



National Research University Higher School of Economics (HSE)

Basic Curriculum

Field of study 01.03.02 Applied Mathematics and Information Science
Educational Programme "Applied Data Analysis and Artificial Intelligence"

Specializations: "Applied Data Analysis", "Data Analysis in Finance", "Machine Learning Architecture"

Implementing unit: St. Petersburg School of Mathematics, Physics and Computer Science, HSE, HSE - Saint Petersburg

Years of Study: 2023/2024 - 2026/2027

Length of Programme: 4 years

Mode of Study: Full Time

Degree: Bachelor's degree

APPROVED
17.05.2023
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		164,00	45,00	41,00	38,00	40,00	
	Core Professional Block (Major)		78,00	38,00	31,00	9,00		
1	Discrete Mathematics	C	12,00	8,00	4,00			GPC-1, GPC-2, GPC-3
2	Linear Algebra and Geometry	C	4,00	4,00				GPC-1, GPC-2, GPC-3
3	Introduction to Programming	C	4,00	4,00				GPC-1, GPC-2, GPC-3, GPC-4, GPC-5
4	Algorithms and Data Structures	C	8,00	8,00				GPC-1, GPC-2, GPC-3, GPC-4, GPC-5
5	Algebra	C	4,00	4,00				GPC-1, GPC-2, GPC-3
6	Calculus 1	C	10,00	10,00				GPC-1, GPC-2, GPC-3
7	Differential Equations	C	4,00		4,00			GPC-1, GPC-2, GPC-3, PC-11, UC-1
8	Computer Architecture and Operating Systems	C	3,00		3,00			GPC-4, UC-1
9	Calculus 2	C	5,00		5,00			GPC-1, GPC-2, GPC-3
10	Probability Theory and Mathematical Statistics	C	16,00		10,00	6,00		GPC-1, GPC-2, GPC-3
11	Numerical and Optimization Methods	C	8,00		5,00	3,00		GPC-1, GPC-3, PC-2, PC-6, UC-1, UC-2
	Elective Professional Block (Major)		86,00	7,00	10,00	29,00	40,00	
	Choice of Specialization		40,00			12,00	28,00	
	Specialization "Applied Data Analysis"		40,00			12,00	28,00	
	Обязательные дисциплины специализации		24,00			12,00	12,00	
1	Large-Scale Machine Learning	C	4,00			4,00		PC-11, PC-12, PC-14
2	Alternative Languages for the JVM	C	4,00			4,00		PC-11, PC-12, PC-14
3	Engineering Practices in Machine Learning	C	4,00			4,00		PC-11, PC-12, PC-14
4	Deep Reinforcement Learning	C	4,00				4,00	PC-10, PC-3, PC-9
5	Information Retrieval (offered in a foreign language)	C	4,00				4,00	PC-10, PC-3, PC-9
6	Self-Driving Car	C	4,00				4,00	PC-10, PC-3, PC-9

	Дисциплины специализации по выбору		16,00			16,00	
1	Game Theory and Auctions	E	4,00			4,00	PC-11, PC-12, PC-13
2	Machine Learning Engineering	E	4,00			4,00	PC-10, PC-3, PC-9
3	Unsupervised Learning	E	4,00			4,00	PC-10, PC-3, PC-9
4	Recommender Systems	E	4,00			4,00	PC-10, PC-3, PC-9
5	Generative Methods in Machine Learning	E	4,00			4,00	PC-10, PC-3, PC-9
6	Bayesian and Neurobiesian Methods	E	4,00			4,00	PC-10, PC-3, PC-9
7	Stochastic Processes	E	4,00			4,00	PC-10, PC-3, PC-9
	Machine Learning Architecture		40,00		12,00	28,00	
	Обязательные дисциплины специализации		24,00		12,00	12,00	
1	Generative Methods in Machine Learning	C	4,00		4,00		PC-11, PC-12, PC-14
2	Image Analysis	C	4,00		4,00		PC-11, PC-12, PC-14
3	Natural Language Processing	C	4,00		4,00		PC-11, PC-12, PC-14
4	Bayesian and Neurobiesian Methods	C	4,00			4,00	PC-10, PC-3, PC-9
5	Machine Learning Engineering	C	4,00			4,00	PC-10, PC-3, PC-9
6	Unsupervised Learning	C	4,00			4,00	PC-10, PC-3, PC-9
	Дисциплины специализации по выбору		16,00			16,00	
1	Game Theory and Auctions	E	4,00			4,00	PC-11, PC-12, PC-13
2	Self-Driving Car	E	4,00			4,00	PC-10, PC-3, PC-9
3	Recommender Systems	E	4,00			4,00	PC-10, PC-3, PC-9
4	Large-Scale Machine Learning	E	4,00			4,00	PC-10, PC-3, PC-9
5	Deep Reinforcement Learning	E	4,00			4,00	PC-10, PC-3, PC-9
6	Stochastic Processes	E	4,00			4,00	PC-10, PC-3, PC-9
7	Information Retrieval (offered in a foreign language)	E	4,00			4,00	PC-10, PC-3, PC-9
	Data Analysis in Finance		40,00		12,00	28,00	
	Обязательные дисциплины специализации		24,00		12,00	12,00	
1	Microeconomics	C	4,00		4,00		PC-11, PC-12, PC-13
2	Econometrics and Elements of Socio-Economic Statistics	C	4,00		4,00		PC-11, PC-12, PC-13
3	Theory of Finance	C	4,00		4,00		PC-11, PC-12, PC-13
4	Asset pricing models	C	4,00			4,00	PC-11, PC-12, PC-13
5	Derivatives	C	4,00			4,00	PC-11, PC-12, PC-13
6	Financial Accounting	C	4,00			4,00	PC-11, PC-12, PC-13
	Дисциплины специализации по выбору		16,00			16,00	
1	Risk Analysis and Actuarial Calculations	E	4,00			4,00	PC-11, PC-12, PC-13
2	Valuation of Real Options	E	4,00			4,00	PC-11, PC-12, PC-13
3	Trading Strategies Development	E	4,00			4,00	PC-11, PC-12, PC-13
4	Corporate Finance	E	4,00			4,00	PC-11, PC-12, PC-13
5	Portfolio Management	E	4,00			4,00	PC-11, PC-12, PC-13
6	Quantitative Methods in Financial Planning and Valuation	E	4,00			4,00	PC-11, PC-12, PC-13
7	Game Theory and Auctions	E	4,00			4,00	PC-11, PC-12, PC-13

	Compulsory Courses		46,00	7,00	10,00	17,00	12,00	
1	Research Seminar	C	8,00			5,00	3,00	PC-1, PC-2, UC-1, UC-2, UC-4
2	Project Seminar	C	9,00	3,00			6,00	UC-1, UC-2
3	C++ Programming Language	C	4,00	4,00				GPC-5, PC-10, PC-11
4	Deep Learning	C	6,00			3,00	3,00	PC-10, PC-3, PC-9
5	Parallel programming	C	4,00			4,00		PC-10, PC-11
6	Software Development	C	5,00			5,00		PC-10, PC-11
7	Databases	C	5,00		5,00			PC-10, PC-12
8	Java programming language	C	5,00		5,00			GPC-5, PC-10, PC-11
	Internship		35,00	8,00	5,00	7,00	15,00	
	Professional Internship		6,00		3,00	3,00		
1	Educational Internship	C	3,00		3,00			PC-1, PC-2, UC-1, UC-2, UC-4
2	Work Experience Internship	C	3,00			3,00		PC-1, PC-2, UC-1, UC-2, UC-4
	Project Internship		14,00	8,00	2,00	4,00		
1	Project	C	14,00	8,00	2,00	4,00		PC-1, PC-2, UC-1, UC-2, UC-3, UC-4
	Research Internship		15,00				15,00	
1	Preparation of Graduation Thesis	C	10,00				10,00	PC-4, PC-5, PC-6, PC-7, PC-8
2	Graduation Internship	C	5,00				5,00	PC-1, PC-2, UC-1, UC-2, UC-4
	General Courses		14,00	7,00	4,00		3,00	
	Core General Courses		2,00	1,00	1,00			
1	Safe Living Basics	C	1,00	1,00				UC-11, UC-8
2	Physical Training	C	1,00		1,00			UC-7
	Optional General Courses		12,00	6,00	3,00		3,00	
1	Russian History	C	4,00	4,00				UC-5
2	Economics	C	3,00				3,00	UC-9
3	Legal Literacy	C	3,00		3,00			UC-10
4	Foundations of Russian Statehood	C	2,00	2,00				UC-5
	Minor		20,00		10,00	10,00		
1	Minor	E	20,00		10,00	10,00		UC-5
	English		1,00				1,00	
	Examinations		1,00				1,00	
1	Independent English Exam (offered in a foreign language)	C						UC-4
2	Project Proposal (offered in a foreign language)	C	1,00				1,00	PC-4, PC-5, PC-6, PC-7, PC-8, UC-4
3	English Language Integrative Exam							UC-4
	Optional Courses							
1	English (offered in a foreign language)	O	14,00	8,00	6,00			UC-4
2	Academic English Writing (offered in a foreign language)	O	2,00				2,00	UC-4
	Data Culture		5,00			5,00		
1	Machine Learning	C	4,00			4,00		PC-9
2	Independent Data Science Test. Advanced Level	C	1,00			1,00		GPC-3, PC-10
3	Independent Programming Test. Advanced Level	C						PC-10

4	Independent Digital Literacy Test	C						GPC-4, PC-6
	Final State Certification (FSC)		1,00				1,00	
	Thesis Work		1,00				1,00	
1	Presenting of Graduation Thesis	C	1,00				1,00	GPC-1, GPC-2, GPC-3, GPC-4, GPC-5, UC-1, UC-2, UC-6

Curriculum agreed:

Academic Supervisor	MUKHIN M.S.	03.05.2023
Dean		03.05.2023
Deputy Director	KUZMIN P.V.	03.05.2023
Head of Centre for Educational Model Design	LEPESHKIN I.A.	17.05.2023

* Subject type:

Compulsory course	C
Elective course	E
Optional course	O