



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: 2024/2025 - 2027/2028

Length of Programme: 4 years

Mode of Study: Full Time

Degree: Bachelor's degree

APPROVED

19.04.2024

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 | | 154,00 | 46,00 | 31,00 | 39,00 | 38,00 | |
| | Core Professional Block (Major) | | 62,00 | 39,00 | 18,00 | 5,00 | | |
| | Basic Components | | 62,00 | 39,00 | 18,00 | 5,00 | | |
| 1 | Probability Theory and Mathematical Statistics | C | 4,00 | | 4,00 | | | GPC-1, PC-1, UC-1 |
| 2 | Histology | C | 3,00 | | 3,00 | | | GPC-1, PC-1, UC-1, UC-2 |
| 3 | Human Physiology with the Basics of Biophysics | C | 6,00 | | 6,00 | | | GPC-1, GPC-2, GPC-3, GPC-4, GPC-5, PC-1, PC-2, PC-5, PC-6, UC-1 |
| 4 | Biochemistry | C | 5,00 | | 5,00 | | | GPC-1, GPC-8, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, PC-8, PC-9, UC-1 |
| 5 | Immunology | C | 5,00 | | | 5,00 | | GPC-1, GPC-2, PC-1, PC-2, UC-1, UC-2 |
| 6 | Invertebrate Zoology | C | 5,00 | 5,00 | | | | GPC-1, PC-1, UC-1 |
| 7 | Vertebrate Zoology | C | 5,00 | 5,00 | | | | GPC-1, GPC-3, PC-1, PC-2, PC-4, UC-1, UC-2, UC-3, UC-5 |
| 8 | Linear Algebra | C | 4,00 | 4,00 | | | | GPC-1, GPC-2, GPC-3, GPC-6, PC-1, PC-3, UC-1, UC-3, UC-5 |
| 9 | Mathematical Analysis with the Basics of Differential Equations | C | 7,00 | 7,00 | | | | GPC-1, GPC-3, GPC-6, PC-1, PC-3, UC-1, UC-3 |
| 10 | General and Inorganic Chemistry | C | 6,00 | 6,00 | | | | GPC-2, GPC-6, PC-8, UC-1 |
| 11 | Organic Chemistry | C | 5,00 | 5,00 | | | | GPC-2, GPC-6, PC-8, UC-1, UC-2 |
| 12 | Structural and Evolutionary Botany | C | 3,00 | 3,00 | | | | GPC-1, PC-1, UC-1 |
| 13 | Physics | C | 4,00 | 4,00 | | | | GPC-1, GPC-2, PC-1, PC-2, UC-1 |
| | Elective Professional Block (Major) | | 92,00 | 7,00 | 13,00 | 34,00 | 38,00 | |
| | Research seminar | | 3,00 | | | 3,00 | | |

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| 1 | Project Seminar | C | 3,00 | | | 3,00 | | GPC-1, GPC-2, GPC-8, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, PC-9, UC-1, UC-11 |
| Basic Profile Part | | | 62,00 | 7,00 | 13,00 | 31,00 | 11,00 | |
| 1 | Genetics (offered in a foreign language) | C | 4,00 | | 4,00 | | | GPC-1, GPC-2, GPC-3, GPC-4, GPC-5, GPC-6, GPC-7, GPC-8, UC-1, UC-2, UC-8 |
| 2 | Microbiology | C | 5,00 | | 5,00 | | | GPC-1, GPC-2, GPC-3, GPC-4, GPC-5, GPC-6, GPC-7, GPC-8, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, UC-1 |
| 3 | Molecular Biology | C | 4,00 | | 4,00 | | | GPC-1, GPC-2, GPC-3, PC-1, PC-2, PC-4, PC-5, PC-6, PC-8, PC-9, UC-1, UC-8 |
| 4 | Differential Equations | C | 3,00 | | | 3,00 | | UC-1, UC-2, UC-3, UC-4, UC-8 |
| 5 | Neurobiology of Behavior | C | 3,00 | | | 3,00 | | GPC-1, GPC-2, PC-3, PC-6, PC-7, PC-8, PC-9, UC-1, UC-2 |
| 6 | Theories of Evolution | C | 3,00 | | | 3,00 | | GPC-3, PC-1, PC-3, PC-7, PC-8, UC-1, UC-3 |
| 7 | Embryology | C | 3,00 | | | 3,00 | | GPC-1, GPC-2, GPC-3, GPC-4, GPC-5, GPC-6, GPC-7, GPC-8, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, PC-9, UC-1, UC-8 |
| 8 | Genetic Engineering and Bioengineering | C | 4,00 | | | | 4,00 | GPC-1, GPC-3, GPC-5, PC-1, PC-2, PC-4, PC-6, PC-8, UC-1, UC-2, UC-3, UC-4, UC-5, UC-6, UC-7 |
| 9 | Cell signalling (offered in a foreign language) | C | 4,00 | | | | 4,00 | GPC-1, GPC-3, GPC-5, GPC-7, PC-1, PC-3, PC-5, PC-7, PC-9, UC-1, UC-2, UC-3 |
| 10 | Biotechnology Market in Russia | C | 3,00 | | | | 3,00 | GPC-1, GPC-3, GPC-5, GPC-7, PC-1, PC-2, PC-5, PC-6, UC-1, UC-2, UC-3, UC-4, UC-5 |
| 11 | Research Methods of Biological Macromolecules | C | 5,00 | | | 5,00 | | GPC-1, GPC-2, PC-1, PC-4, UC-1, UC-2 |
| 12 | Ecology | C | 3,00 | | | 3,00 | | GPC-1, GPC-4, GPC-7, GPC-8, PC-1, PC-2, PC-7, UC-1, UC-10, UC-11, UC-8, UC-9 |
| 13 | Virology | C | 3,00 | | | 3,00 | | GPC-1, GPC-2, PC-1, PC-2, PC-9, UC-1, UC-2 |
| 14 | Bioenergy (offered in a foreign language) | C | 3,00 | | | 3,00 | | GPC-1, GPC-2, GPC-3, GPC-4, GPC-5, GPC-6, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, UC-1, UC-2 |
| 15 | Biotechnology | C | 5,00 | | | 5,00 | | GPC-1, GPC-5, PC-1, PC-2, PC-5, PC-6, UC-1, UC-2 |
| 16 | Cell Biology: the Basics of Bioprocesses | C | 7,00 | 7,00 | | | | GPC-1, GPC-2, GPC-7, GPC-8, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, UC-1, UC-11, UC-2, UC-6 |

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| | Elective disciplines, 4th year | | 5,00 | | | | 5,00 | |
| 1 | Introduction to Medical Biotechnologies | E | 5,00 | | | | 5,00 | GPC-1, GPC-2, PC-1, PC-3, PC-5, UC-1, UC-2, UC-3 |
| 2 | Non-coding RNAs and Epigenetics | E | 5,00 | | | | 5,00 | GPC-1, GPC-3, GPC-5, GPC-7, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, UC-1, UC-3 |
| | Elective disciplines, 4th year | | 7,00 | | | | 7,00 | |
| 1 | Production processes in biotechnology | E | 7,00 | | | | 7,00 | GPC-1, GPC-3, GPC-5, PC-1, PC-3, PC-5, UC-1, UC-2, UC-3, UC-4, UC-5, UC-6 |
| 2 | Bioinformatics for Next Generation Sequencing | E | 7,00 | | | | 7,00 | GPC-1, GPC-3, GPC-5, PC-1, PC-3, UC-1, UC-2, UC-3, UC-4 |
| | Elective disciplines, 4th year | | 15,00 | | | | 15,00 | |
| 1 | Design, Control and Management of Biotechnological Productions | E | 5,00 | | | | 5,00 | GPC-1, GPC-2, GPC-3, GPC-4, GPC-5, PC-1, PC-3, PC-5, PC-8, UC-1, UC-3, UC-5 |
| 2 | Matrix Processes in Biology | E | 5,00 | | | | 5,00 | GPC-1, GPC-2, GPC-3, GPC-4, GPC-5, GPC-6, GPC-7, GPC-8, PC-1, PC-2, PC-3, PC-4, PC-6, UC-1, UC-2, UC-3, UC-4, UC-5, UC-6 |
| 3 | Molecular Oncology | E | 5,00 | | | | 5,00 | GPC-1, GPC-2, GPC-3, GPC-4, GPC-5, GPC-6, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, UC-1, UC-2, UC-3, UC-4, UC-5, UC-6 |
| 4 | Startups in Biotechnology and the Search for Financing | E | 5,00 | | | | 5,00 | GPC-1, GPC-2, GPC-3, GPC-4, PC-1, PC-2, PC-3, PC-4, PC-5, UC-1, UC-10, UC-2, UC-3, UC-4 |
| | Internship | | 34,00 | 8,00 | 5,00 | 7,00 | 14,00 | |
| | Professional Internship | | 20,00 | 8,00 | 5,00 | 4,00 | 3,00 | |
| 1 | Educational Internship 2 | C | 4,00 | | | 4,00 | | GPC-1, GPC-2, GPC-3, GPC-4, GPC-5, GPC-6, GPC-7, GPC-8, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, PC-9, UC-1, UC-3, UC-5, UC-7 |
| 2 | Science and Research Internship | C | 3,00 | | | | 3,00 | GPC-1, GPC-2, GPC-3, GPC-4, GPC-5, GPC-6, GPC-7, GPC-8, 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 |
| 3 | Educational Internship | C | 13,00 | 8,00 | 5,00 | | | GPC-1, GPC-2, PC-1, PC-2, PC-3, UC-1, UC-2 |
| | Project Internship | | 3,00 | | | 3,00 | | |
| 1 | Research or Applied Project | C | 3,00 | | | 3,00 | | GPC-1, GPC-2, GPC-3, PC-1, PC-2, PC-3, UC-1, UC-2 |
| | Research Internship | | 11,00 | | | | 11,00 | |

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| 1 | Graduation Internship | C | 8,00 | | | | 8,00 | GPC-1, GPC-2, GPC-3, GPC-4, GPC-5, GPC-6, GPC-7, GPC-8, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, PC-9, UC-1, UC-2 |
| 2 | Preparation of Graduation Thesis | C | 3,00 | | | | 3,00 | GPC-1, GPC-2, GPC-3, GPC-4, GPC-5, GPC-6, GPC-7, GPC-8, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, PC-9, UC-1, UC-2, UC-3 |
| | General Courses | | 19,00 | 6,00 | 5,00 | 4,00 | 4,00 | |
| | Core General Courses | | 2,00 | 1,00 | 1,00 | | | |
| 1 | Safe Living Basics | C | 1,00 | 1,00 | | | | GPC-1, PC-1, UC-1 |
| 2 | Physical Training | C | 1,00 | | 1,00 | | | GPC-1, PC-1, UC-7 |
| | Optional General Courses | | 17,00 | 5,00 | 4,00 | 4,00 | 4,00 | |
| 1 | Philosophy | C | 4,00 | | | 4,00 | | GPC-1, GPC-2, GPC-3, GPC-4, PC-1, PC-2, PC-3, PC-4, UC-1, UC-2, UC-3, UC-4 |
| 2 | Legal Literacy | C | 4,00 | | | | 4,00 | GPC-1, GPC-7, GPC-8, PC-1, PC-7, UC-1, UC-10, UC-11, UC-2, UC-3, UC-4, UC-5, UC-6, UC-8, UC-9 |
| 3 | Russian History | C | 4,00 | | 4,00 | | | GPC-1, GPC-3, PC-1, PC-2, PC-3, UC-1, UC-5 |
| 4 | Foundations of Russian Statehood | C | 2,00 | 2,00 | | | | GPC-1, GPC-3, GPC-5, PC-1, PC-3, PC-5, UC-1, UC-2, UC-3, UC-4, UC-5 |
| 5 | Economics | C | 3,00 | 3,00 | | | | GPC-2, PC-1, PC-2, PC-3, UC-1, UC-10, UC-4, UC-6, UC-9 |
| | Minor | | 20,00 | | 10,00 | 10,00 | | |
| 1 | Minor | E | 20,00 | | 10,00 | 10,00 | | GPC-1, GPC-2, PC-1, PC-2, UC-1, UC-2 |
| | English | | 1,00 | | | | 1,00 | |
| | Examinations | | 1,00 | | | | 1,00 | |
| 1 | Independent English Exam (offered in a foreign language) | C | | | | | | GPC-1, PC-1, UC-1, UC-2, UC-3, UC-4 |
| 2 | Project Proposal (offered in a foreign language) | C | 1,00 | | | | 1,00 | GPC-1, PC-1, UC-1, UC-4 |
| 3 | English Language Integrative Exam (offered in a foreign language) | C | | | | | | GPC-1, PC-1, UC-1, UC-4 |
| | Optional Courses | | | | | | | |
| 1 | Academic English Writing (offered in a foreign language) | O | 2,00 | | | | 2,00 | GPC-1, PC-1, UC-1, UC-4 |
| 2 | English Language (offered in a foreign language) | O | 14,00 | 8,00 | 6,00 | | | GPC-1, PC-1, UC-4 |
| | Data Culture | | 9,00 | | 9,00 | | | |
| 1 | Bioinformatics | C | 5,00 | | 5,00 | | | GPC-1, GPC-3, GPC-5, GPC-7, GPC-8, PC-1, PC-3, PC-4, PC-8, UC-1, UC-11, UC-2, UC-3, UC-6, UC-9 |
| 2 | Data Scientist with Python | C | 3,00 | | 3,00 | | | GPC-1, GPC-7, GPC-8, PC-1, PC-2, PC-3, PC-8, UC-11 |

