



National Research University Higher School of Economics (HSE)

Basic Curriculum

Field of study 09.04.01 Information Science and Computation Technology

Educational Programme "Computer Systems and Networks"

Trajectories: "Computer Networks", "Computing Systems and Complexes", "Digital Twins of Electronics and Computer Products", "Highload Systems and Code Optimization"

Implementing unit: Tikhonov Moscow Institute of Electronics and Mathematics, HSE - Moscow

Years of Study: 2024/2025 - 2025/2026

Length of Programme: 2 years

Mode of Study: Full Time

Degree: Master's degree / MBA

APPROVED

15.04.2024

Vice Rector

ROSHCHIN S.Y.

Signed with EDS

| Block Code | Course   | Subject type | Credits | Credits by Years |       | Planned Educational Programme Development Results  |
|------------|--|--------------|---------|------------------|-------|--|
|            |  |              |         | 1                | 2     |  |
|            | Degree Programme                                   |              | 120,00  | 60,00            | 60,00 |  |
|            | Computing Systems and Complexes (Applied track)    |              | 120,00  | 60,00            | 60,00 |  |
|            | Key Seminars                                       |              | 18,00   | 9,00             | 9,00  |  |
| 1          | Mentor's Seminar "Computing Systems and Complexes" | C            | 6,00    | 3,00             | 3,00  | GPC-1.ISC, GPC-2.ISC, GPC-3.ISC, GPC-4.ISC, GPC-5.ISC, GPC-6.ISC, GPC-7.ISC, GPC-8.ISC, UC-1, UC-2, UC-3, UC-4, UC-5, UC-6 |
| 2          | Research Seminar                                   | C            | 6,00    | 3,00             | 3,00  | PC-4, UC-1, UC-2, UC-6   |
| 3          | Project Seminar                                    | C            | 6,00    | 3,00             | 3,00  | GPC-2.ISC, PC-4, PC-5, UC-1, UC-2, UC-5  |
|            | Internship   |              | 24,00   | 6,00             | 18,00 |  |
|            | Project Internship                                 |              | 6,00    | 6,00             |       |  |
| 1          | Project  | C            | 6,00    | 6,00             |       | GPC-1.ISC, GPC-2.ISC, GPC-3.ISC, PC-1, PC-11, PC-12, PC-4, PC-5, PC-7, PC-8, UC-1, UC-3, UC-5, UC-6                        |
|            | Professional Internship                            |              | 9,00    |                  | 9,00  |  |
| 1          | Work Experience Internship                         | C            | 9,00    |                  | 9,00  | GPC-1.ISC, GPC-2.ISC, PC-1, PC-2, UC-1, UC-2   |
|            | Research Internship                                |              | 9,00    |                  | 9,00  |  |

|    |  |   |        |       |       |   |
|----|--|---|--------|-------|-------|---|
| 1  | Graduation Thesis  | C | 9,00   |       | 9,00  | GPC-1.ISC, GPC-2.ISC, GPC-3.ISC, GPC-4.ISC, GPC-5.ISC, GPC-6.ISC, GPC-7.ISC, GPC-8.ISC, PC-1, PC-10, PC-11, PC-12, PC-13, PC-14, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, PC-9, UC-1, UC-2, UC-3, UC-4, UC-5, UC-6 |
|    | Major  |   | 66,00  | 45,00 | 21,00 |   |
| 1  | IT-Projects and IT-Processes Management                            | C | 3,00   |       | 3,00  | PC-13, PC-14, PC-3, PC-4, PC-5, UC-5  |
| 2  | Architecture Features Support in the Operating Systems Development | C | 6,00   |       | 6,00  | PC-10   |
| 3  | Neural Networks: Tasks and Computation                             | C | 6,00   |       | 6,00  | PC-2, PC-8  |
| 4  | The Architecture of the Computing Cores of Modern Microprocessors  | C | 6,00   |       | 6,00  | PC-10, PC-2, PC-4, PC-7, PC-8, UC-1, UC-3, UC-6   |
| 5  | Data Analysis and AI Methods                                       | C | 3,00   | 3,00  |       | GPC-3.ISC, PC-2, PC-4, PC-5, PC-6   |
| 6  | Distributed Databases and Network Computing                        | C | 12,00  | 12,00 |       | GPC-2.ISC, GPC-3.ISC, GPC-4.ISC, GPC-5.ISC, GPC-6.ISC   |
| 7  | System Analysis and Complex Systems Design                         | C | 3,00   | 3,00  |       | PC-1, PC-2, PC-5, UC-1, UC-3, UC-6  |
| 8  | Modern Computer Systems  | C | 9,00   | 9,00  |       | GPC-1.ISC, GPC-2.ISC, PC-1, PC-2, UC-1, UC-2  |
| 9  | Optimizing Compilation Technologies                                | C | 6,00   | 6,00  |       | PC-10, PC-2, PC-4, PC-7, PC-8, UC-1, UC-3, UC-6   |
| 10 | Software Engineering   | C | 6,00   | 6,00  |       | PC-10, PC-12, PC-2, PC-4, PC-8  |
| 11 | Computer Simulation  | C | 6,00   | 6,00  |       | PC-10, PC-12, UC-2, UC-4  |
|    | Magolego   |   | 9,00   |       | 9,00  |   |
| 1  | All-university Pool MAGOLEGO Courses                               | E | 9,00   |       | 9,00  | GPC-1.ISC, GPC-2.ISC, GPC-3.ISC, GPC-4.ISC, GPC-5.ISC, GPC-6.ISC, GPC-7.ISC, GPC-8.ISC  |
|    | Final State Certification (FSC)                                    |   | 3,00   |       | 3,00  |   |
| 1  | Final Qualification Paper  | C | 3,00   |       | 3,00  | GPC-1.ISC, GPC-2.ISC, GPC-3.ISC, GPC-4.ISC, GPC-5.ISC, GPC-6.ISC, GPC-7.ISC, GPC-8.ISC, PC-1, PC-10, PC-11, PC-12, PC-13, PC-14, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, PC-9, UC-1, UC-2, UC-3, UC-4, UC-5, UC-6 |
|    | Computer Networks (Applied track)                                  |   | 120,00 | 60,00 | 60,00 |   |
|    | Key Seminars   |   | 18,00  | 9,00  | 9,00  |   |
| 1  | Mentor's Seminar "Computer Networks"                               | C | 6,00   | 3,00  | 3,00  | GPC-1.ISC, GPC-3.ISC, GPC-4.ISC, GPC-6.ISC, GPC-7.ISC, UC-1, UC-2, UC-4, UC-5   |
| 2  | Research Seminar   | C | 6,00   | 3,00  | 3,00  | PC-4  |

|    |   |   |       |       |       |   |
|----|---|---|-------|-------|-------|---|
| 3  | Project Seminar   | C | 6,00  | 3,00  | 3,00  | GPC-2.ISC, PC-4, PC-5, UC-1, UC-2, UC-5   |
|    | Internship  |   | 24,00 | 6,00  | 18,00 |   |
|    | Project Internship  |   | 6,00  | 6,00  |       |   |
| 1  | Project   | C | 6,00  | 6,00  |       | GPC-1.ISC, GPC-2.ISC, GPC-3.ISC, PC-1, PC-4, PC-5, PC-7, PC-8, UC-1, UC-3, UC-5   |
|    | Professional Internship                                     |   | 9,00  |       | 9,00  |   |
| 1  | Work Experience Internship                                  | C | 9,00  |       | 9,00  | GPC-1.ISC, GPC-2.ISC, PC-1, PC-2, UC-1, UC-2  |
|    | Research Internship   |   | 9,00  |       | 9,00  |   |
| 1  | Graduation Thesis   | C | 9,00  |       | 9,00  | GPC-1.ISC, GPC-2.ISC, GPC-3.ISC, GPC-4.ISC, GPC-5.ISC, GPC-6.ISC, GPC-7.ISC, GPC-8.ISC, PC-1, PC-10, PC-11, PC-12, PC-13, PC-14, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, PC-9, UC-1, UC-2, UC-3, UC-4, UC-5, UC-6 |
|    | Major   |   | 66,00 | 45,00 | 21,00 |   |
| 1  | Security of Computer Systems and Computer Networks          | C | 6,00  |       | 6,00  | PC-10, PC-12  |
| 2  | Wireless Networks and Portable Systems                      | C | 6,00  |       | 6,00  | PC-12   |
| 3  | Management and Monitoring of Computer Networks              | C | 6,00  |       | 6,00  | PC-10   |
| 4  | IT-Projects and IT-Processes Management                     | C | 3,00  |       | 3,00  | PC-13, PC-14, PC-3, PC-4, PC-5, UC-5  |
| 5  | System Analysis and Complex Systems Design                  | C | 3,00  | 3,00  |       | PC-1, PC-3, PC-5, UC-1, UC-3, UC-6  |
| 6  | Software Engineering  | C | 6,00  | 6,00  |       | PC-10, PC-12, PC-3, PC-4, PC-8  |
| 7  | Data Analysis and AI Methods                                | C | 3,00  | 3,00  |       | GPC-3.ISC, PC-2, PC-4, PC-5, PC-6   |
| 8  | Modern Computer Systems                                     | C | 9,00  | 9,00  |       | GPC-1.ISC, GPC-2.ISC, PC-1, PC-2, UC-1, UC-2  |
| 9  | Distributed Databases and Network Computing                 | C | 12,00 | 12,00 |       | GPC-3.ISC, PC-2, PC-4, PC-5, PC-6   |
| 10 | Computer Systems Architecture and Technology                | C | 6,00  | 6,00  |       | GPC-3.ISC, PC-1, PC-13, UC-3  |
| 11 | Equipment of Computer Network and Telecommunication Systems | C | 6,00  | 6,00  |       | PC-4, PC-9  |
|    | Magolego  |   | 9,00  |       | 9,00  |   |
| 1  | All-university Pool MAGOLEGO Courses                        | E | 9,00  |       | 9,00  | GPC-1.ISC, GPC-2.ISC, GPC-3.ISC, GPC-4.ISC, GPC-5.ISC, GPC-6.ISC, GPC-7.ISC, GPC-8.ISC  |
|    | Final State Certification (FSC)                             |   | 3,00  |       | 3,00  |   |

|   |  |   |        |       |       |   |
|---|--|---|--------|-------|-------|---|
| 1 | Final Qualification Paper  | C | 3,00   |       | 3,00  | GPC-1.ISC, GPC-2.ISC, GPC-3.ISC, GPC-4.ISC, GPC-5.ISC, GPC-6.ISC, GPC-7.ISC, GPC-8.ISC, PC-1, PC-10, PC-11, PC-12, PC-13, PC-14, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, PC-9, UC-1, UC-2, UC-3, UC-4, UC-5, UC-6 |
|   | Digital Twins of Electronics and Computer Products (Applied track)                                     |   | 120,00 | 60,00 | 60,00 |   |
|   | Key Seminars   |   | 21,00  | 9,00  | 12,00 |   |
| 1 | Research Seminar "Modern Methods of Creating Electronic Layouts and Digital Doubles"                   | C | 6,00   | 3,00  | 3,00  | GPC-1.ISC, UC-1, UC-2, UC-4   |
| 2 | Project Seminar "Standardization in the Field of Design of Electronic and Computer Equipment Products" | C | 9,00   | 3,00  | 6,00  | GPC-5.ISC, GPC-6.ISC, PC-6, PC-8, UC-2, UC-3  |
| 3 | Mentor's Seminar «Digital Transformation of Highly Reliable Product Design Processes»                  | C | 6,00   | 3,00  | 3,00  | GPC-4.ISC, GPC-8.ISC, PC-10, PC-11, PC-9, UC-5, UC-6  |
|   | Internship   |   | 24,00  | 6,00  | 18,00 |   |
|   | Project Internship   |   | 6,00   | 6,00  |       |   |
| 1 | Project  | C | 6,00   | 6,00  |       | GPC-1.ISC, GPC-2.ISC, GPC-3.ISC, GPC-4.ISC, GPC-5.ISC, GPC-6.ISC, GPC-7.ISC, GPC-8.ISC, UC-1, UC-2, UC-3, UC-4, UC-5, UC-6  |
|   | Professional Internship  |   | 9,00   |       | 9,00  |   |
| 1 | Work Experience Internship   | C | 9,00   |       | 9,00  | GPC-1.ISC, GPC-2.ISC, GPC-3.ISC, GPC-4.ISC, GPC-5.ISC, GPC-6.ISC, GPC-7.ISC, GPC-8.ISC, PC-1, PC-10, PC-11, PC-12, PC-13, PC-14, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, PC-9, UC-1, UC-2, UC-3, UC-4, UC-5, UC-6 |
|   | Research Internship  |   | 9,00   |       | 9,00  |   |
| 1 | Graduation Thesis  | C | 9,00   |       | 9,00  | GPC-1.ISC, GPC-2.ISC, GPC-3.ISC, GPC-4.ISC, GPC-5.ISC, GPC-6.ISC, GPC-7.ISC, GPC-8.ISC, PC-1, PC-10, PC-11, PC-12, PC-13, PC-14, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, PC-9, UC-1, UC-2, UC-3, UC-4, UC-5, UC-6 |
|   | Major  |   | 63,00  | 45,00 | 18,00 |   |
| 1 | System Analysis and Complex Systems Design   | C | 3,00   | 3,00  |       | UC-1, UC-2, UC-6  |
| 2 | Data Analysis and AI Methods   | C | 3,00   | 3,00  |       | GPC-3.ISC, PC-4   |
| 3 | Evaluation of the correctness of the ECB application based on computer modeling                        | C | 6,00   | 6,00  |       | PC-10, UC-4, UC-5   |

|    |  |   |               |              |              |   |
|----|--|---|---------------|--------------|--------------|---|
| 4  | Application of Electronic Layouts and Digital Twins                                | C | 6,00          | 6,00         |              | GPC-2.ISC, GPC-7.ISC, PC-13, PC-14, UC-4, UC-6  |
| 5  | Distributed Databases and Network Computing  | C | 12,00         | 12,00        |              | GPC-3.ISC, PC-1, PC-2, UC-1, UC-2, UC-3   |
| 6  | Modern Computer Systems  | C | 9,00          | 9,00         |              | GPC-2.ISC, PC-1, PC-7, UC-1, UC-2   |
| 7  | Software Engineering   | C | 6,00          | 6,00         |              | PC-10, PC-8   |
| 8  | Comprehensive Study of Physical Processes in Devices by Means of Computer Modeling | C | 6,00          |              | 6,00         | PC-12, PC-3, UC-3   |
| 9  | Fundamentals of Devices Dependability  | C | 6,00          |              | 6,00         | PC-4, PC-8, UC-3, UC-5  |
| 10 | Methods and Instruments of Measurement, Test and Control                           | C | 6,00          |              | 6,00         | GPC-3.ISC, GPC-5.ISC, PC-12, PC-8, UC-1   |
|    | <b>Magolego</b>  |   | <b>9,00</b>   |              | <b>9,00</b>  |   |
| 1  | All-university Pool MAGOLEGO Courses   | E | 9,00          |              | 9,00         | GPC-1.ISC, GPC-2.ISC, GPC-3.ISC, GPC-4.ISC, GPC-5.ISC, GPC-6.ISC, GPC-7.ISC, GPC-8.ISC  |
|    | <b>Final State Certification (FSC)</b>   |   | <b>3,00</b>   |              | <b>3,00</b>  |   |
| 1  | Final Qualification Paper  | C | 3,00          |              | 3,00         | GPC-1.ISC, GPC-2.ISC, GPC-3.ISC, GPC-4.ISC, GPC-5.ISC, GPC-6.ISC, GPC-7.ISC, GPC-8.ISC, PC-1, PC-10, PC-11, PC-12, PC-13, PC-14, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, PC-9, UC-1, UC-2, UC-3, UC-4, UC-5, UC-6 |
|    | <b>Highload Systems and Code Optimization (Applied track)</b>                      |   | <b>120,00</b> | <b>60,00</b> | <b>60,00</b> |   |
|    | <b>Key Seminars</b>  |   | <b>15,00</b>  | <b>6,00</b>  | <b>9,00</b>  |   |
| 1  | Highload systems and code optimization   | C | 9,00          | 3,00         | 6,00         | GPC-1.ISC, GPC-3.ISC, PC-1, PC-12, PC-3, PC-9, UC-3, UC-4   |
| 2  | Project Seminar  | C | 6,00          | 3,00         | 3,00         | GPC-1.ISC, GPC-2.ISC, GPC-3.ISC, PC-1, PC-12, PC-4, PC-5, PC-7, PC-8, UC-4, UC-6  |
|    | <b>Internship</b>  |   | <b>24,00</b>  | <b>6,00</b>  | <b>18,00</b> |   |
|    | <b>Project Internship</b>  |   | <b>6,00</b>   | <b>6,00</b>  |              |   |
| 1  | Project  | C | 6,00          | 6,00         |              | GPC-1.ISC, GPC-2.ISC, GPC-3.ISC, GPC-4.ISC, GPC-5.ISC, GPC-6.ISC, GPC-7.ISC, GPC-8.ISC, UC-1, UC-2, UC-3, UC-4, UC-5, UC-6  |
|    | <b>Professional Internship</b>   |   | <b>9,00</b>   |              | <b>9,00</b>  |   |
| 1  | Work Experience Internship   | C | 9,00          |              | 9,00         | GPC-1.ISC, GPC-2.ISC, GPC-3.ISC, GPC-4.ISC, GPC-5.ISC, GPC-6.ISC, GPC-7.ISC, GPC-8.ISC, PC-1, PC-10, PC-11, PC-12, PC-13, PC-14, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, PC-9, UC-1, UC-2, UC-3, UC-4, UC-5, UC-6 |

|    |   |   |       |       |       |   |
|----|---|---|-------|-------|-------|---|
|    | Research Internship                         |   | 9,00  |       | 9,00  |   |
| 1  | Graduation Thesis                           | C | 9,00  |       | 9,00  | GPC-1.ISC, GPC-2.ISC, GPC-3.ISC, GPC-4.ISC, GPC-5.ISC, GPC-6.ISC, GPC-7.ISC, GPC-8.ISC, PC-1, PC-10, PC-11, PC-12, PC-13, PC-14, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, PC-9, UC-1, UC-2, UC-3, UC-4, UC-5, UC-6 |
|    | Major                                       |   | 69,00 | 45,00 | 24,00 |   |
| 1  | IT Product Management                       | C | 6,00  |       | 6,00  | GPC-3.ISC, PC-1, PC-2, PC-5, UC-1   |
| 2  | Multithreaded Programming                   | C | 3,00  |       | 3,00  | PC-2, PC-4, PC-7, UC-2, UC-4  |
| 3  | IT-Projects and IT-Processes Management     | C | 3,00  |       | 3,00  | PC-13, PC-14, PC-3, PC-4, PC-5  |
| 4  | Advanced Programming in Python              | C | 6,00  |       | 6,00  | GPC-2.ISC, GPC-3.ISC, GPC-5.ISC, GPC-8.ISC, PC-1, PC-11, PC-2, PC-7   |
| 5  | Operating Systems                           | C | 6,00  |       | 6,00  | PC-2, PC-4, PC-7  |
| 6  | Web applications development                | C | 3,00  | 3,00  |       | PC-1, PC-10, PC-11, PC-3, PC-4, PC-5, UC-5  |
| 7  | System Programming                          | C | 6,00  | 6,00  |       | PC-2, PC-4, PC-5, PC-7  |
| 8  | Distributed Databases and Network Computing | C | 12,00 | 12,00 |       | GPC-3.ISC, PC-2, PC-4, PC-5, PC-6, UC-1, UC-2, UC-3   |
| 9  | System Analysis and Complex Systems Design  | C | 3,00  | 3,00  |       | PC-1, PC-5, UC-1, UC-3, UC-6  |
| 10 | Software Engineering                        | C | 6,00  | 6,00  |       | PC-1, PC-10, PC-11, PC-3, PC-4, PC-5, UC-5  |
| 11 | Advanced C++                                | C | 9,00  | 9,00  |       | PC-2, PC-4, PC-5, PC-7  |
| 12 | Programming languages and compilers         | C | 6,00  | 6,00  |       | GPC-2.ISC, PC-10, PC-12, PC-4   |
|    | Magolego                                    |   | 9,00  | 3,00  | 6,00  |   |
| 1  | All-university Pool MAGOLEGO Courses        | E | 9,00  | 3,00  | 6,00  | GPC-1.ISC, GPC-2.ISC, GPC-3.ISC, GPC-4.ISC, GPC-5.ISC, GPC-6.ISC, GPC-7.ISC, GPC-8.ISC  |
|    | Final State Certification (FSC)             |   | 3,00  |       | 3,00  |   |
| 1  | Final Qualification Paper                   | C | 3,00  |       | 3,00  | GPC-1.ISC, GPC-2.ISC, GPC-3.ISC, GPC-4.ISC, GPC-5.ISC, GPC-6.ISC, GPC-7.ISC, GPC-8.ISC, PC-1, PC-10, PC-11, PC-12, PC-13, PC-14, PC-2, PC-3, PC-4, PC-5, PC-6, PC-7, PC-8, PC-9, UC-1, UC-2, UC-3, UC-4, UC-5, UC-6 |

**Curriculum agreed:**

Academic Supervisor

VISHNEKOV A.V.

20.03.2024

Dean KROUK E.A. 26.03.2024

Head of Centre for Educational Model Design LEPESHKIN I.A. 12.04.2024

\* Subject type:  
Compulsory course C  
Elective course E