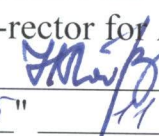


Ministry of Science and Higher Education of the Russian Federation
Federal State Autonomous Educational Institution of Higher Education
Perm National Research Polytechnic University



APPROVED BY
Pro-rector for Academic Affairs

N.V. Lobov
"25" _____ 2021

ACADEMIC COURSE WORKING PROGRAM

Academic course _____ Ergatic Systems
(Name)

Form of education: _____ Full-time studies
(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): _____ (144)4
(Hours (CU))

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

Direction: _____ Mechatronics and Robotics
(Title of curriculum)

1 General Provisions

1.1 Goals and Objectives of the Course

The goal of the course is to form knowledge, abilities and skills focused on organization and estimation of the interaction between human-operator and the set of equipment within modern data management systems for professional purposes.

Discipline objectives:

- to study operation principles, research and estimation methods of modern ergatic systems;
- to form abilities of applying the design methods and analyzing human-machine systems' characteristics;
- to master the skills for justification of the decisions while constructing and estimating modern data management systems.

1.2 Prescribed Objects of the Course

Ergatic system, psychophysiological man's characteristics as a part of the system "human-machine-environment", modeling methods, designing and assessment of the ergatic systems.

1.3 Starting conditions

Preliminary studying of the discipline "Theory of automatic control" is necessary.

2 Planned Results of the Course Training

Competence	Indicator's Index	Planned Results of the Course Training (to know, to be able, 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 theoretical and experimental methods for the "human-machine-environment" system data measuring.	Knows methods of determining functional indicators of flexible production systems.	Grading test
PC-2.6	IA-2 _{PC-2.6}	To be able to calculate the ergatic systems characteristics.	Is able to calculate performance indicators for flexible production systems.	Laboratory work presentation
PC-2.6	IA-3 _{PC-2.6}	To master the skills of ergatic systems' design, reliability, quality assessment and adaptivity.	Has mastered the skills of definition of functional indicators of flexible production systems.	Laboratory work presentation

3 Full time and forms of academic work

Form of academic work	Hours in all	Distribution in hours according to semesters	
		Number of semester	
		8	
1 Holding classes (including results monitoring) in the form:	60	60	
1.1 Contact classwork, including:			
- lectures (L)		28	28
- laboratory work (LW)		30	30
- practice, seminars and/or other seminar-type work (PW)			
- control of self-work (CSW)		2	2
- test paper			
1.2 Students' self-work (SSW)	84	84	
2 Interim/midterm assessment			
Exam			
Grading test	9	9	
Test			
Course Project (CP)			
Course Work (CW)			
Workload in hours	144	144	

4 Course contents

Course units with brief contents	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
8 th semester				
Principles of the ergatic systems organization	6	4	0	20
Definition, structure and classification of the ergatic systems, operator's activity concept in the "human-machine-environment" system				
Ergatic systems modeling	10	12	0	24
Informational and conceptual models of the human-machine system, psychomotor operator's characteristics modeling, specifications; algebraical and structure-algorithmical models of the operator's activity description				
Designing man and technical facilities interaction within the ergatic system	6	8	0	20
System approach to the designing of the human-machine interaction, functional analysis, sharing the tasks between man and robotic system, organization principles of the human-machine interface, virtual				

reality systems, useability				
Ergatic system characteristics evaluation	6	6	0	20
Operator's and "human-machine-environment" system reliability; resource-based approach; professional selection and operators training, operators' group activity. Psychological aspects of human-machine systems service, the assessment of adaptability and system's quality. Objects and the subject of ergonomic evaluation, examination methods. Standards, reference books and instructions in the field of ergonomic specifications				
Total with regard to 8th semester	28	30	0	84
Total with regard to the course	28	30	0	84

Topics of exemplary practical work

№	Topic of practical (seminars) work
1	Development of technical specifications for ergatic system (structure's choice, defining functions and principles implementation).
2	Operator's activity modelling on the basis of algebraical models
3	Information management ergatic system modeling
4	Operator's activity modeling on the basis of structural decomposition methods
5	Design of the ergatic system on the basis of functional analysis
6	Ergatic system's operator interface prototype development
7	Reliability assessment of the ergatic system on the log frames basis
8	Expert and metric methods of the ergatic system quality assessment

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.

Laboratory classes are based on an interactive learning method in which students communicate not only with the teacher but also with each other. At the same time, students' activity in the learning process dominates. The teacher's place in interactive classes is reduced to orienting students' activities to achievement of the goals of studies.

Interactive lectures, group discussions, role-playing games, training sessions, and analysis of situations and simulation models are used in academic studies.

5.2 Students' Manual for the Course Study

Learning the course, it is advisable for students to implement the following recommendations:

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 the basic terms, definitions, notions of the unit from memory.
3. Special attention should be paid to the reports on practical studies and individual complex tasks for self-work.
4. The topics list for individual study is given by the teacher at the lectures. The teacher also provides students with literary sources (first of all, new ones in the periodical scientific literature) for a more detailed under-standing of the issues presented at the lectures.

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	The Oxford Handbook of Cognitive Engineering / Ed. by J.D. Lee and A. Kirlik. Oxford, 2013.	
2	Mar R.A., DeYoung C.G., Higgins D.M., Peterson J.B. Self-liking and self-competence separate self-evaluation from self-deception: Associations with personality, ability, and achievement // Journal of personality. 2006. Vol. 74. №4. P. 1047-1078.	
2. Additional literature		
2.1. Educational and scientific literature		
1	Designing Human-machine Cooperation Systems. / Ed. by Patrick Millot, Wiley-Iste. 2014	
2.2. Periodical literature		
2.3. Standardized and Technical literature		
3. Students' manual in mastering discipline		
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	Methodology instructions for the laboratory works on the discipline "Ergatic systems"	https://disk.yandex.ru/d/jeW98v3kZXbCHQ?w=1	Authorized free access

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

Type of Software	Software branding
Operating systems	Windows 10 (Azure Dev Tools for Teaching)
Office applications	Microsoft Office Professional 2007. licence 42661567
General purpose application software	SciLab (license CeCILL https://www.scilab.org/)

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

Branding	Reference to information resource
Scopus Database	https://www.scopus.com/
eLIBRARY.RU Database	https://elibrary.ru/
Scientific Library of Perm National Polytechnic Research University	http://lib.pstu.ru/
Lan' Electronic library system	https://eJanbook.com/
IPR books Electronic library system	http://www.iprbookshop.ru/
Information resources of Consultant+ web	http://www.consultant.ru/

7 Logistics of the Course Educational Process

Type of classes	Name of the necessary basic equipment	Number of units
Laboratory class	Laptop computer	30
Lecture	Multimedia projector or TV	1

8 Fund of the Course Evaluating Tools

Described in a separate document
