



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: "Machine Learning and Applications", "Software Engineering"
 Implementing unit: Faculty of Computer Science, HSE - Moscow

APPROVED
 25.06.2021
 Vice Rector
 ROSHCHIN S.Y.
 Signed with EDS

Years of Study: 2021/2022 - 2024/2025

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		160,00	43,00	44,00	41,00	32,00	
	Core Professional Block (Major)		99,00	43,00	44,00	12,00		
	Subject Areas		99,00	43,00	44,00	12,00		
	Discrete Mathematics		4,00	4,00				
1	Discrete Mathematics	C	4,00	4,00				GPC-1, GPC-3, UC-1
	Linear 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	Algebra	C	5,00		5,00			GPC-1, GPC-2, GPC-3, PC-1, PC-4, UC-1
3	Numerical Methods	C	6,00		6,00			GPC-1, GPC-2, GPC-3, PC-1
	Mathematical Analysis		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, GPC-2, GPC-3, PC-1, PC-4, UC-6
	Probability Theory and Mathematical Statistics		11,00		11,00			
1	Mathematical Statistics	C	6,00		6,00			GPC-1, GPC-2, GPC-3, PC-1, PC-4
2	Probability Theory	C	5,00		5,00			GPC-1, GPC-2, GPC-3, PC-1, PC-4
	Programming		12,00	12,00				
1	Python as a Tool for Data Collection and Analysis	C	3,00	3,00				GPC-1, GPC-4, PC-2, UC-1, UC-3
2	Modern Software Engineering Practices	C	3,00	3,00				GPC-4, PC-2, PC-3, PC-6, UC-1
3	C++ Programming	C	6,00	6,00				GPC-4, PC-2, PC-3, UC-1
	Algorithms and Data Structures		19,00	9,00	4,00	6,00		
1	Machine Learning 1	C	6,00			6,00		GPC-3, PC-1, UC-1

2	Algorithms and Data Structures	C	9,00	9,00			GPC-2, GPC-3, GPC-4, PC-1, PC-2, UC-1
3	Algorithms and Data Structures 2	C	4,00		4,00		GPC-4, PC-2
	Optimization Methods		6,00			6,00	
1	Optimization Methods	C	6,00			6,00	GPC-2, PC-1, UC-2
	Computer Architecture and Operating Systems		8,00		8,00		
1	Computer Architecture and Operating Systems	C	8,00		8,00		PC-3
	Elective Professional Block (Major)		61,00			29,00	32,00
	Научный-исследовательский семинар		12,00			7,00	5,00
1	Research Seminar "Machine Learning and Applications 1" (offered in a foreign language)	E	7,00			7,00	GPC-1, PC-1, UC-1
2	Research Seminar "Industrial Programming 1" (offered in a foreign language)	E	7,00			7,00	GPC-1, PC-1, UC-1
3	Research Seminar "Machine Learning and Applications 2"	E	5,00				5,00
4	Research Seminar "Industrial Programming 2"	E	5,00				5,00
	Elective Courses		29,00			11,00	18,00
	Блок 1		5,00			5,00	
1	SQL Language	E	5,00			5,00	GPC-1, PC-1, UC-1
2	Bioinformatics	E	5,00			5,00	GPC-1, PC-2
3	Functional Programming	E	5,00			5,00	PC-3, UC-2
4	Computer Systems Security	E	5,00			5,00	GPC-1, PC-1, UC-1
	Блок 2		6,00			6,00	
1	Data Analysis in Business	E	6,00			6,00	GPC-1, PC-1, UC-1
2	Chapters in Applied Statistics	E	6,00			6,00	GPC-1, PC-1, UC-1
3	Topological data analysis	E	6,00			6,00	PC-2, UC-1
4	Time Series Modeling	E	6,00			6,00	GPC-2, PC-1, UC-1
5	Java Programming	E	6,00			6,00	GPC-1, PC-1, UC-1
6	Database Systems	E	6,00			6,00	GPC-1, PC-1, UC-1
	Блок 3		10,00				10,00
1	Computer Systems Security	C	5,00				5,00
2	Deep Learning for Natural Language Processing	C	5,00				5,00
3	Deep Learning for Graph Data Analysis	C	5,00				5,00
	Блок 4		8,00				8,00
1	Reinforcement Learning	C	4,00				4,00
2	Industrial Programming in Haskell	C	4,00				4,00
3	Theory and Practice of Online Experiments	C	4,00				4,00
	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, 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

4	Deep Learning 1	C	5,00				5,00	GPC-1, PC-1, UC-1
	Специализация "Промышленное программирование"		20,00			11,00	9,00	
1	Distributed Systems	C	5,00			5,00		GPC-1, PC-3, UC-1
2	Parallel Computing	C	6,00			6,00		GPC-1, PC-1, UC-1
3	Systems Reliability Engineering	C	5,00				5,00	GPC-1, PC-1, UC-1
4	Systems Reliability Engineering 2	C	4,00				4,00	GPC-1, PC-1, UC-1
	Internship		34,00	3,00	6,00	8,00	17,00	
	Professional Internship		12,00	3,00		3,00	6,00	
1	Educational Internship	C	3,00	3,00				GPC-1, GPC-4, PC-5, PC-6, UC-1, UC-2, UC-3
2	Work Experience Internship	C	3,00			3,00		GPC-1, GPC-2, GPC-3, GPC-4, UC-1, UC-3
3	Graduation Internship	C	6,00				6,00	GPC-1, GPC-2, GPC-3, GPC-4, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, UC-6
	Project Internship		11,00		6,00	5,00		
1	Course Project	C	5,00			5,00		PC-5, UC-3
2	Программный проект	C	6,00		6,00			GPC-1, GPC-3, GPC-4, PC-5, PC-6, UC-1, UC-3
	Research Internship		11,00				11,00	
1	Preparation of Graduation Thesis	C	11,00				11,00	GPC-1, GPC-2, GPC-3, GPC-4, PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, UC-1, UC-6
	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-3, UC-8
2	Physical Training	C	1,00	1,00				UC-7
	Optional General Courses		12,00	8,00			4,00	
1	Philosophy	C	4,00				4,00	GPC-1, PC-1, UC-1
2	Legal Literacy	C	4,00	4,00				UC-10, UC-2
3	Economics	C	4,00	4,00				UC-9
	Minor		20,00		10,00	10,00		
1	Minor	E	20,00		10,00	10,00		UC-1, UC-3, UC-6
	English		1,00				1,00	
	Examinations		1,00				1,00	
1	Independent English Exam (offered in a foreign language)	C						PC-4, UC-1
2	Project Proposal (offered in a foreign language)	C	1,00				1,00	PC-4, PC-5, PC-6, UC-1, UC-4
3	English Language Integrative Exam	C						GPC-4, UC-4, UC-6
	Optional Courses							
1	Academic English Writing (offered in a foreign language)	O	2,00				2,00	PC-4, UC-4, UC-5
2	English (offered in a foreign language)	O	14,00	8,00	6,00			UC-3, UC-4
	Data Culture		5,00	4,00		1,00		

1	Independent Data Science Test. Advanced Level	C	1,00			1,00		GPC-1, GPC-3, PC-1, PC-2, UC-1
2	Independent Digital Literacy Test	C						GPC-4, PC-6, UC-1
3	Python Programming	C	4,00	4,00				GPC-1, GPC-2, PC-2, PC-3, UC-1
4	Independent Programming Test. Advanced Level	C						UC-1
	Final State Certification (FSC)		6,00				6,00	
	Thesis Work		6,00				6,00	
1	Presenting of Graduation Thesis	C	6,00				6,00	GPC-1, GPC-2, GPC-3, GPC-4, 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.	25.06.2021
Dean	ARZHANTSEV I.V.	25.06.2021
Head of Centre for Educational Model Design	LEPESHKIN I.A.	25.06.2021

* Subject type:

Compulsory course	C
Elective course	E
Optional course	O