



National Research University Higher School of Economics (HSE)

Basic Curriculum

Field of study 06.03.01 Biology

Educational Programme "Cellular and Molecular Biotechnologies"

Implementing unit: Faculty of Biology and Biotechnology, HSE - Moscow

Years of Study: 2021/2022 - 2024/2025

Length of Programme: 4 years

Mode of Study: Full Time

Degree: Bachelor's degree

APPROVED

30.04.2021

Vice Rector

ROSHCHIN S.Y.

Signed with EDS

| Block Code | Course | Subject type | Credits | Credits by Years | | | | Planned Educational Programme Development Results |
|------------|--|--------------|---------|------------------|-------|-------|-------|---|
| | | | | 1 | 2 | 3 | 4 | |
| | Degree Programme | | 240,00 | 60,00 | 60,00 | 60,00 | 60,00 | |
| | Major | | 165,00 | 45,00 | 42,00 | 39,00 | 39,00 | |
| | Core Professional Block (Major) | | 67,00 | 40,00 | 22,00 | 5,00 | | |
| | Subject Areas | | 67,00 | 40,00 | 22,00 | 5,00 | | |
| | Botany | | 9,00 | 9,00 | | | | |
| 1 | Structural and Evolutionary Botany | C | 5,00 | 5,00 | | | | GPC-3, PC-5, UC-1 |
| 2 | Mycology and Algology | C | 4,00 | 4,00 | | | | GPC-1, GPC-6, PC-1, UC-2 |
| | Zoology | | 9,00 | 9,00 | | | | |
| 1 | Invertebrate Zoology | C | 5,00 | 5,00 | | | | GPC-3, UC-1 |
| 2 | Vertebrate Zoology | C | 4,00 | 4,00 | | | | GPC-3, UC-1 |
| | Immunology | | 5,00 | | | 5,00 | | |
| 1 | Immunology | C | 5,00 | | | 5,00 | | GPC-1, GPC-10, GPC-11, GPC-12, GPC-13, GPC-14, GPC-2, GPC-3, GPC-4, GPC-5, GPC-6, GPC-7, GPC-8, GPC-9, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, UC-1, UC-3, UC-5, UC-7, UC-9 |
| | Physics | | 4,00 | 4,00 | | | | |
| 1 | Physics | C | 4,00 | 4,00 | | | | GPC-3, PC-7, UC-1 |
| | Chemistry | | 16,00 | 10,00 | 6,00 | | | |
| 1 | General and Inorganic Chemistry | C | 5,00 | 5,00 | | | | GPC-2, PC-8, UC-1 |
| 2 | Organic Chemistry for Biology and Medicine | C | 5,00 | 5,00 | | | | GPC-2, PC-8, UC-1 |
| 3 | Biochemistry | C | 6,00 | | 6,00 | | | GPC-5, PC-8, UC-1 |
| | Mathematics | | 16,00 | 8,00 | 8,00 | | | |
| 1 | Calculus | C | 8,00 | 8,00 | | | | UC-1 |

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| 2 | Linear Algebra | C | 4,00 | | 4,00 | | | UC-1 |
| 3 | Probability Theory and Mathematical Statistics | C | 4,00 | | 4,00 | | | UC-1 |
| | Physiology | | 8,00 | | 8,00 | | | |
| 1 | Human Physiology with the Basics of Biophysics | C | 5,00 | | 5,00 | | | GPC-5, PC-8, UC-1 |
| 2 | Histology | C | 3,00 | | 3,00 | | | GPC-4, PC-4, PC-5, UC-1 |
| | Elective Professional Block (Major) | | 98,00 | 5,00 | 20,00 | 34,00 | 39,00 | |
| | Elective Courses, 3 Module | | 15,00 | | | | 15,00 | |
| 1 | Design, Control and Management of Biotechnological Productions | E | 5,00 | | | | 5,00 | GPC-1, GPC-2, GPC-5, GPC-6, PC-1, PC-8, UC-1, UC-2 |
| 2 | Startups in Biotechnology and the Search for Financing | E | 5,00 | | | | 5,00 | GPC-3, GPC-4, GPC-5, GPC-6, PC-4, PC-6, PC-7, UC-3, UC-4, UC-5, UC-6 |
| 3 | Molecular Oncology | E | 5,00 | | | | 5,00 | GPC-10, GPC-11, GPC-13, GPC-2, GPC-7, PC-2, PC-4, PC-6, PC-8, UC-10, UC-2, UC-6, UC-7, UC-8, UC-9 |
| 4 | Matrix Processes in Biology | E | 5,00 | | | | 5,00 | GPC-1, GPC-14, GPC-6, GPC-9, PC-3, PC-6, PC-7, PC-8, UC-10, UC-3, UC-5, UC-8 |
| | Module "Key seminars" 2024/2025 | | 3,00 | | | | 3,00 | |
| 1 | Scientific research seminar "Introduction to artificial intelligence" | C | 3,00 | | | | 3,00 | GPC-1, GPC-2, GPC-3, GPC-5, PC-1, PC-2, PC-3, UC-1, UC-2, UC-3, UC-5 |
| | Elective Courses, 1 Module | | 7,00 | | | | 7,00 | |
| 1 | Production processes in biotechnology | E | 7,00 | | | | 7,00 | GPC-1, GPC-12, GPC-14, GPC-3, GPC-5, GPC-7, GPC-9, PC-5, PC-6, PC-7, PC-8, UC-1, UC-2, UC-4, UC-6 |
| 2 | Bioinformatics for Next Generation Sequencing | E | 7,00 | | | | 7,00 | GPC-1, GPC-10, GPC-11, GPC-12, GPC-13, GPC-14, GPC-2, GPC-3, GPC-4, GPC-5, GPC-6, GPC-7, GPC-8, GPC-9, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, UC-1, UC-11, UC-4, UC-6, UC-7, UC-9 |
| | Elective Courses, 2 Module | | 4,00 | | | | 4,00 | |
| 1 | Introduction to Medical Biotechnologies | E | 4,00 | | | | 4,00 | GPC-11, GPC-13, GPC-2, GPC-4, GPC-6, GPC-8, GPC-9, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, UC-1, UC-2, UC-3, UC-4, UC-5, UC-6 |
| 2 | Non-coding RNAs and Epigenetics | E | 4,00 | | | | 4,00 | GPC-1, GPC-2, GPC-5, GPC-6, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, UC-1, UC-2 |
| | Базовая профильная часть | | 69,00 | 5,00 | 20,00 | 34,00 | 10,00 | |
| 1 | Biotechnology | C | 5,00 | | | 5,00 | | GPC-10, GPC-11, GPC-12, GPC-5, GPC-6, GPC-7, GPC-8, GPC-9, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, UC-1, UC-2, UC-3 |
| 2 | Bioenergy (offered in a foreign language) | C | 3,00 | | | 3,00 | | GPC-1, GPC-6, GPC-7, GPC-9, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, UC-1, UC-3 |

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| 3 | Virology | C | 3,00 | | | 3,00 | | GPC-1, GPC-3, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, UC-1 |
| 4 | Research Methods of Biological Macromolecules | C | 5,00 | | | 5,00 | | GPC-1, GPC-3, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, UC-1 |
| 5 | Theories of Evolution | C | 3,00 | | | 3,00 | | GPC-1, GPC-2, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, UC-1 |
| 6 | Ecology | C | 3,00 | | | 3,00 | | GPC-1, GPC-13, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, UC-1 |
| 7 | Neurobiology of Behavior | C | 3,00 | | | 3,00 | | GPC-1, PC-1, PC-2, PC-3, PC-5, PC-7, PC-8, UC-1 |
| 8 | Embryology | C | 3,00 | | | 3,00 | | GPC-1, GPC-4, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, UC-1 |
| 9 | Project Seminar | C | 3,00 | | | 3,00 | | GPC-1, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, UC-1 |
| 10 | Differential Equations | C | 3,00 | | | 3,00 | | GPC-1, PC-1, UC-1 |
| 11 | Genetic Engineering and Bioengineering | C | 4,00 | | | | 4,00 | GPC-10, GPC-12, GPC-14, GPC-2, GPC-4, GPC-6, GPC-8, PC-2, PC-4, PC-6, PC-8, UC-10, UC-2, UC-4, UC-6, UC-8 |
| 12 | Biotechnology Market in Russia | C | 3,00 | | | | 3,00 | GPC-10, GPC-12, GPC-14, GPC-2, GPC-4, GPC-6, GPC-8, PC-1, PC-3, PC-5, PC-7, UC-1, UC-3 |
| 13 | Cell signalling (offered in a foreign language) | C | 3,00 | | | | 3,00 | GPC-1, GPC-11, GPC-13, GPC-3, GPC-5, GPC-7, GPC-9, PC-1, PC-3, PC-5, PC-7, UC-1, UC-10, UC-11, UC-2, UC-3, UC-4, UC-5, UC-6, UC-7, UC-8, UC-9 |
| 14 | Cell Biology: the Basics of Bioprocesses | C | 5,00 | 5,00 | | | | GPC-5, PC-1, PC-2, PC-3, PC-4, PC-6, UC-1 |
| 15 | Bioinformatics | C | 5,00 | | 5,00 | | | GPC-1, PC-1, PC-2, PC-3, UC-1, UC-6 |
| 16 | Molecular Biology | C | 6,00 | | 6,00 | | | GPC-1, GPC-11, GPC-14, GPC-5, GPC-6, PC-1, PC-3, PC-4, PC-5, PC-6, UC-1, UC-2, UC-3, UC-6 |
| 17 | Genetics (offered in a foreign language) | C | 4,00 | | 4,00 | | | GPC-1, GPC-11, GPC-6, GPC-7, PC-1, PC-2, PC-5, UC-1, UC-2, UC-6 |
| 18 | Microbiology | C | 5,00 | | 5,00 | | | GPC-1, GPC-10, GPC-4, GPC-5, GPC-6, GPC-8, PC-1, PC-5, PC-6, PC-8, UC-1, UC-6, UC-8 |
| | Internship | | 32,00 | 6,00 | 6,00 | 7,00 | 13,00 | |
| | Professional Internship | | 16,00 | 6,00 | 6,00 | 4,00 | | |
| 1 | Educational Internship | C | 4,00 | | | 4,00 | | GPC-11, GPC-14, GPC-3, GPC-5, GPC-7, GPC-9, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, UC-1 |
| 2 | Educational Internship | C | 12,00 | 6,00 | 6,00 | | | GPC-6, PC-6, UC-1, UC-3, UC-8 |
| | Project Internship | | 3,00 | | | 3,00 | | |

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| 1 | Research Project | C | 3,00 | | | 3,00 | | GPC-1, GPC-6, PC-1, PC-2, PC-3, UC-1, UC-3, UC-4, UC-6 |
| | Research Internship | | 13,00 | | | | 13,00 | |
| 1 | Educational Science Research Internship | C | 3,00 | | | | 3,00 | GPC-1, GPC-10, GPC-12, GPC-14, GPC-6, GPC-8, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, UC-1 |
| 2 | Graduation Internship | C | 7,00 | | | | 7,00 | GPC-1, PC-2, PC-3, UC-1 |
| 3 | Preparation of Graduation Thesis | C | 3,00 | | | | 3,00 | GPC-1, PC-1, PC-2, PC-3, UC-1 |
| | General Courses | | 14,00 | 5,00 | 1,00 | | 4,00 | 4,00 |
| | Core General Courses | | 2,00 | 1,00 | 1,00 | | | |
| 1 | Physical Training | C | 1,00 | | 1,00 | | | UC-7 |
| 2 | Safe Living Basics | C | 1,00 | 1,00 | | | | UC-8 |
| | Optional General Courses | | 12,00 | 4,00 | | | 4,00 | 4,00 |
| 1 | Philosophy | C | 4,00 | | | | 4,00 | GPC-1, PC-1, UC-1, UC-3, UC-5 |
| 2 | Legal Literacy | C | 4,00 | | | | 4,00 | GPC-1, GPC-14, PC-1, UC-1, UC-10, UC-11 |
| 3 | Economics | C | 4,00 | 4,00 | | | | UC-1 |
| | Minor | | 20,00 | | 10,00 | | 10,00 | |
| 1 | Minor | E | 20,00 | | 10,00 | | 10,00 | UC-4 |
| | English | | 1,00 | | | | 1,00 | |
| | Examinations | | 1,00 | | | | 1,00 | |
| 1 | Independent English Exam (offered in a foreign language) | C | | | | | | UC-4 |
| 2 | Project Proposal (offered in a foreign language) | C | 1,00 | | | | 1,00 | GPC-1, PC-1, PC-2, PC-3, UC-1 |
| 3 | English Language Integrative Exam (offered in a foreign language) | C | | | | | | UC-4 |
| | Optional Courses | | | | | | | |
| 1 | Academic Writing in English (offered in a foreign language) | O | 2,00 | | | | 2,00 | GPC-1, PC-1, UC-1, UC-2 |
| 2 | English (offered in a foreign language) | O | 14,00 | 8,00 | 6,00 | | | UC-4 |
| | Data Culture | | 5,00 | 4,00 | 1,00 | | | |
| 1 | Python for Data Extraction and Processing | C | 4,00 | 4,00 | | | | GPC-1, PC-1, UC-1 |
| 2 | Independent Programming Test. Intermediate | C | | | | | | PC-3, UC-2, UC-6 |
| 3 | Independent Digital Literacy Test | C | | | | | | UC-2, UC-6 |
| 4 | Independent Data Science Test. Intermediate | C | 1,00 | | 1,00 | | | GPC-1, PC-1, UC-1, UC-2, UC-6 |
| | Final State Certification (FSC) | | 3,00 | | | | 3,00 | |
| | Thesis Work | | 3,00 | | | | 3,00 | |
| 1 | Presenting of Graduation Thesis | C | 3,00 | | | | 3,00 | GPC-1, PC-2, PC-3, UC-1 |

Curriculum agreed:

Academic Supervisor

STEPANOVA E.V.

23.04.2021

Dean TONEVITSKIY A.G. 23.04.2021

Head of Centre for Educational Model Design LEPESHKIN I.A. 29.04.2021

* Subject type:

Compulsory course C

Elective course E

Optional course O