

Ministry of Science and Higher Education of the Russian Federation
Federal State Autonomous Educational Institution of Higher Education
Perm National Research Polytechnic University



APPROVED BY

Pro-rector for Academic Affairs

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15 11 2021

ACADEMIC COURSE WORKING PROGRAM

Academic course: Artificial Intelligence Methods in Information Management
and Processing

(Name)

Form of education: _____
Full-time
(full-time / part-time / correspondence)

Level of higher education: _____
Bachelor's program
(Bachelor's program / Specialist program / Master's program)

Workload in hours (in credits): _____
108 (3)
(Hours (CU))

Training program (degree): _____
15.03.06 Mechatronics and Robotics
(Code and denomination of degree)

Direction: _____
Mechatronics and Robotics
(Title of curriculum)

Perm 2021

1.1 Goals and Objectives of the Course

The goal of the course is to obtain a set of knowledge, skills and abilities of artificial intelligence methods implementation in the information management and processing field.

1.2 Studied Objects of the Course

The objects to study:

- Artificial intelligence techniques
- Elements of information intelligent systems
- Methods for building software and information support for intelligent systems

1.3 Starting Conditions

Unstipulated

2 Planned Results of the Course Training

Competence	Indicator's Index	Planned Results of the Course Training (to know, to know how, to master)	Indicator of Attaining Competence which the planned results of training are correlated with	Means of Assessment
PC-2.6.	IA-1 _{pc-2.6.}	To know the methods for determining functional indicators of intelligent information systems.	Knows methods of determining functional indicators of flexible production systems.	Internship report
PC-2.6.	IA-2 _{pc-2.6.}	To be able to calculate indicators of the intelligent information systems functioning.	Is able to calculate performance indicators for flexible production systems.	Internship report
PC-2.6.	IA-3 _{pc-2.6.}	To master the skills of determining the functional indicators in intellectual control systems.	Masters the skill of definition of functional indicators of flexible production systems.	Internship report

3 Full time and forms of academic work

Form of academic work	Hours in all	Distribution in hours according to semesters
		Number of semester
		6
1 Holding classes (including results monitoring) in the form:	72	72
1.1 Contactclasswork, including:		
- lectures (L)	32	32
- laboratory work (LW)		
- practice, seminars and/other seminar-type work (PW)	36	36
- control of self-work (CSW)	4	4
- test		
1.2 Students' self-work (SSW)	36	36
2 Intermediate attestation		
Exam		
Grading test		

Test (Credit)	9	9
Course Project (CP)		
Course Work (CW)		
Total workload in hours	108	108

4 Course outline

Name of the units with the course outline	Full time of classroom activity in hours according to the forms			Full time of extracurricular work in hours according to the forms
	L	LW	PW	SSW
6 th semester				
Representation models of information systems knowledge framework	16	0	18	18
The concept of artificial intelligence. Turing test. The Chinese Room Argument. Knowledge concept. Basic knowledge models. The ontology concept. Modern intelligent control systems in the technical, economic and social spheres. Knowledge models based on predicate logic. Knowledge models based on fuzzy logic. Knowledge models based on odd-valued logic. Semantic networks. Active semantic networks. Frames. Production systems. Neural network methods and technologies in information systems.	16	0	18	18
Neural network methods. Creating and training perceptrons. Kohonen map, Kohonen network. Using the Hemming and Hopfield networks. Features of a stochastic neural network. Adaptive resonance theory. Light neural networks. Methods of recognition based on neural networks. Neural network clustering. Intelligent agents. Standalone mobile devices. The intellectual component of industrial robots.	16	0	18	18
Total with regard to 6th semester	32	0	36	36
Total with regard to the course	32	0	36	36

Topics of exemplary practical work (seminars)

№	Topic of practical work (seminars)
1	Fuzzy logic model development
2	Development of a domain logical model
3	Ontology development
4	Product system development
5	Semantic web development
6	Perceptron training
7	Creation and training of the Hamming network
8	Creation and training of convolutional neural network
9	Creation of Kohonen map

5 Organizational and Pedagogical Conditions

5.1 Educational Technologies Used for Competences Formation

Holding lectures in the discipline is based on the active method of training in the process of which students are not passive but active participants of the lesson answering questions of the teacher. Teacher's questions are aimed at activating the process of learning material as well as at the development of logical thinking. The questions stimulating associative thinking and connecting new material with the previous one are identified by the teacher in advance. Practical lessons are held by realization of the method based on active training: problem areas are determined, groups are formed. The following aims are pursued in the process of practical education: use of definite disciplines knowledge and creative methods in solving problems and decision-making; students' skill-building of teamwork, interpersonal communication and development of leadership skills; consolidation of the basic theoretical knowledge.

5.2 Students' Manual for the Course Study

Learning the course students are recommended to fulfill the following positions:

1. Learning of the discipline should be done systematically.
2. After learning one of the course units with the help of the text-book or lecture notes it is recommended to reproduce in memory the basic terms, definitions, notions of the unit.
3. Special attention should be paid to the reports on practical studies, laboratory works and individual complex tasks for self-work.
4. The topic of questions studied individually is given by the teacher at the lectures. Also the teacher refers to the literary resources (first of all, to the newly published in periodicals) in order the students understand the problems touched on the lectures in detail.

6 List of Teaching Materials and Information Supply for Students' Self work in the Discipline

6.1 Paper-based courseware

№	Bibliographic entry (author, title, mode of publication, place, publishing house, year of publication, number of pages)	Number of copies in the library
1 Basic literature		
1	Zhmud, V. A., Dimitrov, L. V., Nosek, J. Numerical Optimization of Regulators for Automatic Control System	
2	Boboulos M. A. Automation and Robotics, BookBoon, 2010	
3	Di Paola A. M. D., Cicirelli G. Mechatronic Systems Applications, - InTech, 2010	
2 Additional literature		
2.1 Educational and scientific literature		
1	Zhang H. Climbing and Walking Robots: towards New Applications	
2.2 Standardized and Technical literature		
3 Students' manual in mastering discipline		
1	Zhang D., Wei B. Mechatronics and Robotics Engineering for Advanced and Intelligent Manufacturing	
4 Teaching and learning materials for students' self-work		

6.2 Electronic Courseware

Kind of literature	Name of training tool	Reference to information resource	Accessibility of EBN (Internet / local net; authorized / free access)
Additional literature	Journal of Mechatronics and Robotics	https://thescipub.com/jmr	internet, free access

6.3 License and Free Distributed Software used in the Course Educational Process

Type of Software	Software branding
OS	Windows 10 (Azure Dev, Tools for Teaching)
Office Applications	Microsoft Office Standard (need license)

6.4 Modern Professional Databases and Inquiry Systems Used in the Course Educational Process

Branding	Reference to information resource
Database: Elsevier "Freedom Collection"	https://www.elsevier.com/
Scopus database	https://www.scopus.com/
Scientific electronic library database (eLIBRARY.RU)	https://elibrary.ru/
Scientific Library of the Perm National Research Polytechnic University	https://lib.pstu/
Lan Electronic Library System	https://e.lanbook.com/
Electronic library system IPR books	https://www.iprbookshop.ru/
Information resources of the Network Consultant Plus	https://www.consultant.ru/
Information and reference system of normative and technical documentation "Tech expert": Norms, rules, standards and legislation of Russia"	https://техэксперт.сайт/

7 Logistics of the Course Educational Process

Type of classes	Name of the necessary basic equipment	Number of units
practical work (seminars)	Personal computers	15
Lectures (L)	Projector and electronic board	1

8 Fund of the Course Evaluating Tools

Described in a separate document
