

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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11 2021

ACADEMIC COURSE WORKING PROGRAM

Academic course: Computer science
(Name)

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

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

Workload in hours (in credits): 180(5)
(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

Mastering the necessary and sufficient level of research competence to solve problems in the field of professional activity using modern information technologies and applied hardware and software.

The objectives of the discipline are:

1. Develop the skills to search, extract, systematize, analyze and select information necessary for solving problems, organize it, transform it, and save it.
2. Develop computer skills for solving simple engineering calculations.
3. Form of ownership methods of storage, transmission, processing and presentation of information in the computer.

1.2. Studied Objects of the Course

Hardware of computer equipment; software computer technology; interaction between hardware and software; human interaction with hardware and software.

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
GPC-5	IA-1 _{gpc-5}	To know structure and methods of digital reporting of oil and gas properties and composition; basic rules for registration and preparation of business documentation based on the basic provisions on measurements, methods, means of ensuring their unity and ways to achieve the required accuracy, comprehensive and quantitative assessment of the quality of oil and gas production facilities; basic rules for the registration and preparation of business documentation based on the main provisions for establishing norms, rules	Knows content and properties of oil and gas, general provisions of metrology, qualimetry, standardization and certification of oil production.	Exam

		and characteristics and confirming the compliance of objects with the requirements of technical regulations, standards, codes of rules or terms of contracts for oil and gas production		
GPC-5	IA-2 _{gpc-5}	To be able to use software packages on your computer to solve simple engineering calculations; use mass media and multimedia technologies to study, analyze and present research results; independently search, extract, systematize, analyze and select information necessary for solving problems, organize, transform, save and transmit it	Is able to use computer with aim to make simple engineering calculation; use appropriately software packages; use general technologies of exploration and prospect for oil as well as organization of oil production in Russia and abroad, standards and specification, sources of information, mass media and multimedia technologies; acquire knowledge by the application of modern educational and information technologies; orient in data flows selecting principal and necessary information; consciously assimilate information, independently find, derive, systematize, analyze and select necessary information aimed at problems solution, organize, transform, store and pass it; critically reconsider cumulative information, form personal opinion, convert information into knowledge, apply information in problems solution using different ways of text processing.	Laboratory lesson report
GPC-5	IA-2 _{gpc-5}	To master methods for protecting the storage and submission of information using modern information technologies and hardware and software; methods of collecting	Masters methods of risk assessment and management of quality performance of manufacturing operations; methods of collection and processing of obtained	Laboratory lesson report

		and processing the received information for risk assessment and quality management of technological operations	information using modern information technologies and applied hardware and software, methods of information security, storage and submission.	
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3. Full time and forms of academic work

Form of academic work	Hours in all	Distribution in hours according to semesters		
		Number of semester		
		1		
1. Holding classes (including results monitoring) in the form:	54	54		
1.1. Contact classwork, including:				
- lectures (L)	18	18		
- laboratory work (LW)	32	32		
- practice, seminars and/or other seminar-type work (PW)				
- control of self-work (CSW)	4	4		
- test				
1.2. Students' self-work (SSW)	90	90		
2. Intermediate attestation				
Exam	36	36		
Grading test				
Test (Credit)				
Course Project (CP)				
Course Work (CW)				
Workload in hours	180	180		

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	
1 semester				
Module 1. Information processes and their software	6	14		32
Topic 1. Basic concepts of information theory. Goals and objectives of computer science. The concept of information. Description of the processes of collecting, transmitting, processing, and accumulating information. Information properties. Data. Data operation. Encoding of text, numeric, and graphic data. Basic structures: linear, tabular, and hierarchical. Number system. Units of representation, measurement, and data storage.				
Topic 2. Technical means of implementing information				

processes. A brief history of computer development. Generation of computers. Computer classifications: by purpose, level of specialization, size, compatibility, etc. Basic configuration of a modern personal computer.				
Topic 3. Software for implementing information processes. Software and its levels. Software classification. Directions of development and evolution of software tools. The concept of the operating system (OS). OS classification. OS functions. Files and file structure.				
Topic 4. Word processor. Working in a word processor. Display mode. Document creation: text formatting, spell checking, thesaurus, AutoFormat, and AutoCorrect. Insert figures, formulas, and tables.				
Topic 5. Spreadsheets. The creation of spreadsheets. Appointment. Basic concept. Data types, input, editing, and formatting. Simple calculations, using standard functions. Create a chart.				
Topic 6. The creation of presentations. Creating presentations. Use templates. Create slides: insert text, drawings, formulas, tables, audio and video information.				
Module 2. Algorithms	8	16		42
Topic 7. Algorithms and algorithmization. Visualization of algorithms. The concept of an algorithm. Forms of representation of algorithms. Graphical representation of algorithms. Linear, branched, and cyclic algorithms. Nested and parallel algorithms. Building an algorithm from basic structures. Step-by-step detailing as a method for designing algorithms.				
Topic 8. Software for implementing algorithms. Computer language. Algorithmization and programming. Syntax and semantics. Translation, interpretation, and compilation of programs. Program testing. Programming algorithms.				
Topic 9. The packages of applied programs. Mathematical and graphical application software packages				
Module 3. Storage, networking and security	4	2		16
Topic 10. Data base. Databases and knowledge bases. Purpose of the database. Basic concepts of relational databases: fields and records, field properties, and data types. Database management systems. Database design and processing.				
Topic 11. Telecommunications. Local and global computer networks. Local and global computer networks. Network protocols. Network services. Basics				

of working on the Internet. Basic Internet Services.				
Topic 12. Methods and means of information protection. The concept of computer security and protection of information constituting a state secret. Computer viruses: classification, methods and means of antivirus protection. Protection of information on the Internet. The concept of encryption. The principle of sufficiency of protection. Electronic signature.				
Total with regard to semester	18	32		90
Total with regard to the course	18	32		90

Topics of exemplary practical work

Sl. №	Topic of practical (seminar) work
	Unstipulated

Topics of exemplary laboratory practice

Sl. №	Topic of laboratory work
1	Encoding of numeric data. Converting numbers from one number system to another. Binary arithmetic
2	Files and file storage system. Organization of work with the objects in the file structure
3	Archiving of documents
4	Local and global computer networks. Data processing using global networks
5	Create and edit documents in Microsoft Word and Google Docs
6	Creating spreadsheets
7	Processing data in Microsoft Excel and Google Spreadsheets
8	Processing spreadsheet data on Android and iOS mobile platforms
9	Creating presentations
10	Linear algorithm
11	Branched algorithms
12	Cyclic algorithms
13	Application package
14	Data processing by means of databases

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 students are recommended to fulfill the following positions:

1. Learning of the discipline should be done systematically.
2. After learning one of the course unit 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 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

Sl.No	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	Esteras S. R. Infotech. English for Computer Users : Student's Book. 4th ed Cambridge : Cambridge Univ. Press, 2008. 168 p.	49
2	Esteras S. R. Infotech. English for Computer Users : Student's Book. 4th ed Cambridge : Cambridge Univ. Press, 2014. 168 p.	9
3	Khabibrahmanova F. R. Development of Computers: from Transistors to Quantum Machines. Perm: PRNPU, 2018. 160 p.	5
4	Balakhonov A.S., Lykov A.N. Computers and information technologies. Perm: PNRPU, 2018. 140 p.	5
2. Additional literature		
2.1. Educational and scientific literature		
1	Rajaraman A. Computer Graphics for Engineers / A. Rajaraman. - Oxford: Alpha Science Intern. Ltd, 2009.	1
2	Patil P.B. Numerical Computational Methods / P.B. Patil, U. P. Verma. - Oxford: Alpha Science Intern. Ltd, 2006.	1
3	An Attribute Grammar for the Semantic Analysis of Ada / J. Uhl [et al.]. - Berlin [et al.]: Springer-Verlag, 1982.	1
4	English for Computer Science Students : textbook / T. V. Smirnova;. M.: Flinta, Science, 2004.	19
5	Computers and Informatics in Developing Countries / World Acad. of Sciences TriesteThird,Italy. - London: Butterworths, 1989.	1
6	Terms of contemporary informatics: programming, computer science, Internet / E. Yu. Vaulina, V. N. Rychkov. M.: Eksmo, 2004. 637 p.	9
7	A Dictionary of Computing : over 6300 entries / . 5th ed Oxford : Oxford University Press, 2004. 597 p.	1
2.2. Standardized and Technical literature		
	Unstipulated	
3. Students' manual in mastering discipline		

	Unstipulated	
4. Teaching and learning materials for students' self work		
	Unstipulated	

6.2. Electronic Courseware

Kind of literature	Name of training tool	Reference to information resource	Accessibility of EBN (Internet/local net; authorized/free access)
Basic literature	Informatics. Laboratory workshop on English language. Teaching manual / V. I. Lebedev, I. V. Lebedeva. – Stavropol: Publisher of NCFU, 2018. – 153 p.	URL: http://www.iprbookshop.ru/83195.html 1 (date of request: 30.11.2020)	authorized access
Basic literature	Lebedev V. I. Informatics: course of lectures in English. – Stavropol: Publisher NCSU, 2015. – 102 p	URL: http://www.iprbookshop.ru/63090.html 1 (date of request: 30.11.2020)	authorized access
Additional literature	Gvozdeva E. A. Computer science : educational and methodical manual / E. A. Gvozdeva. — Moscow : NRNU MEPhI, 2011. — 52 c. — ISBN 978-5-7262-1601-0.	URL: https://e.lanbook.com/book/75995 (date of request: 29.11.2020)	authorized access
Additional literature	Pushkina E.N. English for radio physicists and computer science learners / E.N. Pushkina. — Nizhnij Novgorod : Lobachevsky UNN, 2020. — 131 c.	URL: https://e.lanbook.com/book/144628 (date of request: 30.11.2020)	authorized access

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

Type of Software	Software branding
Operating system	Windows 10, lic. 66232645
Operating system	Windows 7, lic.MS Imagine
Office software	Adobe Acrobat 9.0 Pro Edu, lic. 21134490

Office software	Microsoft Office Professional 2007. lic. 42661567
General purpose application software	IIO Dr.Web Desktop Security Suite , 2000 lic, PNIPU 2017
General purpose application software	Mathcad 14 University Classroom, lic. SE14RYMMEV0002-FLEX
General purpose application software	WinRAR, lic. # 879261.1493674
Image processing software	CorelDRAW Graphics Suite X4, lic. LCCDGSX4MULAB
General purpose application software	Total Commander 7.xx, lic. 110000
Management systems for projects, research, development, design, modeling and implementation	Autodesk AutoCAD 2019 Education Multi-seat Stand-alone

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

Branding	Reference to information resource
Elsevier "Freedom Collection" database	https://www.elsevier.com/
Scopus database	https://www.scopus.com/
Springer Nature e-books database	http://link.springer.com/ http://jwww.springerprotocols.com/ http://materials.springer.com/ http://zbmath.org/ http://npg.com/
Web of Science database	http://www.webofscience.com/
Scientific electronic library database (eLIBRARY.RU)	https://elibrary.ru/
Scientific library of Perm national research Polytechnic University	http://lib.pstu.ru/
LAN electronic library system	https://e.lanbook.com/
Iprbooks electronic library system	http://www.iprbookshop.ru/
Virtual reading room of the Russian state library	https://dvs.rsl.ru/
Electronic library of dissertations of the Russian state library	http://www.diss.rsl.ru/

7. Logistics of the Course Educational Process

Type of classes	Name of the necessary basic equipment	Number of units
Laboratory work	Computers included (system unit, monitor, keyboard, mouse)	15
Lecture	Interactive whiteboard	1
Lecture	Multimedia complex consisting of: multimedia projector, interactive whiteboard, acoustic system	1

8. Fund of the Course Evaluating Tools

Described in a separate document
