



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
22.07.2022
Vice Rector
ROSHCHIN S.Y.
Signed with EDS

Years of Study: 2022/2023 - 2025/2026

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	45,00	37,00	37,00	
	Core Professional Block (Major)		110,00	44,00	45,00	12,00	9,00	
	Subject Areas		110,00	44,00	45,00	12,00	9,00	
	Discrete Mathematics		4,00	4,00				
1	Discrete Mathematics	C	4,00	4,00				GPC-1, GPC-2, GPC-3, PC-1, UC-1
	Algebra and Geometry		20,00	9,00	11,00			
1	Linear Algebra	C	9,00	9,00				GPC-1, GPC-2, GPC-3, PC-1, UC-1
2	Numerical Methods	C	6,00		6,00			GPC-1, PC-1, UC-1
3	Algebra	C	5,00		5,00			GPC-1, PC-1, UC-1
	по математическому анализу		19,00	9,00	10,00			
1	Calculus	C	9,00	9,00				GPC-1, GPC-2, GPC-3, PC-1, UC-1
2	Calculus 2	C	10,00		10,00			GPC-1, PC-1, UC-1
	Programming		22,00	13,00			9,00	
1	Data Bases (offered in a foreign language)	C	4,00				4,00	GPC-1, PC-1, UC-1
2	Python Programming	C	4,00	4,00				GPC-4, GPC-5, PC-2, PC-3, UC-1, UC-3
3	Modern Software Engineering Practices	C	3,00	3,00				GPC-4, GPC-5, PC-2, PC-3, UC-1, UC-3
4	C++ Programming	C	6,00	6,00				GPC-4, GPC-5, PC-2, PC-3, UC-1, UC-3
5	Methods and Systems for Processing Big Data	C	5,00				5,00	GPC-1, PC-1, UC-1
	по алгоритмам и структурам данных		19,00	9,00	4,00	6,00		
1	Algorithms and Data Structures 2	C	4,00		4,00			GPC-1, PC-1, UC-1
2	Machine Learning 1	C	6,00			6,00		GPC-3, PC-1, UC-1
3	Algorithms and Data Structures	C	9,00	9,00				GPC-2, GPC-3, GPC-4, PC-1, PC-2, PC-3, UC-1, UC-3
	in probability theory and mathematical statistics		12,00		12,00			

1	Probability Theory	C	5,00		5,00			GPC-1, PC-1, UC-1
2	Mathematical Statistics	C	7,00		7,00			GPC-1, PC-1, UC-1
	по методам оптимизации		6,00			6,00		
1	Optimization Methods	C	6,00			6,00		GPC-2, PC-1, UC-2
	по архитектуре компьютера и операционным системам		8,00		8,00			
1	Computer Architecture and Operating Systems	C	8,00		8,00			GPC-1, PC-1, UC-1
	Elective Professional Block (Major)		53,00			25,00	28,00	
	Научно-исследовательские семинары		9,00			3,00	6,00	
1	Research Seminar "Machine Learning and Applications 1" (offered in a foreign language)	E	3,00			3,00		GPC-1, PC-1, UC-1
2	Research Seminar "Industrial Programming 1" (offered in a foreign language)	E	3,00			3,00		GPC-1, PC-1, UC-1
3	Research Seminar "Distributed Systems 2"	E	6,00				6,00	GPC-1, PC-1, UC-1
4	Research Seminar "Machine Learning and Applications 2"	E	6,00				6,00	GPC-1, PC-1, UC-1
	Блоки дисциплин по выбору		24,00			11,00	13,00	
	First block (1 of 7)		5,00			5,00		
1	Functional Programming	E	5,00			5,00		GPC-1, PC-1, UC-1
2	SQL Language	E	5,00			5,00		GPC-1, PC-1, UC-1
	Second block (1 of 6)		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
	Third block (2 of 9)		5,00				5,00	
1	Computer Systems Security	E	6,00				6,00	GPC-1, PC-1, UC-1
2	Bayesian and Neurobayesian methods in machine learning	E	6,00				6,00	GPC-1, PC-1, UC-1
3	Unstructured Data Analysis	E	6,00				6,00	GPC-1, PC-1, UC-1
4	Deep Learning for Sound Processing	E	6,00				6,00	GPC-1, PC-1, UC-1
5	Methods and Systems for Processing Big Data	E	6,00				6,00	GPC-1, PC-1, UC-1
	Fourth block (2 of 7)		8,00				8,00	
1	Reinforcement Learning	E	4,00				4,00	GPC-1, PC-1, UC-1
2	Generative Models in Machine Learning	E	4,00				4,00	GPC-1, PC-1, UC-1
3	Computer Vision	E	4,00				4,00	GPC-1, PC-1, UC-1
4	Design and Development of High-Load Systems	E	4,00				4,00	GPC-1, PC-1, UC-1
5	Functional Programming	E	4,00				4,00	GPC-1, PC-1, UC-1
6	Media Data Compression and Distribution	E	4,00				4,00	GPC-1, PC-1, UC-1
	Специализации		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, PC-1, UC-1
2	Applied Statistical Data Analysis	C	5,00			5,00		GPC-1, PC-1, UC-1
3	Large-Scale Machine Learning	C	4,00				4,00	GPC-1, PC-1, UC-1

4	Deep Learning 2	C	5,00				5,00	GPC-1, PC-1, UC-1
	Специализация "Промышленное программирование"		20,00			11,00	9,00	
1	Theory and Practice of Concurrency	C	6,00			6,00		GPC-1, PC-3, UC-1
2	Distributed Systems	C	5,00			5,00		GPC-1, PC-3, UC-1
3	Parallel Computing	C	5,00				5,00	GPC-1, PC-1, UC-1
4	Design and Development of High-Load Systems	C	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-3, GPC-4, GPC-5, PC-1, PC-2, PC-3, PC-5, PC-6, UC-3, UC-6
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	Term Paper	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	Software Project	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-2, UC-3, UC-4
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-3
	General Courses		14,00	10,00			4,00	
	Core General Courses		2,00	2,00				
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	8,00			4,00	
1	Economics	C	4,00	4,00				GPC-1, PC-1, UC-10, UC-9
2	Legal Literacy	C	4,00	4,00				UC-10, UC-2
3	Optional General Courses	E	4,00				4,00	UC-11, UC-5
	Minor		20,00		10,00	10,00		
1	Minor	E	20,00		10,00	10,00		UC-1
	English		1,00				1,00	
	Examinations		1,00				1,00	
1	Independent English Exam (offered in a foreign language)	C						GPC-1, PC-4, UC-4
2	Project Proposal	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-3, UC-4
2	Academic writing (offered in a foreign language)	O	2,00			2,00	PC-4, UC-4, UC-5
Data Culture							
			8,00	3,00		5,00	
1	Independent Programming Test. Advanced Level	C					GPC-3, GPC-4, PC-2, PC-3, UC-1
2	External Examinations on Digital Skills. Entry-level	C					GPC-4
3	External Examinations on Digital Skills. Intermediate Level	C					GPC-4
4	Data Science, AI and Generative Models Independent Test. Advanced Level	C	1,00			1,00	GPC-1, PC-1, UC-1
5	External Examinations on Digital Skills. Final Level	C					GPC-1, PC-1, UC-1
6	Deep Learning 1 (offered in a foreign language)	C	4,00			4,00	GPC-3, PC-1, PC-2, UC-1
7	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
8	Independent Digital Literacy Test	C					GPC-4, PC-5, PC-6, 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

Curriculum agreed:

Academic Supervisor	PROMYSLOV V.V.	20.07.2022
Dean	ARZHANTSEV I.V.	20.07.2022
Head of Centre for Educational Model Design	LEPESHKIN I.A.	20.07.2022

* Subject type:

Compulsory course	C
Elective course	E
Optional course	O