Additional teacher involved: Dr. Saule Musurova		
<p><b>Syllabus</b></p> <p><b>General Biology</b></p> <p>The course explores the history of the development of modern concepts of living nature, outstanding discoveries in biological science that have become part of human culture; the complex and contradictory paths of development of modern scientific views, ideas, theories, concepts, and hypotheses (about the essence and origin of life, and humans); the role of biological science in shaping the modern natural-scientific worldview; methods of scientific knowledge; biological systems (cell, organism, population, species, ecosystem).</p> <p><b>Introduction to Biology</b></p> <p>The discipline introduces students to the fundamental principles of modern science – biology; teaches students to interpret scientific facts and hypotheses, formulate and justify their own point of view; cultivates skills in independent work with scientific and methodological literature and conducting research for necessary information.</p>		
<p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <ul style="list-style-type: none"> <li>-<b>Knowledge:</b> Define fundamental biological concepts and terminology.</li> <li>-<b>Comprehension:</b> Explain the organization and function of biological systems.</li> <li>-<b>Application:</b> Apply biological principles to simple laboratory and environmental tasks.</li> <li>-<b>Analysis:</b> Analyze biological data and phenomena.</li> <li>-<b>Synthesis:</b> Integrate biological knowledge to explain complex life processes.</li> <li>-<b>Evaluation:</b> Evaluate scientific information and experimental results</li> </ul>		
<p><b>Core readings:</b></p> <ul style="list-style-type: none"> <li>- Campbell, N. A., &amp; Reece, J. B. (2020). Biology. Pearson Education.</li> </ul>		

Course number OH1204	Course name: <b>General Chemistry</b>		
Type of course Basic Course	Semester / Rotation 2025/2026 / Winter Term	Student capacity: 60	
Teaching methods Lectures, lab work, field observations, and multimedia demonstrations.	Prerequisites for attendance None	Language English	
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>	
Written form (100%) (100 minutes)		8 (92 contact hours in class + 148 hours of self-study (together 240hrs)	
Course coordinator: Associate Prof. Dr. Yuliya Byzova		Semester week hours: 8	
Additional teacher involved: Roman Tarunin			
<p><b>Syllabus</b></p> <p>The course is aimed at acquiring sufficient knowledge and the appropriate application of fundamental ideas related to atomic and molecular structure. It emphasizes the understanding of the local and global significance of chemistry for the environment and industry.</p>			
<p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <ul style="list-style-type: none"> <li>-<b>Knowledge:</b> Recall atomic theory, chemical laws, and periodic relationships.</li> <li>-<b>Comprehension:</b> Explain the properties and reactions of chemical elements and compounds.</li> <li>-<b>Application:</b> Perform basic laboratory experiments following safety regulations.</li> <li>-<b>Analysis:</b> Analyze chemical data and reaction outcomes.</li> <li>-<b>Synthesis:</b> Develop experimental procedures to test chemical hypotheses</li> <li>-<b>Evaluation:</b> Evaluate experimental accuracy and reliability of results.</li> </ul>			
<p><b>Core readings:</b></p> <ul style="list-style-type: none"> <li>- Ebbing, D., &amp; Gammon, S. D. (2017). General Chemistry. Cengage Learning.</li> </ul>			

Course number ONID/OPID1207	Course name: <b>Fundamentals of Scientific Research / Organization and Planning of Research Activity</b> (one discipline to choose from)		
Type of course Basic Course	Semester / Rotation 2025/2026 / Winter Term	Student capacity: 60	
Teaching methods Lectures, lab work, field observations, and multimedia demonstrations.	Prerequisites for attendance None	Language English	
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>	
Creative exam (100%) (100 minutes)		4 (62contact hours in class + 58 hours of self-study (together 120hrs)	
Course coordinator: Senior Lecturer: Roman Tarunin		Semester week hours: 4	
Additional teacher involved:			
<p><b>Syllabus</b></p> <p><b>Fundamentals of Scientific Research</b></p> <p>This course introduces the basic concepts and tools of scientific research. Students learn to identify research problems, design experiments, analyze results, and plan research projects effectively in biotechnology.</p> <p><b>Organization and Planning of Research Activity</b></p> <p>The course focuses on the principles and methods of organizing and planning scientific research. Students learn to design research projects, manage resources and timelines, and apply modern approaches to effective research coordination. Emphasis is placed on project structure, documentation, teamwork, and ethical standards in scientific activity.</p>			
<b>Learning goals and qualifications in this module students learn to (national or international):</b>			
<p><b>Fundamentals of Scientific Research</b></p> <ul style="list-style-type: none"> <li>-<b>Knowledge:</b> Identify stages of scientific research and project planning.</li> <li>-<b>Comprehension:</b> Explain research design and data analysis principles.</li> <li>-<b>Application:</b> Develop a small research proposal using proper methodology.</li> <li>-<b>Analysis:</b> Analyze the structure and ethics of research publications.</li> <li>-<b>Synthesis:</b> Integrate various research methods for solving complex problems.</li> <li>-<b>Evaluation:</b> Critically assess research design quality and data interpretation.</li> </ul> <p><b>Organization and Planning of Research Activity</b></p> <ul style="list-style-type: none"> <li>-<b>Knowledge:</b> Define the fundamental principles and organizational structure of scientific research activities.</li> <li>-<b>Comprehension:</b> Explain the stages of planning and managing research projects within institutional and funding frameworks.</li> <li>- <b>Application:</b> Apply project management tools and scheduling techniques in organizing research work.</li> <li>-<b>Analysis:</b> Analyze research resources, risks, and time management strategies to ensure project efficiency.</li> <li>-<b>Synthesis:</b> Design a structured research plan integrating interdisciplinary collaboration and innovation.</li> </ul>			

- **Evaluation:** Evaluate the effectiveness of research organization and planning processes using performance indicators and quality criteria.

**Core readings:**

1. Creswell, J. W., & Creswell, J. D. (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (5th ed.). Thousand Oaks, CA: SAGE Publications.
2. Punch, K. F. (2014). *Introduction to Social Research: Quantitative and Qualitative Approaches* (3rd ed.). London: SAGE.
3. Bryman, A. (2016). *Social Research Methods* (5th ed.). Oxford: Oxford University Press.
4. Saunders, M., Lewis, P., & Thornhill, A. (2019). *Research Methods for Business Students* (8th ed.). Harlow: Pearson Education.

Course number SAGW/LIU1108	Course name: <b>Succeeding as a Global Wildcat 2 / Leadership and Innovation 2</b> (one discipline to choose from)		
Type of course Additional type of study	Semester / Rotation 2025/2026 / Winter Term	Student capacity: 130	
Teaching methods Workshops, teamwork, presentations, and reflective assignments.	Prerequisites for attendance -	Language English	
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>	
Assessment based on participation and project performance (100%)		1 (10 contact hours in class + 20 hours of self-study (together 30))	
Course coordinator: Senior Lecturer: Katelyn Maragi		Semester week hours: 0,7	
Additional teacher involved:			
<p><b>Syllabus</b></p> <p>The course serves as an introduction to studying at the University of Arizona as an international student studying at one of our many microcampuses. In addition to communicating with fellow students at the main campus in Tucson and familiarizing themselves with the university's online lesson management system D2L (Desire 2 Learn), students will actively develop cultural knowledge and academic skills that are fundamental to university life in the United States.</p>			
<p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <ul style="list-style-type: none"> <li>-<b>Knowledge:</b> Describe principles of leadership and innovation.</li> <li>-<b>Comprehension:</b> Understand the role of teamwork and global competence.</li> <li>-<b>Application:</b> Apply leadership skills in team-based projects.</li> <li>-<b>Analysis:</b> Evaluate team performance and problem-solving strategies.</li> <li>-<b>Synthesis:</b> Design innovative solutions addressing global challenges.</li> <li>-<b>Evaluation:</b> Reflect on personal leadership style and effectiveness.</li> </ul>			
<p><b>Core readings:</b></p> <ul style="list-style-type: none"> <li>- Northouse, P. G. (2021). Leadership: Theory and Practice. SAGE Publications.</li> </ul>			

Course number SAGW/LIU1108	Course name: <b>Educational Practice</b>	
Type of course Additional type of study	Semester / Rotation 2025/2026 / Winter Term	Student capacity: 60
Teaching methods Supervised practice, observation, lab work, and reporting.	Prerequisites for attendance None	Language English
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>
Assessment based on participation and project performance (100%)		2 (6 contact hours in class + 54 hours of self-study (together 60))
Course coordinator: Associate Professor Dr. Yuliya Byzova		Semester week hours: 3
Additional teacher involved:		
<b>Syllabus</b> Formation of practical professional skills in students, acquisition of initial practical experience in the main types of professional activity for their subsequent acquisition of general and professional competencies in their chosen specialty.		
<b>Learning goals and qualifications in this module students learn to (national or international):</b> <ul style="list-style-type: none"> <li>-<b>Knowledge:</b> Recognize the structure and objectives of professional laboratory practice.</li> <li>-<b>Comprehension:</b> Understand safety standards and organizational aspects of laboratory work.</li> <li>-<b>Application:</b> Perform supervised experiments or project tasks.</li> <li>-<b>Analysis:</b> Analyze collected data and report results accurately.</li> <li>-<b>Synthesis:</b> Combine theoretical and practical knowledge to solve real-world problems.</li> <li>-<b>Evaluation:</b> Evaluate personal performance and identify areas for improvement.</li> </ul>		
<b>Core readings:</b> <ul style="list-style-type: none"> <li>- University Internship Manual, Kozybayev University (latest edition).</li> </ul>		

# 3rd Semester

Fall Term 2026/2027

Course number K(R)Ya1104	Course name: <b>Kazakh Language</b>	
Type of course Core Course	Semester / Rotation 2026/2027 / Fall Term	Student capacity: 130
Teaching methods interactive classes, practical communication, and self-study.	Prerequisites for attendance -	Language Kazakh
<b>Type of examination (Final Grade Composition)</b>  Computer Testing (100%) (100 minutes)		<b>ECTS (+Workload in hrs)</b>  5 (47 contact hours in class + 103 hours of self-study (together 150hrs)
Module coordinator Prof. Dr. Zhanar Talaspaeva		Semester week hours: 3
Additional teacher involved: -		
<p><b>Syllabus</b></p> <p>This course develops communicative competence in Kazakh, focusing on professional and academic vocabulary. It improves reading, writing, and speaking skills required for academic and workplace contexts. The formation of a socio-humanitarian worldview in students within the context of the national idea of spiritual modernization, which involves the development of qualities such as internationalism and tolerance towards world cultures and languages based on national consciousness and cultural codes. These qualities serve as conveyors of world-class knowledge, advanced modern technologies, the use and transfer of which can ensure the modernization of the country and the personal career growth of future specialists.</p>		
<p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <ul style="list-style-type: none"> <li>- <b>Knowledge:</b> Recall academic and professional vocabulary in Kazakh.</li> <li>- <b>Comprehension:</b> Interpret professional and academic texts in the chosen language.</li> <li>- <b>Application:</b> Write structured reports and deliver oral presentations on biotechnological topics.</li> <li>- <b>Analysis:</b> Analyze linguistic and stylistic aspects of professional texts.</li> <li>- <b>Synthesis:</b> Combine grammar and vocabulary skills to produce coherent scientific communication.</li> <li>- <b>Evaluation:</b> Evaluate oral and written scientific communication for accuracy and style.</li> </ul>		

**Core readings:**

1. Sarsembayeva, N. (2020). \*Kazakh Language for Academic Purposes. KazNU Press.
2. Iskakova, G. (2021). \*Professional Communication in Kazakh Language. Nur-Sultan: UMO RK.
3. Barysheva, T. (2019). \*Russian Language for Academic and Professional Purposes. Academia.

Course number PYa2205	Course name: <b>Foreign Language Workshop 1</b>		
Type of course Basic Course	Semester / Rotation 2026/2027 / Winter Term	Student capacity: 130	
Teaching methods Interactive practice, pair work, listening comprehension, reading and writing exercises, and group discussions.	Prerequisites for attendance English Language	Language English	
<b>Type of examination (Final Grade Composition)</b> Written exam (100%) (100 minutes)		<b>ECTS (+Workload in hrs)</b> 6 (152 contact hours in class + 28 hours of self-study (together 180hrs)	
Course coordinator: Senior Instructor: Shnar Tokisheva		Semester week hours: 4	
Additional teacher involved:			
<p><b>Syllabus</b></p> <p>The course is designed to enhance students' ability to master the English language. Students work on expanding their vocabulary, as well as improving reading comprehension and basic writing skills. The emphasis is placed on acquiring the skills necessary for working in an English-speaking environment and achieving success in studies.</p>			
<p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <ul style="list-style-type: none"> <li>-<b>Knowledge:</b> Recall specialized vocabulary and grammar used in scientific English.</li> <li>-<b>Comprehension:</b> Understand spoken and written academic texts.</li> <li>-<b>Application:</b> Write academic essays, reports, and summaries in English.</li> <li>-<b>Analysis:</b> Analyze and interpret scientific information from English sources.</li> <li>-<b>Synthesis:</b> Combine different language skills to communicate effectively in a research environment.</li> <li>-<b>Evaluation:</b> Assess written and spoken English performance for academic and professional adequacy.</li> </ul>			
<p><b>Core readings:</b></p> <ol style="list-style-type: none"> <li>1. Bailey, S. (2018). *Academic Writing: A Handbook for International Students. Routledge.</li> <li>2. Jordan, R. R. (2020). *English for Academic Purposes. Cambridge University Press.</li> <li>3. Swales, J. M., &amp; Feak, C. B. (2021). *Academic Writing for Graduate Students. University of Michigan Press.</li> </ol>			

Course number TONH2110	Course name: <b>Theoretical Foundations of Inorganic Chemistry</b>		
Type of course Core Course	Semester / Rotation 2026/2027 / Fall Term	Student capacity: 60	
Teaching methods Lectures, problem-solving seminars, laboratory demonstrations, and independent work.	Prerequisites for attendance General Chemistry	Language English	
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>	
Written exam (100%) (100 minutes)		8 (92 contact hours in class + 148 hours of self-study (together 240))	
Course coordinator: Associate Professor Dr. Yuliya Byzova		Semester week hours: 6	
Additional teacher involved: -			
<p><b>Syllabus</b></p> <p>The discipline is aimed at acquiring sufficient knowledge and the appropriate application of fundamental concepts related to chemical kinetics, electrochemistry, and thermodynamics. It emphasizes the understanding of the local and global significance of chemistry for the environment and industry.</p>			
<p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <ul style="list-style-type: none"> <li>-<b>Knowledge:</b> Recall periodic properties and bonding models in inorganic compounds.</li> <li>- <b>Comprehension:</b> Explain the structure and reactivity of elements and coordination complexes.</li> <li>-<b>Application:</b> Apply inorganic chemistry theories to experimental data and problem-solving.</li> <li>-<b>Analysis:</b> Analyze trends in chemical behavior based on atomic and molecular properties.</li> <li>-<b>Synthesis:</b> Predict the behavior of new inorganic materials in biological systems.</li> <li>-<b>Evaluation:</b> Critically evaluate theoretical models and experimental findings.</li> </ul>			
<p><b>Core readings:</b></p> <ol style="list-style-type: none"> <li>1. Miessler, G. L., &amp; Tarr, D. A. (2019). Inorganic Chemistry. Pearson Education.</li> <li>2. Atkins, P., &amp; Overton, T. (2020). Shriver &amp; Atkins' Inorganic Chemistry. Oxford University Press.</li> <li>3. Housecroft, C. E., &amp; Sharpe, A. G. (2018). Inorganic Chemistry. Pearson Education.</li> </ol>			

Course number BOE/EEB2212	Course name: <b>Biology with Basics of Ecology / Evolutionary and Ecological Biology</b> (one discipline to choose from)		
Type of course Basic Course	Semester / Rotation 2026/2027 / Fall Term	Student capacity: 60	
Teaching methods Lectures, laboratory work, ecological field studies, and team projects.	Prerequisites for attendance Introduction to Biology	Language English	
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>	
Written exam (100%) (100 minutes)		8 (92 contact hours in class + 148 hours of self-study (together 240))	
Course coordinator: Senior Lecturer: Galina Gordiyanova		Semester week hours: 6	
Additional teacher involved: -			
<p><b>Syllabus</b></p> <p><b>Biology with Basics of Ecology</b> The discipline explores the history of the development of modern concepts of living nature, outstanding discoveries in biological science that have become part of human culture; the complex and contradictory paths of development of modern scientific views, ideas, theories, concepts, and hypotheses (about the essence and origin of life, humans); the role of biological science in shaping the modern natural-scientific worldview; methods of scientific cognition; biological systems (cell, organism, population, species, ecosystem).</p> <p><b>Evolutionary and Ecological Biology</b> The discipline is aimed at training highly specialized specialists with a broad general biological education, who are knowledgeable about the fundamental principles of the development of living organisms, with a focus on ecology and evolutionary theory.</p>			
<p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <p><b>Biology with Basics of Ecology</b></p> <ul style="list-style-type: none"> <li>- <b>Knowledge:</b> Describe fundamental principles of ecology and evolution.</li> <li>- <b>Comprehension:</b> Explain ecological relationships and evolutionary processes.</li> <li>- <b>Application:</b> Apply ecological methods in field and laboratory research.</li> <li>- <b>Analysis:</b> Analyze population and environmental data for trends and variability.</li> <li>- <b>Synthesis:</b> Integrate ecological and evolutionary theory to explain biodiversity.</li> <li>- <b>Evaluation:</b> Evaluate human impacts and propose sustainable solutions.</li> </ul> <p><b>Evolutionary and Ecological Biology</b></p> <ul style="list-style-type: none"> <li>- <b>Knowledge:</b> Identify fundamental concepts of evolution, ecology, and biodiversity.</li> <li>- <b>Comprehension:</b> Explain mechanisms of natural selection, adaptation, and ecological interactions.</li> <li>- <b>Application:</b> Apply evolutionary and ecological principles to analyze biological systems and environmental issues.</li> <li>- <b>Analysis:</b> Distinguish relationships among species, populations, and ecosystems using analytical methods.</li> </ul>			

**-Synthesis:** Integrate evolutionary theory and ecological data to explain complex biological phenomena.

**-Evaluation:** Critically assess human impact on ecosystems and evaluate strategies for biodiversity conservation.

**Core readings:**

1. Campbell, N. A., & Reece, J. B. (2020). *Biology*. Pearson Education.
2. Molles, M. C. (2020). *Ecology: Concepts and Applications*. McGraw-Hill Education.
3. Freeman, S., & Herron, J. C. (2019). *Evolutionary Analysis*. Pearson Education.

Course number Fiz2208	Course name: <b>Physics 1</b>		
Type of course Basic Course	Semester / Rotation 2026/2027 / Fall Term	Student capacity: 60	
Teaching methods Lectures, problem-solving workshops, lab experiments, and tutorials.	Prerequisites for attendance -	Language English	
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>	
Written exam (100%) (100 minutes)		8 (92 contact hours in class + §48 hours of self-study (together 240)	
Course coordinator: Senior Lecturer: Ruslan Astamirov		Semester week hours: 6	
Additional teacher involved: -			
<p><b>Syllabus</b></p> <p>The introductory physics course for first-year students, based on mathematical calculus, introduces classical mechanics. The science of mechanics describes and explains the causes of changes in the motion of bodies. Key concepts such as space, time, mass, and force are given clear working definitions, which serve as the foundation for empirical discovery and verification of Newton's laws of motion. Concepts such as center of mass, momentum, torque, angular momentum, work, kinetic, and potential energy are introduced in a well-motivated manner, and the 'conservation laws' (more accurately, theorems in the context of mechanics) are derived from Newton's laws.</p>			
<p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <ul style="list-style-type: none"> <li>-<b>Knowledge:</b> Recall fundamental physical quantities and laws of motion.</li> <li>-<b>Comprehension:</b> Explain the physical meaning of work, energy, and force interactions.</li> <li>-<b>Application:</b> Apply physical principles to analyze mechanical systems.</li> <li>-<b>Analysis:</b> Analyze data from physical experiments and interpret graphical results.</li> <li>-<b>Synthesis:</b> Integrate theoretical and experimental understanding in biophysical contexts.</li> <li>-<b>Evaluation:</b> Evaluate experimental accuracy and theoretical consistency.</li> </ul>			
<p><b>Core readings:</b></p> <ol style="list-style-type: none"> <li>1. Young, H. D., &amp; Freedman, R. A. (2020). University Physics with Modern Physics. Pearson Education.</li> <li>2. Halliday, D., Resnick, R., &amp; Walker, J. (2018). Fundamentals of Physics. Wiley.</li> <li>3. Serway, R. A., &amp; Jewett, J. W. (2019). Physics for Scientists and Engineers. Cengage Learning.</li> </ol>			

# 4th Semester

## Spring Term 2026/2027

Course number	Course name: <b>Fundamentals of Artificial Intelligence</b>	
Type of course Basic Course	Semester / Rotation 2026/2027 / Spring Term	Student capacity: 130
Teaching methods Lectures, problem-solving workshops, seminars	Prerequisites for attendance -	Language English
<b>Type of examination (Final Grade Composition)</b>  Written exam (100%) (100 minutes)		<b>ECTS (+Workload in hrs)</b>  5 (62 contact hours in class + 88 hours of self-study (together 150))
Course coordinator: Senior Lecturer: Vladislav Semenyuk		Semester week hours: 4
Additional teacher involved: -		
<b>Syllabus</b> The course introduces fundamental concepts of Artificial Intelligence, including knowledge representation, search algorithms, neural networks, and machine learning. Students explore applications of AI in science, biotechnology, and data analytics.		
<b>Learning goals and qualifications in this module students learn to (national or international):</b>  <b>Knowledge:</b> Identify key principles, terminology, and historical foundations of artificial intelligence. <b>Comprehension:</b> Explain the structure and functioning of intelligent systems and algorithms. <b>Application:</b> Apply AI models to solve basic classification and prediction tasks. <b>Analysis:</b> Analyze the performance and limitations of machine learning models. <b>Synthesis:</b> Integrate AI tools into problem-solving processes in interdisciplinary research. <b>Evaluation:</b> Critically assess the ethical and societal impacts of AI technologies.		
<b>Core readings:</b> 1. Russell, S., & Norvig, P. (2021). Artificial Intelligence: A Modern Approach (4th ed.). Pearson. 2. Goodfellow, I., Bengio, Y., & Courville, A. (2016). Deep Learning. MIT Press. 3. Poole, D. L., & Mackworth, A. K. (2023). Artificial Intelligence: Foundations of Computational Agents (3rd ed.). Cambridge University Press.		

Course number PYa2214	Course name: <b>Foreign Language Workshop 2</b>		
Type of course Basic Course	Semester / Rotation 2026/2027 / Spring Term	Student capacity: 130	
Teaching methods Interactive practice, pair work, listening comprehension, reading and writing exercises, and group discussions.	Prerequisites for attendance English Language, Foreign Language Workshop 1	Language English	
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>	
Written exam (100%) (100 minutes)		6 (152 contact hours in class + 28 hours of self-study (together 180hrs)	
Course coordinator: Senior Instructor: Shnar Tokisheva		Semester week hours: 10	
Additional teacher involved:			
<b>Syllabus</b> This course develops students' communicative competence in academic and professional contexts, focusing on speaking, listening, reading, and writing skills. Emphasis is placed on scientific terminology and effective presentation of research results.			
<b>Learning goals and qualifications in this module students learn to (national or international):</b>			
<p><b>Knowledge:</b> Identify lexical and grammatical structures relevant to academic English.</p> <p><b>Comprehension:</b> Explain meanings and use of professional terminology in context.</p> <p><b>Application:</b> Demonstrate effective communication in academic discussions and writing.</p> <p><b>Analysis:</b> Analyze linguistic features of research articles and presentations.</p> <p><b>Synthesis:</b> Compose academic texts integrating information from various sources.</p> <p><b>Evaluation:</b> Assess and improve one's own language performance for clarity and precision.</p>			
<b>Core readings:</b>			
<ol style="list-style-type: none"> <li>1. Bailey, S. (2022). Academic Writing: A Handbook for International Students (5th ed.). Routledge.</li> <li>2. Swales, J. M., &amp; Feak, C. B. (2021). Academic Writing for Graduate Students (4th ed.). University of Michigan Press.</li> <li>3. Murphy, R. (2019). English Grammar in Use (5th ed.). Cambridge University Press.</li> </ol>			

Course number Sta2210	Course name: <b>Statistics</b>		
Type of course Basic Course	Semester / Rotation 2026/2027 / Spring Term	Student capacity: 130	
Teaching methods Theoretical and practical lectures, statistical software workshops (Excel), case studies, collaborative exercises, independent data analysis, visualization and presentation of results.	Prerequisites for attendance Mathematics	Language English	
<b>Type of examination (Final Grade Composition)</b>  Written exam (100%) (100 minutes)		<b>ECTS (+Workload in hrs)</b>  6 (77 contact hours in class + 103 hours of self-study (together 180 hrs))	
Course coordinator: Senior Instructor: Ruslan Astamirov		Semester week hours: 5	
Additional teacher involved:			
<b>Syllabus</b> The course provides a foundation in descriptive and inferential statistics for biological and chemical data analysis. Students learn to apply statistical methods for hypothesis testing, correlation, regression, and experimental design.			
<b>Learning goals and qualifications in this module students learn to (national or international):</b> <b>Knowledge:</b> Identify main statistical concepts, variables, and data types. <b>Comprehension:</b> Explain statistical measures and probability distributions. <b>Application:</b> Use statistical software to analyze experimental data. <b>Analysis:</b> Interpret statistical results and assess data variability. <b>Synthesis:</b> Integrate statistical reasoning into scientific research. <b>Evaluation:</b> Critically evaluate statistical approaches in published studies.			
<b>Core readings:</b> 1. Field, A. (2022). Discovering Statistics Using IBM SPSS Statistics (6th ed.). Sage Publications. 2. Navidi, W. (2021). Statistics for Engineers and Scientists (6th ed.). McGraw-Hill. 3. Rosner, B. (2020). Fundamentals of Biostatistics (9th ed.). Cengage Learning.			

Course number OH/TOOH2211	Course name: <b>Organic Chemistry 1 / Theoretical Foundations of Organic Chemistry</b> (one discipline to choose from)		
Type of course Basic Course	Semester / Rotation 2026/2027 / Spring Term	Student capacity: 60	
Teaching methods Concept-based lectures, molecular modeling, problem-solving on reaction mechanisms, virtual labs, synthesis design projects, flipped classroom, self-study quizzes.	Prerequisites for attendance General Chemistry	Language English	
<b>Type of examination (Final Grade Composition)</b>  Written exam (100%) (100 minutes)		<b>ECTS (+Workload in hrs)</b>  8 (92 contact hours in class + 148 hours of self-study (together 240 hrs)	
Course coordinator: Associate Professor, Dr.: Yuliya Byzova		Semester week hours: 6	
Additional teacher involved:			
<p><b>Syllabus</b></p> <p><b>Organic Chemistry 1</b></p> <p>This course explores the structure, bonding, and reactivity of organic compounds, focusing on functional groups, stereochemistry, and reaction mechanisms. It provides the theoretical basis for understanding organic synthesis and biomolecular transformations.</p> <p><b>Theoretical Foundations of Organic Chemistry</b></p> <p>The course provides a theoretical understanding of the structure, bonding, and reactivity of organic molecules. Students explore mechanisms of organic reactions, stereochemistry, and the role of electronic effects in chemical transformations. Emphasis is placed on applying theoretical principles to predict reactivity and design synthetic pathways.</p> <p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <p><b>Organic Chemistry 1</b></p> <p><b>Knowledge:</b> Identify main statistical concepts, variables, and data types.  <b>Comprehension:</b> Explain statistical measures and probability distributions.  <b>Application:</b> Use statistical software to analyze experimental data.  <b>Analysis:</b> Interpret statistical results and assess data variability.  <b>Synthesis:</b> Integrate statistical reasoning into scientific research.  <b>Evaluation:</b> Critically evaluate statistical approaches in published studies.</p> <p><b>Theoretical Foundations of Organic Chemistry</b></p> <p><b>Knowledge:</b> Identify types of organic compounds, bonding, and isomerism.  <b>Comprehension:</b> Explain reaction mechanisms, stereochemical configurations, and electron effects.  <b>Application:</b> Predict outcomes of organic reactions under various conditions.  <b>Analysis:</b> Analyze mechanisms, intermediates, and transition states in multistep reactions.  <b>Synthesis:</b> Combine theoretical concepts to design reaction sequences and molecular structures.</p>			

**Evaluation:** Assess the reliability of mechanistic and structural predictions using modern theoretical tools.

**Core readings:**

1. Bruice, P. Y. (2021). Organic Chemistry (9th ed.). Pearson.
2. Clayden, J., Greeves, N., & Warren, S. (2023). Organic Chemistry (3rd ed.). Oxford University Press.
3. McMurry, J. (2022). Organic Chemistry (10th ed.). Cengage Learning.

Course number Mik/BKOG2213	Course name: <b>Microbiology / Cell Biology with Fundamentals of Histology and Embryology</b> (one discipline to choose from)		
Type of course Basic Course	Semester / Rotation 2026/2027 / Spring Term	Student capacity: 60	
Teaching methods Lectures with visual demonstrations and digital microscopy; laboratory experiments on microbial culture, staining, and observation; case-based learning on cell and tissue structures; problem-solving sessions on microbial processes and embryological development; group discussions and peer learning	Prerequisites for attendance Introduction to Biology	Language English	
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>	
Written exam (100%) (100 minutes)		8 (92 contact hours in class + 148 hours of self-study (together 240 hrs))	
Course coordinator: Professor, Dr.: Dmitriy Berillo		Semester week hours: 6	
Additional teacher involved:			
<p><b>Syllabus</b></p> <p><b>Microbiology</b> The goal of the course is to study traditional and modern information related to the morphology, structure, metabolism, taxonomy, genetics, ecology of microorganisms, and their practical significance.</p> <p><b>Cell Biology with Fundamentals of Histology and Embryology</b> The discipline studies the microscopic and submicroscopic structure and development of cells, tissues, and organs of living organisms, as well as the basic biological laws of organism development. Upon completion of this course, the learner will be able to use chemical and biological equipment, work with magnification tools, prepare temporary slides, and conduct experiments.</p> <p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <p><b>Microbiology</b>  <b>Knowledge:</b> Identify major types of microorganisms and cell structures.  <b>Comprehension:</b> Explain cellular processes and microbial metabolism.  <b>Application:</b> Perform basic microbiological and cytological techniques.  <b>Analysis:</b> Interpret microscopic and culture data to identify cell types and microorganisms.  <b>Synthesis:</b> Integrate cellular and microbial knowledge to explain biological systems.  <b>Evaluation:</b> Evaluate experimental results for accuracy and biological significance</p> <p><b>Cell Biology with Fundamentals of Histology and Embryology</b>  <b>Knowledge:</b> Identify the structure and functions of cellular organelles, tissues, and embryonic stages.</p>			

**Comprehension:** Explain fundamental processes of cell division, differentiation, and tissue organization.

**Application:** Apply microscopy and histological techniques to study cellular and tissue samples.

**Analysis:** Analyze the relationship between cellular morphology and physiological function in various tissues.

**Synthesis:** Integrate cell biological, histological, and embryological concepts to explain organismal development.

**Evaluation:** Critically assess experimental observations and interpret histological and embryological data in a biological context.

**Core readings:**

1. Madigan, M. T., Bender, K. S., Buckley, D. H., & Sattley, W. M. (2021). Brock Biology of Microorganisms (16th ed.). Pearson.
2. Alberts, B. et al. (2022). Molecular Biology of the Cell (7th ed.). Garland Science.
3. Kierszenbaum, A. L., & Tres, L. L. (2020). Histology and Cell Biology: An Introduction to Pathology (5th ed.). Elsevier.

Course number Agr2301	Course name: <b>Agrobiotechnology</b>		
Type of course Profile Course	Semester / Rotation 2026/2027 / Spring Term	Student capacity: 60	
Teaching methods Lectures, laboratory demonstrations, field studies, case-based learning, project work, teamwork, expert guest sessions.	Prerequisites for attendance Introduction to Biotechnology	Language English	
<b>Type of examination (Final Grade Composition)</b>  Written exam (100%) (100 minutes)		<b>ECTS (+Workload in hrs)</b>  4 (62 contact hours in class + 58 hours of self-study (together 120 hrs)	
Course coordinator: Professor, Dr. Andrea Zucollo		Semester week hours: 4	
Additional teacher involved:			
<b>Syllabus</b> The discipline forms knowledge and understanding of the development directions of modern biotechnology, the physiological foundations of agricultural biotechnology, and the main areas of microbiological biotechnology and their application in agriculture.			
<b>Learning goals and qualifications in this module students learn to (national or international):</b> <b>Knowledge:</b> Identify core concepts of agricultural biotechnology and plant genetics. <b>Comprehension:</b> Explain principles of plant transformation and biotechnology applications. <b>Application:</b> Utilize biotechnological tools to analyze or modify plant material. <b>Analysis:</b> Examine case studies on genetic modification and bioresource use. <b>Synthesis:</b> Develop strategies for sustainable agricultural biotechnology projects. <b>Evaluation:</b> Assess ethical, ecological, and economic implications of agrobiotechnology.			
<b>Core readings:</b> 1. Dubey, R. C. (2022). A Textbook of Biotechnology (8th ed.). S. Chand Publishing. 2. Slater, A., Scott, N., & Fowler, M. (2021). Plant Biotechnology: The Genetic Manipulation of Plants (3rd ed.). Oxford University Press. 3. Altman, A., & Hasegawa, P. M. (2020). Plant Biotechnology and Agriculture: Prospects for the 21st Century (2nd ed.). Academic Press.			

# 5th Semester

Fall Term 2027/2028

Course number PIYa3217	Course name: <b>Foreign Language Workshop 3</b>		
Type of course Basic Course	Semester / Rotation 2027/2028 / Fall Term	Student capacity: 130	
Teaching methods Interactive practice, pair work, listening comprehension, reading and writing exercises, and group discussions.	Prerequisites for attendance Foreign Language Workshop 1, Foreign Language Workshop 2	Language English	
<b>Type of examination (Final Grade Composition)</b> Written exam (100%) (100 minutes)		<b>ECTS (+Workload in hrs)</b> 6 (152 contact hours in class + 28 hours of self-study (together 180 hrs)	
Course coordinator: Senior Instructor, Shnar Tokisheva		Semester week hours: 10	
Additional teacher involved:			
<p><b>Syllabus</b> The discipline studies the fundamentals of intercultural communication and professional competencies, encompassing all types of speech activities, which are developed based on the subject content at the given level.</p> <p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <p><b>Knowledge:</b> Recognize vocabulary, grammatical structures, and common expressions used in academic and professional communication.</p> <p><b>Comprehension:</b> Explain main ideas and details from spoken and written texts in a foreign language.</p> <p><b>Application:</b> Use appropriate language structures and terminology to express opinions and arguments in discussions and written tasks.</p> <p><b>Analysis:</b> Distinguish between formal and informal language styles and analyze linguistic features in authentic materials.</p> <p><b>Synthesis:</b> Integrate diverse linguistic and cultural elements to create coherent oral presentations and written compositions.</p> <p><b>Evaluation:</b> Critically assess one's own language use and peer performance, identifying strengths and areas for improvement.</p>			

**Core readings:**

Swan, M., & Smith, B. (2018). *Learner English: A Teacher's Guide to Interference and Other Problems* (2nd ed.). Oxford University Press.

Murphy, R. (2019). *English Grammar in Use* (5th ed.). Cambridge University Press.

McCarthy, M., & O'Dell, F. (2017). *Academic Vocabulary in Use: Upper-Intermediate to Advanced*. Cambridge University Press.

Redman, S. (2017). *English Vocabulary in Use: Pre-Intermediate and Intermediate* (3rd ed.). Cambridge University Press.

Gairns, R., & Redman, S. (2018). *Working with Words: A Guide to Teaching and Learning Vocabulary*. Cambridge University Press.

Course number OH/HFPO3209	Course name: <b>Organic Chemistry 2/ The chemistry of functional derivatives of organic molecules</b> (one discipline to choose from)		
Type of course Basic Course	Semester / Rotation 2027/2028 / Fall Term	Student capacity: 60	
Teaching methods Concept-based lectures, molecular modeling, problem-solving on reaction mechanisms, virtual labs, synthesis design projects, flipped classroom, self-study quizzes.	Prerequisites for attendance Organic Chemistry 1/ Theoretical Foundations of Organic Chemistry	Language English	
<b>Type of examination (Final Grade Composition)</b>  Written exam (100%) (100 minutes)		<b>ECTS (+Workload in hrs)</b>  8 (92 contact hours in class + 148 hours of self-study (together 240 hrs)	
Course coordinator: Associate Professor, Dr.: Yuliya Byzova		Semester week hours: 6	
Additional teacher involved: Roman Tarunin			
<p><b>Syllabus</b></p> <p><b>Organic Chemistry 2</b></p> <p>The study of the diversity and characteristics of functional derivatives of organic compounds; the main mechanisms of chemical reactions in organic chemistry of functional derivatives of organic molecules.</p> <p><b>The chemistry of functional derivatives of organic molecules</b></p> <p>This course provides an in-depth study of the chemistry of organic compounds containing key functional groups such as carbonyls, carboxylic acids, esters, amides, and their derivatives. Students explore mechanisms of substitution, addition, and elimination reactions, as well as the relationship between molecular structure and reactivity. The course emphasizes the application of these principles in the synthesis of complex organic molecules and materials relevant to biotechnology and environmental chemistry.</p>			
<b>Learning goals and qualifications in this module students learn to (national or international):</b>			
<p><b>Organic Chemistry 2</b></p> <p><b>Knowledge:</b> Identify fundamental concepts of organic chemistry including hybridization, bonding, nomenclature, and functional groups.</p> <p><b>Comprehension:</b> Explain mechanisms of basic organic reactions such as substitution, elimination, and addition.</p> <p><b>Application:</b> Predict products of organic reactions and apply IUPAC rules for naming complex organic molecules.</p> <p><b>Analysis:</b> Distinguish between reaction mechanisms based on structure, reagents, and reaction conditions.</p> <p><b>Synthesis:</b> Design synthetic pathways for simple organic compounds using fundamental reaction principles.</p>			

**Evaluation:** Assess the efficiency, selectivity, and environmental impact of organic synthesis methods.

### **The chemistry of functional derivatives of organic molecules**

**Knowledge:** Identify fundamental theoretical principles governing the structure, bonding, and reactivity of organic molecules.

**Comprehension:** Explain electronic effects, resonance, and stereochemical concepts that determine reaction mechanisms.

**Application:** Apply theoretical models to predict the stability, acidity, and reactivity of organic compounds.

**Analysis:** Analyze reaction mechanisms using molecular orbital theory and energy profile diagrams.

**Synthesis:** Develop theoretical explanations for experimental outcomes and propose reaction pathways based on mechanistic reasoning.

**Evaluation:** Critically assess the validity and limitations of theoretical models in explaining organic transformations.

#### **Core readings:**

Clayden, J., Greeves, N., Warren, S., & Wothers, P. (2012). *Organic Chemistry* (2nd ed.). Oxford University Press.

Carey, F. A., & Sundberg, R. J. (2007). *Advanced Organic Chemistry, Part A: Structure and Mechanisms* (5th ed.). Springer.

Lowry, T. H., & Richardson, K. S. (1987). *Mechanism and Theory in Organic Chemistry* (3rd ed.). Harper & Row.

Anslyn, E. V., & Dougherty, D. A. (2006). *Modern Physical Organic Chemistry*. University Science Books.

March, J. (1992). *Advanced Organic Chemistry: Reactions, Mechanisms, and Structure* (4th ed.). Wiley-Interscience.

Course number Bio3215	Course name: <b>Biochemistry</b>		
Type of course Basic Course	Semester / Rotation 2026/2027 / Fall Term	Student capacity: 60	
Teaching methods Lectures with multimedia support; laboratory experiments and demonstrations; case studies and problem-based learning; interactive discussions; group projects and presentations; analysis of biochemical pathways through modeling software; individual assignments and quizzes for formative assessment.	Prerequisites for attendance General Chemistry, Organic Chemistry 1	Language English	
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>	
Written exam (100%) (100 minutes)		6 (77 contact hours in class + 103 hours of self-study (together 180 hrs))	
Course coordinator: Associate Professor, Dr. Yuliya Byzova		Semester week hours: 5	
Additional teacher involved:			
<p><b>Syllabus</b></p> <p>The discipline that studies the molecular foundations of life: the chemical composition, structure, properties, and localization of substances that make up organisms, the pathways and regularities of their formation, the sequence and mechanisms of transformations, as well as the functional role of biomolecules.</p>			
<p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <p><b>Knowledge:</b> Identify the structure, properties, and functions of major biomolecules such as proteins, lipids, carbohydrates, and nucleic acids.</p> <p><b>Comprehension:</b> Explain the principles of enzyme catalysis, metabolic pathways, and energy transformation in living systems.</p> <p><b>Application:</b> Apply biochemical concepts to analyze metabolic regulation and interpret experimental data.</p> <p><b>Analysis:</b> Distinguish between normal and altered biochemical processes occurring in cells under physiological and pathological conditions.</p> <p><b>Synthesis:</b> Integrate biochemical knowledge to model metabolic networks and propose mechanisms for biochemical reactions.</p> <p><b>Evaluation:</b> Critically assess experimental approaches, methodologies, and recent advances in biochemistry relevant to biotechnology and health sciences.</p>			

**Core readings:**

Berg, J. M., Tymoczko, J. L., Gatto, G. J., & Stryer, L. (2019). *Biochemistry* (9th ed.). W. H. Freeman and Company.

Nelson, D. L., & Cox, M. M. (2021). *Lehninger Principles of Biochemistry* (8th ed.). W. H. Freeman and Company.

Voet, D., Voet, J. G., & Pratt, C. W. (2016). *Fundamentals of Biochemistry: Life at the Molecular Level* (5th ed.). Wiley.

Garrett, R. H., & Grisham, C. M. (2017). *Biochemistry* (6th ed.). Cengage Learning.

Berg, J. M., & Stryer, L. (2020). *Biochemistry: A Short Course* (4th ed.). W. H. Freeman and Company.

Course number VB3302	Course name: <b>Introduction to Biotechnology</b>		
Type of course Profile Course	Semester / Rotation 2026/2027 / Fall Term	Student capacity: 60	
Teaching methods Lectures with multimedia presentations; laboratory experiments and demonstrations; project-based learning; group discussions and case studies on biotechnology applications; analysis of scientific articles; problem-solving sessions; seminars with student presentations; and individual research assignments to develop analytical and critical thinking skills.	Prerequisites for attendance -	Language English	
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>	
Written exam (100%) (100 minutes)		6 (77 contact hours in class + 103 hours of self-study (together 180 hrs))	
Course coordinator: Associate Professor, Dr. Samantha Orchard		Semester week hours: 5	
Additional teacher involved:			
<p><b>Syllabus</b></p> <p>The course is focused on the study of the application of biological organisms and systems for the processing of raw materials into socially beneficial products. It explores the possibility of gene transfer between organisms; by transferring a gene, we can endow the recipient with a new function. As a society, we must consider the pros and cons of various achievements in the field of biotechnology; to do so, we must first understand how they work.</p>			
<b>Learning goals and qualifications in this module students learn to (national or international):</b>			
<p><b>Knowledge:</b> Identify the main concepts, history, and applications of biotechnology in agriculture, medicine, and industry.</p> <p><b>Comprehension:</b> Explain fundamental biological principles and molecular techniques that form the basis of biotechnological processes.</p> <p><b>Application:</b> Apply basic laboratory techniques used in biotechnology, such as DNA extraction, microbial culture, and enzyme assays.</p> <p><b>Analysis:</b> Analyze the role of biotechnology in solving global challenges related to food security, health, and the environment.</p> <p><b>Synthesis:</b> Integrate knowledge from biology, chemistry, and technology to design simple biotechnological solutions or projects.</p> <p><b>Evaluation:</b> Assess ethical, legal, and social implications of biotechnological innovations and their impact on society and the environment.</p>			

**Core readings:**

Brown, T. A. (2016). *Introduction to Biotechnology* (4th ed.). Pearson Education.

Thieman, W. J., & Palladino, M. A. (2018). *Introduction to Biotechnology* (4th ed.). Pearson.

Glick, B. R., Pasternak, J. J., & Patten, C. L. (2010). *Molecular Biotechnology: Principles and Applications of Recombinant DNA* (4th ed.). ASM Press.

Primrose, S. B., & Twyman, R. M. (2014). *Principles of Gene Manipulation and Genomics* (8th ed.). Wiley-Blackwell.

Clark, D. P., & Pazdernik, N. J. (2016). *Biotechnology: Academic Cell Update Edition* (2nd ed.). Academic Press.

Course number <b>Fil3109</b>	Course name <b>Philosophy</b>		
Type of course General education discipline	Semester 2027/2028 Fall Term	Student capacity: 90	
Teaching methods group projects, self-study, case study	Prerequisites for attendance None	Language English	
<b>Type of examination (Final Grade Composition)</b>  Written exam (100%) (100 minutes)		<b>ECTS (+Workload in hrs)</b> 5 (62 contact hrs in class +88 hrs of self-study (together 150 hrs))	
Module coordinator Senior Instructor: Malikov Alexey		Semester week hours: 5	
Additional teacher involved: -			
<p><b>Syllabus</b></p> <p>Content Description</p> <p>The discipline is focused on developing students' critical and analytical thinking, enabling them to understand fundamental principles of knowledge, morality, and human existence. It cultivates intellectual independence and the ability to reason logically in addressing ethical and social issues. The course contributes to forming a holistic worldview and responsible citizenship aligned with modern global challenges.</p>			
<p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <ul style="list-style-type: none"> <li>- <b>Knowledge:</b> Understand fundamental philosophical concepts, categories, and theories in the context of classical and modern philosophy.</li> <li>- <b>Comprehension:</b> Interpret philosophical texts and identify key arguments, ethical positions, and worldviews.</li> <li>- <b>Application:</b> Apply philosophical reasoning to analyze contemporary social, cultural, and professional issues.</li> <li>- <b>Analysis:</b> Compare different philosophical schools and critically evaluate their relevance to modern challenges.</li> <li>- <b>Synthesis:</b> Integrate philosophical knowledge with professional and personal decision-making, forming a coherent system of values.</li> <li>- <b>Evaluation:</b> Assess moral and intellectual perspectives, demonstrating independent judgment and reflective thinking.</li> </ul>			

**Core readings:**

Yeon, Asmah Laili, and Yuhanif Yusof. *Philisophy and Theory of Law*. Sintok: Universiti Utara Malaysia, 2015.

McKaughan, D.J., VandeWall, H. *The history and philosophy of science: A reader*. - London: Bloomsbury Academic, 2018. - 1104 p.

Smith N. *Introduction to philosophy*. – OpenStax, 2022. Payne R. W. *An introduction to philosophy*. – 2015.

Grayling A. C. *The history of philosophy*. – Penguin UK, 2019

Russell B. *History of western philosophy*. – Routledge, 2004.

# 6th Semester

## Spring Term 2027/2028

Course number Fiz3216	Course name: <b>Physics 2</b>	
Type of course Basic Course	Semester / Rotation 2027/2028 / Spring Term	Student capacity: 60
Teaching methods Lectures, problem-solving workshops, lab experiments, and tutorials.	Prerequisites for attendance -	Language English
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>
Written exam (100%) (100 minutes)		8 (92 contact hours in class + 148 hours of self-study (together 240)
Course coordinator: Senior Lecturer: Ruslan Astamirov		Semester week hours: 6
Additional teacher involved: -		
<p><b>Syllabus</b></p> <p>The physics course, based on mathematical calculus, introduces electromagnetism. The course begins with a focus on everyday observations of electrostatics and the description of fundamental measurements that led to the discovery of Coulomb's law. Electrostatics, based on Coulomb's law, is developed into a mathematical theory. Topics include electric charges, fields, dipoles, continuous charge distributions, Gauss's law, electric potential, conductors, and capacitors. The course then introduces electric current circuits and direct current, which leads to magnetic fields, Biot-Savart law, Ampère's law, and magnetic forces.</p>		
<p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <p><b>Knowledge:</b> Identify fundamental physical quantities, laws, and concepts of electromagnetism, including Coulomb's law, Gauss's law, and Ampère's law.</p> <p><b>Comprehension:</b> Explain the relationships between electric and magnetic fields, charge distributions, and their effects on matter.</p> <p><b>Application:</b> Apply mathematical calculus to solve problems involving electrostatics, electric circuits, and magnetic fields.</p> <p><b>Analysis:</b> Analyze electric potential, field configurations, and current distributions using theoretical and experimental approaches.</p> <p><b>Synthesis:</b> Combine principles of electricity and magnetism to model physical systems and design simple circuits or electromagnetic devices.</p>		

**Evaluation:** Critically assess experimental data, the accuracy of physical models, and the applicability of electromagnetic theory to real-world phenomena.

**Core readings:**

Halliday, D., Resnick, R., & Walker, J. (2021). *Fundamentals of Physics* (12th ed.). Wiley.

Serway, R. A., & Jewett, J. W. (2018). *Physics for Scientists and Engineers with Modern Physics* (10th ed.). Cengage Learning.

Young, H. D., Freedman, R. A., & Ford, A. L. (2019). *University Physics with Modern Physics* (15th ed.). Pearson.

Tipler, P. A., & Mosca, G. (2007). *Physics for Scientists and Engineers* (6th ed.). W. H. Freeman.

Purcell, E. M., & Morin, D. J. (2013). *Electricity and Magnetism* (3rd ed.). Cambridge University Press.

Course number PB/FPPN3311	Course name: <b>Food Biotechnology / Fermentation of Food and Beverages</b> (one discipline to choose from)	
Type of course Profile Course	Semester / Rotation 2027/2028 / Spring Term	Student capacity: 60
Teaching methods Lectures with multimedia presentations; laboratory experiments in fermentation and enzyme applications; case studies on genetically modified food production; group projects focused on food innovation; seminars and discussions on bioethics and food safety; independent assignments and research presentations integrating current scientific literature.	Prerequisites for attendance Introduction to Biotechnology	Language English
<b>Type of examination (Final Grade Composition)</b>  Written exam (100%) (100 minutes)		<b>ECTS (+Workload in hrs)</b>  6 (77 contact hours in class + 103 hours of self-study (together 180 hrs))
Course coordinator: Professor, Dr.: Dmitry Berillo		Semester week hours: 6
Additional teacher involved:		
<p><b>Syllabus</b></p> <p><b>Food Biotechnology</b></p> <p>The discipline studies the history of the development of microorganism biotechnology and the technology of food production based on the use of microorganisms. The goal and objectives of the discipline are to provide students with knowledge about the features of biological processes occurring in the cells of various groups of microorganisms that form the basis of food production.</p> <p><b>Fermentation of Food and Beverages</b></p> <p>The discipline is aimed at teaching students to perform tasks in production related to the production of essential human products through the use of the biosynthetic potential of microorganisms, plant, and animal cells cultured on artificial nutrient media in fermentation modes.</p> <p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <p><b>Food Biotechnology</b></p> <p><b>Knowledge:</b> Identify the principles of biotechnology applied in food production, processing, and preservation.</p> <p><b>Comprehension:</b> Explain the role of microorganisms, enzymes, and genetic modification in the development of functional and safe food products.</p> <p><b>Application:</b> Apply biotechnological techniques such as fermentation, enzyme technology, and microbial culture in food systems.</p>		

**Analysis:** Analyze the biochemical and microbiological parameters affecting food quality, stability, and safety.

**Synthesis:** Develop innovative approaches for improving nutritional value and sustainability through biotechnological processes.

**Evaluation:** Assess the ethical, environmental, and regulatory aspects of food biotechnology and their implications for human health.

### **Fermentation of Food and Beverages**

**Knowledge:** Identify the principles and microbiological basis of food and beverage fermentation.

**Comprehension:** Explain metabolic pathways of microorganisms involved in the production of fermented products and beverages.

**Application:** Apply fermentation techniques for the production, preservation, and enhancement of food quality.

**Analysis:** Analyze factors influencing fermentation efficiency, flavor development, and product safety.

**Synthesis:** Design controlled fermentation processes integrating microbial, biochemical, and technological parameters.

**Evaluation:** Evaluate the quality, nutritional value, and safety of fermented products, considering industrial standards and sustainability principles.

#### **Core readings:**

Campbell-Platt, G. (2017). *Food Science and Technology* (2nd ed.). Wiley-Blackwell.

Shetty, K., Paliyath, G., Pometto, A., & Levin, R. E. (Eds.). (2006). *Food Biotechnology* (2nd ed.). CRC Press.

Banwart, G. J. (2014). *Basic Food Microbiology* (2nd ed.). Springer.

Singh, R. S., Singh, T., & Pandey, A. (2019). *Biotechnology for Sustainable Food Production*. Springer.

Knorr, D. (2018). *Food Biotechnology: Advances in Bioprocesses and Applications*. Academic Press.

Course number BR/THPR3312	Course name: <b>Plant Biotechnology/ Technology of Storage and Processing of Crop Production</b> (one discipline to choose from)		
Type of course Profile Course	Semester / Rotation 2027/2028 / Spring Term	Student capacity: 60	
Teaching methods Lectures, problem-solving workshops, lab experiments, and tutorials.	Prerequisites for attendance Introduction to Biotechnology	Language English	
<b>Type of examination (Final Grade Composition)</b>  Written exam (100%) (100 minutes)		<b>ECTS (+Workload in hrs)</b>  6 (77contact hours in class + 103 hours of self-study (together 180)	
Course coordinator: Professor, Dr. Andrea Zucollo		Semester week hours: 5	
Additional teacher involved: -			
<p><b>Syllabus</b></p> <p><b>Plant Biotechnology</b> The course studies the issues of plant reproduction biotechnology (including cell, tissue, organ cultures, and plant clones). Modern biotechnologies offer fundamentally new methods for generating new and valuable genetic diversity in plants for human life by selecting forms and clones of individuals with desirable characteristics.</p> <p><b>Technology of Storage and Processing of Crop Production</b> The goal of the discipline is to prepare future specialists for successful independent work in production conditions by mastering practical techniques for handling, storage, and processing of agricultural products.</p> <p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <p><b>Plant Biotechnology</b></p> <p><b>Knowledge:</b> Identify the principles, concepts, and terminology related to plant tissue culture, genetic engineering, and molecular breeding.</p> <p><b>Comprehension:</b> Explain the mechanisms of gene transfer, plant transformation, and regulation of gene expression in plant systems.</p> <p><b>Application:</b> Apply biotechnological techniques such as micropropagation, somatic embryogenesis, and Agrobacterium-mediated transformation.</p> <p><b>Analysis:</b> Analyze physiological, biochemical, and genetic factors affecting plant growth and development in vitro.</p> <p><b>Synthesis:</b> Design biotechnological strategies for crop improvement, stress resistance, and increased productivity.</p> <p><b>Evaluation:</b> Critically assess ethical, ecological, and biosafety issues associated with genetically modified plants and biotechnological innovations in agriculture.</p> <p><b>Technology of Storage and Processing of Crop Production</b></p>			

**Knowledge:** Identify the fundamental principles of post-harvest technology, storage methods, and processing of agricultural crops.

**Comprehension:** Explain the physical, chemical, and biological processes affecting crop quality during storage and processing.

**Application:** Apply technological operations and equipment for drying, cleaning, sorting, and preserving crop products.

**Analysis:** Analyze the factors influencing product stability, nutrient retention, and microbial safety during storage and processing.

**Synthesis:** Develop technological schemes and strategies for improving crop preservation, minimizing losses, and ensuring food quality.

**Evaluation:** Assess the efficiency, sustainability, and economic feasibility of storage and processing technologies in agricultural production.

**Core readings:**

Kader, A. A. (Ed.). (2002). *Postharvest Technology of Horticultural Crops* (3rd ed.). University of California, Agriculture and Natural Resources.

Fellows, P. J. (2017). *Food Processing Technology: Principles and Practice* (4th ed.). Woodhead Publishing.

Hodges, R. J., Buzby, J. C., & Bennett, B. (2011). Postharvest Losses and Waste in Developed and Less Developed Countries: Opportunities to Improve Resource Use. *Journal of Agricultural Science*.

Rosenthal, A. (2009). *Postharvest Handling: A Systems Approach* (2nd ed.). Academic Press.

Chakraverty, A., Mujumdar, A. S., Raghavan, G. S. V., & Ramaswamy, H. S. (2003). *Handbook of Postharvest Technology: Cereals, Fruits, Vegetables, Tea, and Spices*. Marcel Dekker.

Course number GRZh3303	Course name: <b>Plant and Animal Genetics</b>		
Type of course Profile Course	Semester / Rotation 2027/2028 / Spring Term	Student capacity: 60	
Teaching methods Lectures with multimedia support; laboratory classes on Mendelian and molecular genetics; group discussions and problem-solving sessions; case studies on genetic selection and breeding programs; computer simulations for inheritance patterns and population genetics; project-based learning and research presentations; independent literature review and data interpretation tasks.	Prerequisites for attendance -	Language English	
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>	
Written exam (100%) (100 minutes)		8 (92 contact hours in class + 148 hours of self-study (together 240))	
Course coordinator: Dr. Amritha Wickramage		Semester week hours: 6	
Additional teacher involved: -			
<p><b>Syllabus</b></p> <p>The course is designed to help students explore and apply the fundamental concepts of the broad field of genetics, including areas such as transmission genetics, cytogenetics, cytoplasmic inheritance, quantitative inheritance, population genetics and evolution, as well as molecular genetics. Students will be able to solve a wide range of genetic problems using core concepts and selecting appropriate and effective approaches. Students will also acquire some basic laboratory skills that will enhance their understanding of the concepts presented in the course.</p>			
<p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <p><b>Knowledge:</b> Identify fundamental genetic concepts, including inheritance laws, gene structure, chromosomal organization, and variation in plants and animals.</p> <p><b>Comprehension:</b> Explain molecular mechanisms of heredity, mutation, recombination, and their influence on phenotype expression and evolution.</p> <p><b>Application:</b> Apply classical and molecular genetic techniques – such as hybridization, selection, and marker-assisted analysis – to study and improve biological traits.</p> <p><b>Analysis:</b> Analyze inheritance patterns, population genetics data, and gene interactions in plant and animal species.</p> <p><b>Synthesis:</b> Integrate genetic principles with biotechnological approaches to develop breeding strategies for enhanced productivity and sustainability.</p>			

**Evaluation:** Critically assess genetic data, experimental outcomes, and the ethical, ecological, and social implications of genetic manipulation in agriculture and animal breeding.

**Core readings.**

Hartl, D. L., & Ruvolo, M. (2020). *Genetics: Analysis of Genes and Genomes* (10th ed.). Jones & Bartlett Learning.

Snustad, D. P., & Simmons, M. J. (2019). *Principles of Genetics* (8th ed.). Wiley.

Klug, W. S., Cummings, M. R., Spencer, C. A., & Palladino, M. A. (2021). *Concepts of Genetics* (12th ed.). Pearson.

Griffiths, A. J. F., Wessler, S. R., Carroll, S. B., & Doebley, J. (2015). *Introduction to Genetic Analysis* (11th ed.). W. H. Freeman and Company.

Falconer, D. S., & Mackay, T. F. C. (1996). *Introduction to Quantitative Genetics* (4th ed.). Longman.

Course number MG3304	Course name: <b>Microbial Genetics</b>		
Type of course Profile Course	Semester / Rotation 2027/2028 / Spring Term	Student capacity: 60	
Teaching methods Lectures supported by multimedia materials; laboratory experiments on microbial mutation and gene transfer; problem-based learning using case studies on antibiotic resistance; group discussions and research projects on genetic regulation; computer simulations of operon models; analysis of scientific literature; student presentations on current advances in microbial genomics.	Prerequisites for attendance -	Language English	
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>	
Written exam (100%) (100 minutes)		6 (77 contact hours in class + 1103 hours of self-study (together 180))	
Course coordinator: Dr. David Baltrus		Semester week hours: 5	
Additional teacher involved: -			
<b>Syllabus</b> The discipline studies the structure and functions of prokaryotic genes; methods of gene transfer and mapping, DNA structure, replication, transcription, and translation. It also covers practical computer analysis of DNA sequences and gene cloning strategies. The principles of gene expression regulation, as well as the biology of plasmids and bacteriophages, are also explored.			
<b>Learning goals and qualifications in this module students learn to (national or international):</b>			
<b>Knowledge:</b> Identify the structure, organization, and function of microbial genomes, plasmids, and mobile genetic elements.			
<b>Comprehension:</b> Explain mechanisms of genetic variation in microorganisms, including mutation, recombination, transduction, transformation, and conjugation.			
<b>Application:</b> Apply molecular and genetic techniques to study microbial gene expression, regulation, and adaptation.			
<b>Analysis:</b> Analyze genetic interactions, operon systems, and horizontal gene transfer in prokaryotic populations.			
<b>Synthesis:</b> Design experimental approaches for genetic manipulation of microorganisms in biotechnology and environmental microbiology.			
<b>Evaluation:</b> Critically assess the significance of microbial genetics in antibiotic resistance, metabolic engineering, and industrial applications.			

**Core readings.**

Snyder, L., & Champness, W. (2013). *Molecular Genetics of Bacteria* (4th ed.). ASM Press.

Maloy, S. R., Cronan, J. E., & Freifelder, D. (2004). *Microbial Genetics* (2nd ed.). Jones & Bartlett Learning.

Madigan, M. T., Bender, K. S., Buckley, D. H., Sattley, W. M., & Stahl, D. A. (2021). *Brock Biology of Microorganisms* (16th ed.). Pearson.

Willey, J. M., Sherwood, L. M., & Woolverton, C. J. (2020). *Prescott's Microbiology* (12th ed.). McGraw-Hill Education.

Slonczewski, J. L., & Foster, J. W. (2017). *Microbiology: An Evolving Science* (5th ed.). W. W. Norton & Company.

Course number	Course name <b>Production Practice 1</b>	
Type of course Professional discipline	Semester 2027/2028 Spring Term	Student capacity: 60
Teaching methods Supervised field or laboratory practice; individual and group project; observation and documentation of production processes; participation in practical and technical operations under mentor guidance; maintenance of a daily practice logbook; preparation of analytical and reflective reports; feedback sessions with supervisors for evaluation and improvement.	Prerequisites for attendance Educational practice	Language English
<b>Type of examination (Final Grade Composition)</b>  Written exam (100%) (100 minutes)		<b>ECTS (+Workload in hrs)</b> 5 (0 contact hrs in class +150 hrs of self-study (together 150 hrs)
Module coordinator Associate Professor, Dr: Yuliya Byzova		Semester week hours: -
Additional teacher involved:  -		
<b>Syllabus</b> Content Description The course provides students with initial practical experience in professional environments such as laboratories, research centers, or industrial enterprises. It aims to develop professional competencies through the application of theoretical knowledge in real work conditions. Students observe production processes, participate in routine technical operations, and familiarize themselves with workplace organization, safety protocols, and quality control systems. The practice serves as an essential step in forming professional responsibility, discipline, and teamwork skills.		
<b>Learning goals and qualifications in this module students learn to (national or international):</b>  <b>Knowledge:</b> Identify the basic principles, objectives, and organization of industrial or laboratory practice in the chosen professional field.  <b>Comprehension:</b> Explain the structure, workflow, and safety requirements of production or research environments.  <b>Application:</b> Apply theoretical knowledge and technical skills to perform assigned professional tasks under real working conditions.  <b>Analysis:</b> Analyze practical problems, operational data, and technological processes to identify areas for improvement.  <b>Synthesis:</b> Develop proposals for optimizing production procedures or laboratory techniques based on practical experience.		

**Evaluation:** Evaluate one's own performance, workplace efficiency, and compliance with quality and safety standards during practice.

**Core readings:**

Groover, M. P. (2020). *Fundamentals of Modern Manufacturing: Materials, Processes, and Systems* (8th ed.). Wiley.

Stanbury, P. F., Whitaker, A., & Hall, S. J. (2016). *Principles of Fermentation Technology* (3rd ed.). Butterworth-Heinemann.

Shuler, M. L., & Kargi, F. (2017). *Bioprocess Engineering: Basic Concepts* (3rd ed.). Prentice Hall.

Doran, P. M. (2013). *Bioprocess Engineering Principles* (2nd ed.). Academic Press.

OECD. (2018). *Best Practice Guidelines for Biological Resource Centres*. Organisation for Economic Co-operation and Development.

# 7th Semester

## Fall Term 2028/2029

Course number GKMM4305	Course name: <b>Core Concepts in Molecular Microbiology</b>	
Type of course Profile Course	Semester / Rotation 2028/2029 / Fall Term	Student capacity: 60
Teaching methods Lectures with multimedia support; laboratory sessions on microbial molecular techniques (DNA isolation, PCR, electrophoresis); problem-based learning using case studies on microbial gene regulation; group discussions on recent discoveries in molecular microbiology; project-based learning focused on microbial genomics and biotechnology; seminars and student presentations; analysis of scientific papers and bioinformatics databases.	Prerequisites for attendance Microbiology/ Cell Biology with Fundamentals of Histology and Embryology	Language English
<b>Type of examination (Final Grade Composition)</b>  Written exam (100%) (100 minutes)		<b>ECTS (+Workload in hrs)</b>  6 (77 contact hours in class + 103 hours of self-study (together 180))
Course coordinator: Dr. Kerry Cooper		Semester week hours: 5
Additional teacher involved: -		
<b>Syllabus</b> In this course, students work individually and in teams to deepen their understanding of microbiology by studying how microbes function at the molecular level. Topics include microbial communities, evolution, information flow, gene regulation, pathogenesis, and immunology. It is important to note that this course will help students specializing in microbiology to complete other mandatory or elective courses.		
<b>Learning goals and qualifications in this module students learn to (national or international):</b>  <b>Knowledge:</b> Identify the molecular structures and functions of microbial macromolecules, including DNA, RNA, proteins, and membranes.  <b>Comprehension:</b> Explain key molecular processes such as DNA replication, transcription, translation, and gene regulation in microorganisms.		

**Application:** Apply molecular techniques for studying microbial metabolism, gene expression, and interactions with the environment.

**Analysis:** Analyze molecular mechanisms underlying microbial adaptation, pathogenicity, and antibiotic resistance.

**Synthesis:** Integrate molecular microbiology concepts to design experiments and interpret results related to microbial genetics and physiology.

**Evaluation:** Critically assess current advances in molecular microbiology and their applications in biotechnology, medicine, and environmental science.

**Core readings:**

Madigan, M. T., Bender, K. S., Buckley, D. H., Sattley, W. M., & Stahl, D. A. (2021). *Brock Biology of Microorganisms* (16th ed.). Pearson.

Snyder, L., & Champness, W. (2013). *Molecular Genetics of Bacteria* (4th ed.). ASM Press.

Willey, J. M., Sherwood, L. M., & Woolverton, C. J. (2020). *Prescott's Microbiology* (12th ed.). McGraw-Hill Education.

Slonczewski, J. L., & Foster, J. W. (2017). *Microbiology: An Evolving Science* (5th ed.). W. W. Norton & Company.

Madigan, M. T., & Martinko, J. M. (2015). *Biology of Microorganisms* (15th ed.). Pearson.

Course number LB4306	Course name: <b>Biotechnology Laboratory</b>		
Type of course Profile Course	Semester / Rotation 2028/2029 / Fall Term	Student capacity: 60	
Teaching methods Hands-on laboratory training; guided experiments under instructor supervision; project-based learning; group work focused on experimental design and data interpretation; use of molecular biology software for DNA and protein analysis; case studies on industrial and medical biotechnology; laboratory reports and presentations to develop scientific communication skills.	Prerequisites for attendance Introduction to Biotechnology	Language English	
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>	
Written exam (100%) (100 minutes)		4 (62 contact hours in class + 58 hours of self-study (together 120 hrs)	
Course coordinator: Dr. Sarah Hind		Semester week hours: 6	
Additional teacher involved:			
<p><b>Syllabus</b></p> <p>The course is aimed at providing students with practical experience in fundamental laboratory techniques used in biotechnology: PCR, molecular cloning, genetic engineering, DNA sequencing, microorganism cultivation, and protein production.</p>			
<p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <p><b>Knowledge:</b> Identify fundamental concepts, laboratory equipment, and safety rules in biotechnology experimentation.</p> <p><b>Comprehension:</b> Explain the principles of molecular cloning, PCR, and protein expression in biotechnology workflows.</p> <p><b>Application:</b> Perform standard biotechnological techniques such as DNA isolation, amplification, sequencing, and microbial culture.</p> <p><b>Analysis:</b> Analyze experimental data and troubleshoot problems arising during molecular and microbiological procedures.</p> <p><b>Synthesis:</b> Design and conduct experiments integrating multiple techniques for gene or protein manipulation.</p> <p><b>Evaluation:</b> Critically assess the reliability of experimental data and evaluate biotechnological methods in terms of accuracy, reproducibility, and biosafety.</p>			

**Core readings:**

Sambrook, J., & Russell, D. W. (2001). *Molecular Cloning: A Laboratory Manual* (3rd ed.). Cold Spring Harbor Laboratory Press.

Brown, T. A. (2016). *Gene Cloning and DNA Analysis: An Introduction* (7th ed.). Wiley-Blackwell.

Ausubel, F. M., Brent, R., Kingston, R. E., Moore, D. D., Seidman, J. G., Smith, J. A., & Struhl, K. (2003). *Current Protocols in Molecular Biology*. Wiley.

Green, M. R., & Sambrook, J. (2012). *Molecular Cloning: A Laboratory Manual, Volume I–III* (4th ed.). Cold Spring Harbor Laboratory Press.

Glick, B. R., Pasternak, J. J., & Patten, C. L. (2010). *Molecular Biotechnology: Principles and Applications of Recombinant DNA* (4th ed.). ASM Press.

Course number IB4307	Course name: <b>Industrial Biotechnology</b>		
Type of course Profile Course	Semester / Rotation 2028/2029 / Fall Term	Student capacity: 60	
Teaching methods Lectures with multimedia presentations; laboratory sessions; project-based learning focused on bioprocess optimization; group discussions and case studies on industrial-scale production; simulation exercises using bioprocess modeling software; seminars with student presentations on sustainable biotechnological innovations; analysis of scientific and industrial reports to develop critical thinking and problem-solving skills.	Prerequisites for attendance Introduction to Biotechnology	Language English	
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>	
Written exam (100%) (100 minutes)		6 (77contact hours in class + 103 hours of self-study (together 180)	
Course coordinator: Associate Professor, Dr. Samantha Orchard		Semester week hours: 5	
Additional teacher involved: -			
<p><b>Syllabus</b></p> <p>This course is dedicated to the key technologies underlying biotechnology research, including enzyme discovery and engineering, systems and synthetic biology, as well as biochemical and process engineering. Broader issues related to sustainable production are discussed, including scientific innovations and bioethics, and how these technologies are embodied in real-world applications that benefit society and impact our daily lives.</p>			
<p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <p><b>Knowledge:</b> Identify the main principles and technologies of enzyme engineering, microbial fermentation, and bioprocess optimization.</p> <p><b>Comprehension:</b> Explain the mechanisms and applications of metabolic and synthetic biology in industrial biotechnology.</p> <p><b>Application:</b> Apply biochemical and process engineering concepts to design and optimize biotechnological production systems.</p> <p><b>Analysis:</b> Analyze the efficiency of industrial bioprocesses, including enzyme kinetics, bioreactor performance, and product yield.</p>			

**Synthesis:** Develop innovative biotechnological strategies for sustainable production of biofuels, pharmaceuticals, and biomaterials.

**Evaluation:** Evaluate technological, ethical, and environmental aspects of industrial biotechnology and its contribution to a sustainable bioeconomy.

**Core readings:**

Crueger, W., & Crueger, A. (2017). *Biotechnology: A Textbook of Industrial Microbiology* (3rd ed.). Sinauer Associates.

Allwood, M. C., & Martin, G. P. (2014). *Industrial Pharmaceutical Biotechnology* (2nd ed.). CRC Press.

Nielsen, J., & Villadsen, J. (2018). *Bioreaction Engineering Principles* (3rd ed.). Springer.

Singh, R. S., Pandey, A., & Larroche, C. (2019). *Advances in Industrial Biotechnology*. Springer.

Stanbury, P. F., Whitaker, A., & Hall, S. J. (2016). *Principles of Fermentation Technology* (3rd ed.). Butterworth-Heinemann.

Course number NPES4308	Course name: <b>Scientific Writing for Environmental, Agricultural and Life Sciences</b>		
Type of course Profile Course	Semester / Rotation 2028/2029 / Fall Term	Student capacity: 60	
Teaching methods Interactive lectures and workshops; peer review and collaborative editing sessions; guided analysis of published scientific papers; problem-based learning through writing assignments; individual consultations with instructor on writing progress; presentations of student research proposals and drafts; integration of plagiarism detection and citation management tools; reflective writing exercises to enhance critical thinking and self-assessment.	Prerequisites for attendance -	Language English	
<b>Type of examination (Final Grade Composition)</b>  Written exam (100%) (100 minutes)		<b>ECTS (+Workload in hrs)</b>  4 (62 contact hours in class + 58 hours of self-study (together 120))	
Course coordinator: Ms. Breanna Watkins		Semester week hours: 4	
Additional teacher involved: -			
<p><b>Syllabus</b></p> <p>This course will focus on advanced technical writing skills necessary for effective scientific communication. Ultimately, completing this course will improve students' ability to write general research papers, theses with honors, technical reports, grant applications, and journal articles to advance their careers in the future. The goal is to help students become strong writers by analyzing what constitutes good scientific writing, developing a "toolkit for the writer-researcher," and working with these tools. This course will teach students critical thinking and writing skills necessary for a successful and productive career in environmental, agricultural, and life sciences.</p>			
<p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <p><b>Knowledge:</b> Identify the structure, components, and conventions of scientific writing across different types of academic documents.</p> <p><b>Comprehension:</b> Explain the principles of clarity, precision, and coherence in scientific communication.</p> <p><b>Application:</b> Apply academic writing conventions to compose abstracts, introductions, methods, results, and discussion sections of scientific papers.</p> <p><b>Analysis:</b> Analyze examples of scientific texts to identify strengths, weaknesses, and rhetorical strategies used by authors.</p>			

**Synthesis:** Integrate data interpretation, visualization, and argumentation into cohesive written documents for publication or presentation.

**Evaluation:** Critically assess the quality of scientific manuscripts and peer reviews, ensuring compliance with ethical standards and citation norms.

**Core readings.**

Day, R. A., & Gastel, B. (2016). *How to Write and Publish a Scientific Paper* (8th ed.). Cambridge University Press.

Hofmann, A. H. (2023). *Scientific Writing and Communication: Papers, Proposals, and Presentations* (5th ed.). Oxford University Press.

Glasman-Deal, H. (2020). *Science Research Writing: For Non-Native Speakers of English* (2nd ed.). World Scientific Publishing.

Peat, J., Elliott, E., Baur, L., & Keena, V. (2013). *Scientific Writing: Easy When You Know How* (2nd ed.). BMJ Books.

Alley, M. (2018). *The Craft of Scientific Writing* (4th ed.). Springer.

Course number LMG4309	Course name: <b>Microbial Genetics Laboratory</b>		
Type of course Profile Course	Semester / Rotation 2028/2029 / Fall Term	Student capacity: 60	
Teaching methods Hands-on laboratory experiments; guided molecular genetics exercises under instructor supervision; computer-based analysis of DNA and protein sequences; group research projects on gene expression and regulation; demonstrations of gene transfer and bacteriophage biology; problem-based learning focused on experimental troubleshooting; preparation of detailed laboratory reports and oral presentations to develop scientific communication skills.	Prerequisites for attendance Microbial Genetics	Language English	
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>	
Written exam (100%) (100 minutes)		4 (62 contact hours in class + 58 hours of self-study (together 120))	
Course coordinator: Dr. David Baltrus		Semester week hours: 4	
Additional teacher involved: -			
<b>Syllabus</b> A laboratory course related to the lecture course on the structure and functions of prokaryotic genes; methods of gene transfer and mapping, DNA structure, replication, transcription, and translation. Practical computational analysis of DNA sequences and gene cloning strategies. Principles of gene expression regulation. Biology of plasmids and bacteriophages.			
<b>Learning goals and qualifications in this module students learn to (national or international):</b>  <b>Knowledge:</b> Identify the fundamental methods and tools used in microbial genetics, including gene mapping, cloning, and sequencing.  <b>Comprehension:</b> Explain the mechanisms of DNA replication, transcription, translation, and horizontal gene transfer in prokaryotes.  <b>Application:</b> Apply laboratory techniques for DNA isolation, bacterial transformation, and plasmid characterization.  <b>Analysis:</b> Analyze genetic data using computational tools to map genes and predict protein-coding regions.  <b>Synthesis:</b> Design experiments to investigate gene function and regulation using microbial systems.			

**Evaluation:** Evaluate experimental results, troubleshoot procedures, and assess the accuracy and reproducibility of molecular data.

**Core readings.**

Maloy, S. R., Cronan, J. E., & Freifelder, D. (2004). *Microbial Genetics* (2nd ed.). Jones & Bartlett Learning.

Snyder, L., & Champness, W. (2013). *Molecular Genetics of Bacteria* (4th ed.). ASM Press.

Willey, J. M., Sherwood, L. M., & Woolverton, C. J. (2020). *Prescott's Microbiology* (12th ed.). McGraw-Hill Education.

Madigan, M. T., Bender, K. S., Buckley, D. H., Sattley, W. M., & Stahl, D. A. (2021). *Brock Biology of Microorganisms* (16th ed.). Pearson.

Clark, D. P., & Pazdernik, N. J. (2016). *Biotechnology: Academic Cell Update Edition* (2nd ed.). Academic Press.

Course number SOIE/OD4313	Course name: <b>Statistical Foundations of the Information Age/ Dealing with Data</b> (one discipline to choose from)		
Type of course Profile Course	Semester / Rotation 2028/2029 / Fall Term	Student capacity: 60	
Teaching methods Lectures with multimedia presentations; computer-based workshops; problem-solving sessions and group projects on data analysis; case studies applying statistics to real-world datasets in science and technology; interactive discussions and peer feedback; individual assignments focused on coding, visualization, and interpretation of results; practical exercises in predictive modeling and probabilistic reasoning.	Prerequisites for attendance Statistics	Language English	
<b>Type of examination (Final Grade Composition)</b>  Written exam (100%) (100 minutes)		<b>ECTS (+Workload in hrs)</b>  6 (77 contact hours in class + 103 hours of self-study (together 180))	
Course coordinator: Assistant Professor of Practice, Mr. Christopher Mills		Semester week hours: 5	
Additional teacher involved: -			
<p><b>Syllabus</b></p> <p><b>Statistical Foundations of the Information Age</b> Understanding the uncertainty and variability of contemporary data: summarization and description of data, counting rules and basic probability, data visualization, graphical summaries of data, working with large datasets, forecasting stochastic outcomes based on quantitative input data. Operations with statistical software packages such as R.</p> <p><b>Dealing with Data</b> The goal of this course is to introduce the tools, techniques, and issues related to data processing: where the data comes from, how to store and retrieve it, how to extract knowledge from data through analysis, and the social, ethical, and legal issues associated with its use. Throughout the course, students will gain practical experience working with real datasets from various sources, including social media and citizen science projects, as well as hands-on experience with commonly used analysis and visualization tools.</p>			
<b>Learning goals and qualifications in this module students learn to (national or international):</b>			
<b>Statistical Foundations of the Information Age</b>			
<b>Knowledge:</b> Identify key concepts of descriptive statistics, probability, and data distribution.			
<b>Comprehension:</b> Explain the role of uncertainty and variability in data interpretation and forecasting.			

**Application:** Apply statistical methods and software tools (e.g., R) for data analysis, visualization, and hypothesis testing.

**Analysis:** Analyze large datasets using quantitative techniques to reveal patterns, relationships, and stochastic trends.

**Synthesis:** Develop predictive models and integrate statistical results into evidence-based decision-making.

**Evaluation:** Critically assess the accuracy, reliability, and ethical use of statistical methods and data representations.

### **Dealing with Data**

**Knowledge:** Identify key concepts, tools, and terminology in data processing, analysis, and visualization.

**Comprehension:** Explain the processes of data collection, storage, cleaning, and ethical use.

**Application:** Apply data analysis techniques using real-world datasets and common software tools.

**Analysis:** Analyze data quality, detect patterns, and interpret results from multiple data sources.

**Synthesis:** Design data-driven projects integrating collection, analysis, and visualization components.

**Evaluation:** Critically evaluate the social, legal, and ethical implications of data-driven decisions and data privacy practices.

### **Core readings.**

Moore, D. S., Notz, W. I., & Fligner, M. A. (2021). *The Basic Practice of Statistics* (9th ed.). W. H. Freeman and Company.

Diez, D. M., Barr, C. D., & Çetinkaya-Rundel, M. (2021). *OpenIntro Statistics* (4th ed.). OpenIntro.

James, G., Witten, D., Hastie, T., & Tibshirani, R. (2021). *An Introduction to Statistical Learning with Applications in R* (2nd ed.). Springer.

Provost, F., & Fawcett, T. (2013). *Data Science for Business: What You Need to Know About Data Mining and Data-Analytic Thinking*. O'Reilly Media.

VanderPlas, J. (2016). *Python Data Science Handbook: Essential Tools for Working with Data*. O'Reilly Media.

# 8th Semester

## Spring Term 2028/2029

Course number VT4111	Course name: <b>Introduction to Theater</b>		
Type of course Core Course	Semester / Rotation 2028/2029 / Spring Term	Student capacity: 60	
Teaching methods Lectures with visual and multimedia support; seminar discussions on dramatic literature and performance analysis; workshops in acting, directing, and stage movement; group projects involving short scene production; visits to live or recorded theater performances; reflective essays and creative assignments integrating theory and practice; peer review of performances to develop critical appreciation and constructive feedback skills.	Prerequisites for attendance -	Language English	
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>	
Creative exam (100%) (100 minutes)		5 (62 contact hours in class + 88 hours of self-study (together 150))	
Course coordinator: Senior Lecturer: Mukhatayeva Zhanar		Semester week hours: 4	
Additional teacher involved: -			
<p><b>Syllabus</b></p> <p>The course explores the fundamental aspects of theatrical art, as well as its impact on society, culture, and science. Students will learn the basic principles of theatrical production, understand the structure of dramatic works, study acting techniques and directing methods, and analyze the aesthetic and sociocultural contexts that influence the creation and perception of theatrical works.</p>			
<p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <p><b>Knowledge:</b> Identify the fundamental concepts, terminology, and historical development of theatrical art.</p> <p><b>Comprehension:</b> Explain the structural elements of dramatic works and the principles of theatrical performance and direction.</p>			

**Application:** Apply basic acting, staging, and analytical techniques in performance and dramatic interpretation.

**Analysis:** Analyze theatrical texts and performances in relation to their cultural, social, and aesthetic contexts.

**Synthesis:** Develop original performance concepts or interpretations integrating theoretical and creative perspectives.

**Evaluation:** Critically assess theatrical productions and creative processes, demonstrating understanding of artistic value, cultural impact, and ethical considerations.

**Core readings:**

Brockett, O. G., & Ball, R. J. (2014). *The Essential Theatre* (11th ed.). Cengage Learning.

Wilson, E., & Goldfarb, A. (2018). *Living Theatre: A History of Theatre* (8th ed.). McGraw-Hill Education.

Benedetti, J. (2007). *The Art of the Actor: The Essential History of Acting, from Classical Times to the Present Day*. Routledge.

Stanislavski, K. (2013). *An Actor's Work: A Student's Diary*. Routledge.

Zarrilli, P. B., McConachie, B., Williams, G. J., & Fisher, C. (2010). *Theatre Histories: An Introduction* (2nd ed.). Routledge.

Course number LB4306	Course name: <b>Features of Entrepreneurial Activity</b>	
Type of course Basic Course	Semester / Rotation 2028/2029 / Spring Term	Student capacity: 60
Teaching methods Lectures with multimedia and case-based discussions; seminars and workshops on business modeling and innovation; practical exercises in developing business plans and feasibility studies; problem-based learning through analysis of real entrepreneurial cases; group projects simulating enterprise management and start-up development.	Prerequisites for attendance -	Language English
<b>Type of examination (Final Grade Composition)</b>  Written exam (100%) (100 minutes)		<b>ECTS (+Workload in hrs)</b>  6 (77 contact hours in class + 103 hours of self-study (together 180 hrs)
Course coordinator: Dr. Dimash Shaikin		Semester week hours: 5
Additional teacher involved:		
<p><b>Syllabus</b></p> <p>The aim of the course is to form a systematic understanding of the nature and characteristics of entrepreneurial activity, to study the basics, forms, and methods of organizing entrepreneurial activity, and to learn how to apply the acquired knowledge to optimize economic activities in enterprises of any form of ownership.</p>		
<p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <p><b>Knowledge:</b> Identify key concepts, principles, and terminology related to entrepreneurship and business organization.</p> <p><b>Comprehension:</b> Explain the economic, social, and legal characteristics of entrepreneurial activity and its role in market economies.</p> <p><b>Application:</b> Apply business planning, management, and financial analysis methods to real or simulated entrepreneurial projects.</p> <p><b>Analysis:</b> Analyze market environments, risks, and resource allocation in entrepreneurial decision-making.</p> <p><b>Synthesis:</b> Develop innovative business ideas and design organizational strategies for effective enterprise development.</p> <p><b>Evaluation:</b> Assess the effectiveness, sustainability, and ethical implications of entrepreneurial decisions and business models.</p>		

**Core readings:**

Hisrich, R. D., Peters, M. P., & Shepherd, D. A. (2020). *Entrepreneurship* (11th ed.). McGraw-Hill Education.

Kuratko, D. F. (2019). *Entrepreneurship: Theory, Process, and Practice* (11th ed.). Cengage Learning.

Drucker, P. F. (2015). *Innovation and Entrepreneurship: Practice and Principles*. Routledge.

Scarborough, N. M. (2018). *Essentials of Entrepreneurship and Small Business Management* (9th ed.). Pearson.

Barringer, B. R., & Ireland, R. D. (2019). *Entrepreneurship: Successfully Launching New Ventures* (6th ed.). Pearson.

Course number LB4306	Course name: <b>Plant Genetics and Genomics</b>		
Type of course Basic Course	Semester / Rotation 2028/2029 / Spring Term	Student capacity: 60	
Teaching methods Lectures with multimedia and interactive discussions; laboratory sessions; computer-based workshops in genome sequencing and bioinformatics tools; project-based learning through analysis of plant genomic datasets; case studies on genetic modification and breeding strategies; group presentations on current research in plant genomics.	Prerequisites for attendance -	Language English	
<b>Type of examination (Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b>	
Written exam (100%) (100 minutes)		6 (77 contact hours in class + 103 hours of self-study (together 180 hrs)	
Course coordinator: Dr. Sarah Hind		Semester week hours: 5	
Additional teacher involved:			
<p><b>Syllabus</b></p> <p>The course is aimed at studying the field of science related to the study and use of DNA-based data in the life sciences. Genetics is the study of how DNA is the foundation of the functionality of each cell, as well as the code that transfers information from one generation to the next. New sequencing technologies can now generate vast amounts of data from DNA. Genomics is the study of this data with the goal of making significant discoveries in areas such as medicine, agriculture, evolution, the environment, and biotechnology</p>			
<b>Learning goals and qualifications in this module students learn to (national or international):</b>			
<p><b>Knowledge:</b> Identify key principles of plant genetics, genome organization, and inheritance mechanisms.</p> <p><b>Comprehension:</b> Explain the role of DNA, RNA, and gene regulation in plant development and adaptation.</p> <p><b>Application:</b> Apply genetic and genomic methods to analyze gene sequences, molecular markers, and genome mapping.</p> <p><b>Analysis:</b> Analyze large-scale genomic data to identify genetic variation and functional genes related to agronomic traits.</p> <p><b>Synthesis:</b> Design genomic research strategies for plant improvement and stress resistance using modern sequencing and bioinformatics tools.</p>			

**Evaluation:** Critically assess genomic technologies, experimental designs, and ethical considerations in plant genetics research.

**Core readings:**

Brown, T. A. (2020). *Genomes 5* (5th ed.). Garland Science.

Slater, A., Scott, N. W., & Fowler, M. R. (2008). *Plant Biotechnology: The Genetic Manipulation of Plants* (2nd ed.). Oxford University Press.

Singh, B. D., & Singh, A. K. (2021). *Marker-Assisted Plant Breeding: Principles and Practices* (2nd ed.). Springer.

Goodwin, S., McPherson, J. D., & McCombie, W. R. (2016). *Coming of Age: Ten Years of Next-Generation Sequencing Technologies*. *Nature Reviews Genetics*, 17(6), 333–351.

Buchanan, B. B., Gruissem, W., & Jones, R. L. (2015). *Biochemistry and Molecular Biology of Plants* (2nd ed.). Wiley-Blackwell.

Course number	Course name <b>Pre-Diploma Practice/ Production Practice 2</b>		
Type of course Professional discipline	Semester 2028/2029 Spring Term	Student capacity: 60	
Teaching methods Supervised individual and field work at, laboratorie; consultations with academic advisors and industry mentors; project-based learning through data collection and analysis; participation in professional and technological processes; preparation of written reports and presentations; defense of pre-diploma results before a review committee.	Prerequisites for attendance Production Practice 1	Language English	
<b>Type of examination</b> Written exam (100%) (100 minutes)	<b>(Final Grade Composition)</b>		<b>ECTS (+Workload in hrs)</b> 5 (0 contact hrs in class +150 hrs of self-study (together 150 hrs)
Module coordinator Associate Professor, Dr.: Yuliya Byzova			Semester week hours: -
Additional teacher involved: Dr. Andrea Zucollo			
<p><b>Syllabus</b></p> <p><b>Pre-Diploma Practice</b></p> <p>The course provides students with the opportunity to apply theoretical and practical knowledge gained throughout their studies to real research, technological, or production tasks in preparation for their final diploma project. During the practice, students collect, analyze, and interpret data; conduct experiments or case studies; and prepare analytical materials forming the foundation of their thesis. The course fosters independence, critical thinking, and professional responsibility, enabling students to formulate solutions to real-world scientific or industrial problems within their field.</p> <p><b>Production Practice 2</b></p> <p>This course is designed to consolidate students' professional skills and competencies through direct participation in industrial, laboratory, or research activities aligned with their field of study. It provides practical experience in solving complex technical, organizational, or experimental tasks, as well as familiarization with modern production technologies, management systems, and quality assurance procedures. The practice helps students gain independence in professional decision-making, apply analytical thinking, and prepare for pre-diploma or research projects.</p> <p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <p><b>Pre-Diploma Practice</b></p> <p><b>Knowledge:</b> Identify the structure, objectives, and methodological requirements of pre-diploma research and project preparation.</p> <p><b>Comprehension:</b> Explain the connections between theoretical knowledge and practical applications relevant to the diploma project.</p>			

**Application:** Apply professional, analytical, and research skills to collect, process, and interpret data necessary for the final thesis.

**Analysis:** Analyze the effectiveness of existing technological, scientific, or organizational solutions related to the diploma topic.

**Synthesis:** Develop independent solutions, models, or recommendations for improving processes or systems in the chosen field of study.

**Evaluation:** Critically evaluate the quality, originality, and practical significance of one's own pre-diploma work in accordance with academic and ethical standards.

## **Production Practice 2**

**Knowledge:** Identify advanced principles of industrial, laboratory, or field practice in accordance with the professional profile of the program.

**Comprehension:** Explain the organization, workflow, and technological processes of the enterprise or research facility.

**Application:** Apply theoretical and methodological knowledge to perform complex professional tasks under minimal supervision.

**Analysis:** Analyze technological, organizational, or research data to assess efficiency, quality, and innovation potential.

**Synthesis:** Develop proposals for improving technological processes, quality control, or research methodologies based on collected data.

**Evaluation:** Evaluate personal performance, professional competence, and compliance with safety, ethical, and quality standards during practice.

## **Core readings:**

Groover, M. P. (2020). *Fundamentals of Modern Manufacturing: Materials, Processes, and Systems* (8th ed.). Wiley.

Doran, P. M. (2013). *Bioprocess Engineering Principles* (2nd ed.). Academic Press.

Stanbury, P. F., Whitaker, A., & Hall, S. J. (2016). *Principles of Fermentation Technology* (3rd ed.). Butterworth-Heinemann.

ISO 9001:2015. *Quality Management Systems – Requirements*. International Organization for Standardization.

OECD (2018). *Best Practice Guidelines for Biological Resource Centres*. Organisation for Economic Co-operation and Development.

Course number	Course name <b>Diploma Thesis Defense / Preparation and Passing of Complex Examination</b> (one discipline to choose from)	
Type of course Professional discipline	Semester 2028/2029 Spring Term	Student capacity: 60
Teaching methods group projects, self-study, case study	Prerequisites for attendance None	Language English
<b>Type of examination (Final Grade Composition)</b>  Written exam (100%) (100 minutes)		<b>ECTS (+Workload in hrs)</b> 8 (0 contact hrs in class +240 hrs of self-study (together 240 hrs)
Module coordinator Associate Professor, Dr. Yuliya Byzova		Semester week hours: -
Additional teacher involved:		
<p><b>Syllabus</b></p> <p><b>Diploma Thesis Defense</b></p> <p>This course represents the final stage of the undergraduate program and is aimed at consolidating the student's research and professional competencies through the preparation, presentation, and defense of a diploma thesis. It involves the independent execution of research or applied work under the supervision of a scientific advisor, with an emphasis on analytical, creative, and critical thinking skills. The course culminates in the public defense of the thesis before an academic committee, demonstrating the student's ability to conduct research, interpret results, and communicate findings effectively in both written and oral forms.</p> <p><b>Preparation and Passing of Complex Examination</b></p> <p>This course is designed to prepare students for the final comprehensive examination of their study program. It provides a structured review of key theoretical concepts, methodologies, and applications developed throughout the curriculum. The course emphasizes integration of multidisciplinary knowledge, analytical reasoning, and critical evaluation skills. Students engage in exam-focused practice through case analyses, problem-solving, and discussion of real-world scenarios relevant to their field, ensuring readiness for final assessment and professional application of knowledge.</p> <p><b>Learning goals and qualifications in this module students learn to (national or international):</b></p> <p><b>Diploma Thesis Defense</b></p> <p><b>Knowledge:</b> Identify the structure, requirements, and academic standards for writing and defending a diploma (bachelor's) thesis.</p> <p><b>Comprehension:</b> Explain the principles of scientific reasoning, academic integrity, and effective communication in thesis preparation.</p> <p><b>Application:</b> Apply research methods, data analysis techniques, and professional formatting standards in the preparation of the final thesis.</p> <p><b>Analysis:</b> Analyze research findings and theoretical frameworks to draw substantiated conclusions and practical recommendations.</p>		

**Synthesis:** Integrate theoretical knowledge and empirical results into a coherent scientific work demonstrating independent research competence.

**Evaluation:** Defend the diploma thesis before an academic committee, demonstrating critical thinking, professionalism, and the ability to justify one's scientific position.

### **Preparation and Passing of Complex Examination**

**Knowledge:** Identify the key theoretical and practical concepts across the selected discipline based on the cumulative learning outcomes of the program.

**Comprehension:** Explain interconnections between fundamental theories, methods, and applications within the chosen field of study.

**Application:** Apply acquired knowledge and problem-solving skills to answer integrated questions and case studies from the selected discipline.

**Analysis:** Analyze complex academic or professional problems, integrating knowledge from multiple modules and sources.

**Synthesis:** Develop coherent arguments and structured responses demonstrating a holistic understanding of the discipline.

**Evaluation:** Critically assess scientific concepts, methods, and evidence, and justify conclusions during oral or written examination.

### **Core readings:**

Day, R. A., & Gastel, B. (2016). *How to Write and Publish a Scientific Paper* (8th ed.). Cambridge University Press.

Booth, W. C., Colomb, G. G., & Williams, J. M. (2016). *The Craft of Research* (4th ed.). University of Chicago Press.

Creswell, J. W., & Creswell, J. D. (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (5th ed.). SAGE Publications.

Slater, A., Scott, N. W., & Fowler, M. R. (2008). *Plant Biotechnology: The Genetic Manipulation of Plants* (2nd ed.). Oxford University Press.

Stanbury, P. F., Whitaker, A., & Hall, S. J. (2016). *Principles of Fermentation Technology* (3rd ed.). Butterworth-Heinemann.

Clark, D. P., & Pazdernik, N. J. (2016). *Biotechnology: Academic Cell Update Edition* (2nd ed.). Academic Press.