



National Research University Higher School of Economics (HSE)

Basic Curriculum

Field of study 01.03.02 Applied Mathematics and Information Science

Educational Programme "Computing and Data Science"

Specializations: "Industrial Programming", "Machine Learning and Applications", "Software Engineering"

Implementing unit: Faculty of Computer Science, HSE - Moscow

APPROVED  
27.05.2024  
Vice Rector  
ROSHCHIN S.Y.  
Signed with EDS

Years of Study: 2024/2025 - 2027/2028

Length of Programme: 4 years

Mode of Study: Full Time

Degree: Bachelor's degree

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		163,00	44,00	44,00	41,00	34,00	
	Core Professional Block (Major)		104,00	44,00	44,00	16,00		
1	Algorithms and Data Structures	C	9,00	9,00				GPC-2, PC-1, PC-2, UC-1, UC-3
2	Discrete Mathematics	C	4,00	4,00				GPC-1, GPC-2, GPC-3, UC-1
3	Modern Software Engineering Practices	C	3,00	3,00				GPC-4, GPC-5, PC-2, PC-3, UC-1, UC-3
4	Linear Algebra	C	10,00	10,00				GPC-1, GPC-2, GPC-3, PC-1, UC-1
5	Calculus	C	10,00	10,00				GPC-1, GPC-2, GPC-3, PC-1, UC-1
6	Python Programming	C	4,00	4,00				GPC-4, GPC-5, PC-2, PC-3, UC-1, UC-3
7	Algebra	C	6,00		6,00			GPC-1, PC-1, UC-1
8	Numerical Methods	C	7,00		7,00			GPC-1, PC-1, UC-1
9	Algorithms and Data Structures 2	C	4,00		4,00			GPC-2, PC-1, PC-2, UC-1, UC-3
10	Computer Architecture and Operating Systems	C	8,00		8,00			GPC-1, PC-1, UC-1
11	Calculus 2	C	9,00		9,00			GPC-1, GPC-2, GPC-3, PC-1, UC-1
12	Mathematical Statistics	C	5,00		5,00			GPC-1, PC-1, UC-1
13	Probability Theory	C	5,00		5,00			GPC-1, PC-1, UC-1
14	Machine Learning 1	C	6,00			6,00		GPC-3, PC-1, PC-2, UC-1
15	Optimization Methods	C	6,00			6,00		GPC-2, PC-1, UC-2
16	Deep Learning 1	C	4,00			4,00		GPC-1, GPC-2, PC-1, PC-2, UC-1, UC-2
17	C++ Programming	C	4,00	4,00				GPC-4, GPC-5, PC-2, PC-3, UC-1, UC-3
	Elective Professional Block (Major)		59,00			25,00	34,00	
	Block 1 (1 of 3)		5,00			5,00		
1	Functional Programming	E	5,00			5,00		PC-3, UC-1, UC-2
2	SQL Language	E	5,00			5,00		PC-3, UC-1, UC-2
3	Computer Systems Security	E	5,00			5,00		PC-3, UC-1, UC-2

	Block 2 (1 of 3)		6,00			6,00	
1	Data Analysis in Business	E	6,00			6,00	GPC-1, PC-1, UC-1
2	Computer Networks	E	6,00			6,00	GPC-1, PC-1, UC-1
3	Time Series Modeling	E	6,00			6,00	GPC-1, PC-1, UC-1
	Block 3		10,00			10,00	
1	Deep Learning for Natural Language Processing	E	5,00			5,00	GPC-1, PC-1, UC-1
2	Methods and Systems for Processing Big Data	E	5,00			5,00	GPC-1, PC-1, UC-1
3	Unstructured Data Analysis	E	5,00			5,00	GPC-1, PC-1, UC-1
	Research Seminar		10,00			3,00	7,00
	Research Seminar 1		3,00			3,00	
1	Research Seminar "Machine Learning and Applications 1" (offered in a foreign language)	E	3,00			3,00	GPC-3, PC-1, PC-3, PC-4, UC-1, UC-2, UC-3, UC-4
2	Research Seminar "Industrial Programming 1" (offered in a foreign language)	E	3,00			3,00	GPC-2, GPC-3, PC-1, PC-3, PC-4, UC-1, UC-2, UC-3, UC-4
	Научно-исследовательский семинар 2		7,00			7,00	
1	Research Seminar "Machine Learning and Applications 2" (offered in a foreign language)	E	7,00			7,00	GPC-3, PC-1, PC-3, PC-4, UC-1, UC-2, UC-3, UC-4
2	Research Seminar "Industrial Programming 2" (offered in a foreign language)	E	7,00			7,00	GPC-2, GPC-3, PC-1, PC-3, PC-4, UC-1, UC-2, UC-3, UC-4
	Specialization		20,00			11,00	9,00
	Специализация "Машинное обучение и приложения"		20,00			11,00	9,00
1	Machine Learning 2	C	6,00			6,00	GPC-1, GPC-2, GPC-3, PC-2, PC-4, PC-5, UC-3, UC-4
2	Applied Statistical Data Analysis	C	5,00			5,00	GPC-1, GPC-2, GPC-3, PC-2, PC-4, PC-5, UC-3, UC-4
3	Large-Scale Machine Learning	C	4,00			4,00	GPC-1, GPC-2, GPC-3, PC-2, PC-4, PC-5, UC-3, UC-4
4	Deep Learning 2	C	5,00			5,00	GPC-1, GPC-2, GPC-3, PC-2, PC-4, PC-5, UC-3, UC-4
	Специализация "Промышленное программирование"		20,00			11,00	9,00
1	Theory and Practice of Concurrency	C	6,00			6,00	GPC-1, GPC-2, GPC-3, PC-2, PC-4, PC-5, UC-3, UC-4
2	Distributed Systems	C	5,00			5,00	GPC-1, GPC-2, GPC-3, PC-2, PC-4, PC-5, UC-3, UC-4
3	Systems Reliability Engineering	C	5,00			5,00	GPC-1, GPC-2, GPC-3, PC-2, PC-4, PC-5, UC-3, UC-4
4	Systems Reliability Engineering 2	C	4,00			4,00	GPC-1, GPC-2, GPC-3, PC-2, PC-4, PC-5, UC-3, UC-4
	Block 4 (2 of 3)		8,00			8,00	
1	Reinforcement Learning	E	4,00			4,00	GPC-1, PC-1, UC-1
2	Industrial Programming in Haskell	E	4,00			4,00	GPC-1, PC-1, UC-1
3	Theory and Practice of Online Experiments	E	4,00			4,00	GPC-1, PC-1, UC-1
	Internship		31,00	3,00	5,00	8,00	15,00

	Professional Internship		6,00	3,00		3,00	
1	Educational Internship	C	3,00	3,00			GPC-1, PC-1, UC-1
2	Work Experience Internship	C	3,00			3,00	GPC-1, GPC-2, GPC-3, GPC-4, GPC-5, PC-1, PC-2, PC-3, PC-5, PC-6, UC-1, UC-3, UC-6
	Project Internship		10,00		5,00	5,00	
1	Course Project 1	C	5,00		5,00		GPC-1, GPC-2, GPC-3, GPC-4, GPC-5, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, UC-1, UC-3, UC-4
2	Course Project 2	C	5,00			5,00	GPC-1, GPC-2, GPC-3, GPC-4, GPC-5, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, UC-1, UC-2, UC-3
	Research Internship		15,00				15,00
1	Preparation of Graduation Thesis	C	9,00				9,00 GPC-1, GPC-2, GPC-3, GPC-4, GPC-5, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, UC-1, UC-10, UC-11, UC-2, UC-3, UC-4, UC-5, UC-6, UC-7, UC-8, UC-9
2	Graduation Internship	C	6,00				6,00 GPC-1, GPC-2, GPC-3, GPC-4, GPC-5, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, UC-1, UC-10, UC-11, UC-2, UC-3, UC-4, UC-5, UC-6, UC-7, UC-8, UC-9
	General Courses		18,00	10,00	1,00		7,00
	Core General Courses		2,00	1,00	1,00		
1	Safe Living Basics	C	1,00	1,00			UC-7, UC-8
2	Physical Training	C	1,00		1,00		UC-7
	Optional General Courses		16,00	9,00			7,00
1	Russian History	C	4,00	4,00			UC-1, UC-5
2	Philosophy	C	4,00			4,00	UC-1, UC-10, UC-11, UC-5
3	Economics	C	3,00			3,00	UC-10, UC-9
4	Legal Literacy	C	3,00	3,00			UC-10, UC-3
5	Foundations of Russian Statehood	C	2,00	2,00			UC-1, UC-5
	Minor		20,00		10,00	10,00	
1	Minor	E	20,00		10,00	10,00	GPC-1, PC-1, UC-1
	English		1,00				1,00
	Examinations		1,00				1,00
1	Independent English Exam (offered in a foreign language)	C					PC-4, UC-4
2	Project Proposal (offered in a foreign language)	C	1,00			1,00	PC-4, PC-5, UC-4
3	English Language Integrative Exam (offered in a foreign language)	C					PC-4, UC-4
	Optional Courses						
1	English (offered in a foreign language)	O	14,00	8,00	6,00		PC-4, UC-4
2	Academic writing (offered in a foreign language)	O	2,00			2,00	PC-4, UC-4
	Data Culture		4,00	3,00		1,00	
1	Python as a Tool for Data Collection and Analysis	C	3,00	3,00			GPC-4, GPC-5, PC-2, PC-3, UC-1, UC-3

2	External Examinations on Digital Skills. Entry-level	C					GPC-4
3	External Examinations on Digital Skills. Intermediate Level	C					GPC-4
4	External Examinations on Digital Skills. Final Level	C					GPC-4
5	Independent Digital Literacy Test	C					GPC-4, PC-5, PC-6, UC-1
6	Independent Programming Test. Advanced Level	C					GPC-4
7	Data Science, AI and Generative Models Independent Test. Advanced Level	C	1,00			1,00	GPC-4
	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, GPC-2, GPC-3, GPC-4, GPC-5, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, UC-1, UC-10, UC-11, UC-2, UC-3, UC-4, UC-5, UC-6, UC-7, UC-8, UC-9
	State Examinations						

**Curriculum agreed:**

Academic Supervisor                      PROMYSLOV V.V.                                      14.05.2024

Dean    ARZHANTSEV I.V.                                      15.05.2024

Head of Centre for  
Educational Model Design                      LEPESHKIN I.A.                                      22.05.2024

\* Subject type:

Compulsory course                      C  
Elective course                              E  
Optional course                              O