



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"  
 Implementing unit: Faculty of Computer Science, HSE - Moscow

APPROVED  
 12.07.2023  
 Vice Rector  
 ROSHCHIN S.Y.  
 Signed with EDS

Years of Study: 2023/2024 - 2026/2027

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		165,00	44,00	44,00	39,00	38,00	
	Core Professional Block (Major)		108,00	44,00	44,00	15,00	5,00	
1	Discrete Mathematics	C	4,00	4,00				GPC-1, GPC-2, GPC-3, PC-1, UC-1
2	Linear Algebra	C	9,00	9,00				GPC-1, GPC-2, GPC-3, PC-1, UC-1
3	Calculus	C	9,00	9,00				GPC-1, GPC-2, GPC-3, PC-1, UC-1
4	Modern Software Engineering Practices	C	3,00	3,00				GPC-4, PC-2, PC-3, PC-6, UC-1
5	Algorithms and Data Structures	C	9,00	9,00				GPC-2, GPC-3, GPC-4, PC-1, PC-2, UC-1
6	Python Programming	C	4,00	4,00				GPC-1, GPC-2, PC-2, PC-3, UC-1
7	C++ Programming	C	6,00	6,00				GPC-4, PC-2, PC-3, UC-1
8	Distributed Systems	C	5,00			5,00		GPC-1, GPC-2, GPC-4, UC-1
9	Machine Learning 1	C	5,00			5,00		GPC-1, PC-1, UC-1
10	Discrete Optimization	C	5,00			5,00		GPC-1, GPC-3, UC-1
11	Methods and Systems for Processing Big Data	C	5,00				5,00	GPC-1, PC-1, UC-1
12	Algebra	C	6,00		6,00			GPC-1, GPC-2, GPC-3, PC-1, PC-2, UC-1
13	Numerical Methods	C	7,00		7,00			GPC-1, GPC-2, PC-1, PC-2, UC-1
14	Algorithms and Data Structures 2	C	4,00		4,00			GPC-3, GPC-4, PC-2, UC-1
15	Computer Architecture and Operating Systems	C	8,00		8,00			GPC-3, GPC-5, PC-2, PC-3, PC-5, UC-1
16	Mathematical Statistics	C	5,00		5,00			GPC-1, GPC-2, PC-1, PC-2, UC-1
17	Probability Theory	C	5,00		5,00			GPC-1, GPC-2, PC-1, PC-2, UC-1
18	Calculus 2	C	9,00		9,00			GPC-1, GPC-2, GPC-3, PC-1, PC-2, UC-1, UC-2
	Elective Professional Block (Major)		57,00			24,00	33,00	

	Research Seminar		9,00		3,00	6,00	
	Research Seminar 1		3,00		3,00		
1	Research Seminar "Machine Learning and Applications 1"	E	3,00		3,00		GPC-1, PC-1, UC-1
2	Research Seminar "Industrial Programming 1"	E	3,00		3,00		GPC-1, PC-1, UC-1
	Научно-исследовательский семинар 2		6,00			6,00	
1	Research Seminar "Machine Learning and Applications 2"	E	6,00			6,00	GPC-1, PC-1, UC-1
2	Research Seminar "Industrial Programming 1"	E	6,00			6,00	GPC-1, PC-1, UC-1
	Elective Courses		28,00		10,00	18,00	
	Block 1		4,00		4,00		
1	SQL Language	E	4,00		4,00		UC-1
2	Bioinformatics	E	4,00		4,00		UC-1
3	Functional Programming	E	4,00		4,00		UC-1
4	Computer Systems Security	E	4,00		4,00		UC-1
	Block 2		6,00		6,00		
1	Data Analysis in Business	E	6,00		6,00		UC-1
2	Chapters in Applied Statistics	E	6,00		6,00		UC-1
3	Topological data analysis	E	6,00		6,00		UC-1
4	Time Series Modeling	E	6,00		6,00		UC-1
5	Java Programming	E	6,00		6,00		UC-1
6	Database Systems	E	6,00		6,00		UC-1
	Block 3		10,00			10,00	
1	Computer Systems Security	E	5,00			5,00	UC-1
2	Bayesian Methods for Machine Learning	E	5,00			5,00	UC-1
3	Unstructured Data Analysis	E	5,00			5,00	UC-1
4	Deep Learning for Sound Processing	E	5,00			5,00	UC-1
5	Methods and Systems for Processing Big Data	E	5,00			5,00	UC-1
	Block 4		8,00			8,00	
1	Reinforcement Learning	E	4,00			4,00	UC-1
2	Generative Models in Machine Learning	E	4,00			4,00	UC-1
3	Computer Vision	E	4,00			4,00	UC-1
4	Design and Development of High-Load Systems	E	4,00			4,00	UC-1
5	Functional Programming	E	4,00			4,00	UC-1
6	Media Data Compression and Distribution	E	4,00			4,00	UC-1
	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		UC-1
2	Applied Statistical Data Analysis	C	5,00		5,00		UC-1
3	Deep Learning	C	5,00			5,00	UC-1
4	Large-Scale Machine Learning	C	4,00			4,00	UC-1

	Специализация "Промышленное программирование"		20,00			11,00	9,00	
1	Distributed Systems	C	5,00			5,00		UC-1
2	Parallel Computing	C	6,00			6,00		UC-1
3	Databases	C	5,00				5,00	UC-1
4	Design and Development of High-Load Systems	C	4,00				4,00	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-3, GPC-4, GPC-5, PC-1, PC-2, PC-3, PC-5, PC-6, UC-6
2	Work Experience Internship	C	3,00			3,00		GPC-1, 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	-	C	5,00		5,00			UC-1
2	-	C	5,00			5,00		UC-1
	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-11, UC-2, UC-3
	General Courses		14,00	10,00	1,00		3,00	
	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		12,00	9,00			3,00	
1	Foundations of Russian Statehood	C	2,00	2,00				UC-1, UC-5
2	Russian History	C	4,00	4,00				UC-1, UC-5
3	Legal Literacy	C	3,00	3,00				UC-10, UC-8
4	Economics	C	3,00				3,00	PC-4, PC-5, UC-10, UC-9
	Minor		20,00		10,00	10,00		
1	Minor	E	20,00		10,00	10,00		PC-1
	English		1,00				1,00	
	Examinations		1,00				1,00	
1	Independent English Exam (offered in a foreign language)	C						UC-1
2	Project Proposal (offered in a foreign language)	C	1,00				1,00	UC-1
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 English Writing (offered in a foreign language)	O	2,00			2,00	PC-4, PC-5, UC-3, UC-4, UC-5
	Data Culture		6,00	3,00		3,00	
1	Independent Digital Literacy Test	C					GPC-4, PC-5, PC-6, UC-1
2	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
3	External Examinations on Digital Skills. Entry-level	C					GPC-4, PC-5, PC-6, UC-1
4	External Examinations on Digital Skills. Intermediate Level	C					GPC-4, PC-5, PC-6, UC-1
5	Independent Programming Test. Advanced Level	C					GPC-4, PC-5, PC-6, UC-1
6	Deep Learning 1	C	2,00			2,00	GPC-1, PC-1, UC-1
7	External Examinations on Digital Skills. Final Level	C					GPC-1, PC-1, UC-1
8	Data Science, AI and Generative Models Independent Test. Advanced Level	C	1,00			1,00	GPC-1, PC-1, UC-1
	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.	10.07.2023
Dean	ARZHANTSEV I.V.	11.07.2023
Head of Centre for Educational Model Design	LEPESHKIN I.A.	11.07.2023

\* Subject type:

Compulsory course	C
Elective course	E
Optional course	O