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ФИО: Ястребов Олег Александрович
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**Federal State Autonomous Educational Institution of Higher Education
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA
RUDN University**

Agrarian -Technological Institute

educational division (faculty/institute/academy) as higher education programme developer

COURSE SYLLABUS

Information technology

course title

Recommended by the Didactic Council for the Education Field of:

35.04.04 Agronomy

field of studies / speciality code and title

The course instruction is implemented within the professional education programme of higher education:

Integrated Plant Protection

higher education programme profile/specialisation title

1. COURSE GOAL(s)

The purpose of mastering the discipline "Information technology" is to form basic ideas about obtaining and processing information for its analysis by a person and making decisions on its basis to perform management tasks related to production activities in the field of agriculture.

2. REQUIREMENTS FOR LEARNING OUTCOMES

Mastering the discipline "Information technology" is aimed at the formation of the following competencies (part of the competencies) among students:

Table 2.1. List of competences that students acquire through the course study

Competence code	Competence descriptor	Competence formation indicators (within this course)
GK-1	Able to carry out search, critical analysis of problem situations on the basis of a systematic approach, to develop an action strategy	GK-1.1 Performs the search for the necessary information, its critical analysis and summarizes the results of the analysis to solve the task
		GK-1.2 Uses a systematic approach to solve the tasks
GK-7	Able to search for the necessary sources of information and data, perceive, analyze, memorize and transmit information using digital means, as well as with the help of algorithms when working with data received from various sources in order to effectively use the information received to solve problems, to evaluate information, its reliability, to build logical conclusions on the basis of incoming information and data	GK-7.1 Evaluates information, its reliability, builds logical conclusions on the basis of incoming information and data
		GK-7.2 Has practical experience in searching, perceiving, storing, analyzing, transmitting information and data using digital tools, algorithms and application programs in order to solve the tasks
OPK-1	Able to solve the tasks of developing the field of professional activity and (or) organization based on the analysis of scientific and industrial achievements;	OPK-1.3 Applies available technologies, including information and communication technologies, to solve the problems of professional activity in agronomy
OPK-3	Able to use modern methods of problem solving in the development of new technologies in professional activities	OPK-3.2 Uses information resources, achievements of science and practice in the development of new technologies in agronomy
OPK-7	Able to own the tools for working with large arrays	OPK-7.1 Owns the tools for working with large arrays of structured and unstructured information

Competence code	Competence descriptor	Competence formation indicators (within this course)
	of structured and unstructured information, use modern digital methods of processing, analysis, interpretation and visualization of data in order to solve the tasks of professional and research activities in the field of agronomy	OPK-7.2 Uses modern digital methods of data processing, analysis, interpretation and visualization in order to solve the tasks
PK-1	Able to collect, process, analyze and systematize scientific and technical information, domestic and foreign experience in the field of agronomy	PK-1.2 Conducts information retrieval of knowledge-intensive technologies in biotechnology and genetic engineering using various databases and network resources
PK-6	Able to provide consultations on innovative technologies in agronomy	PK-6.1 Proficient in the methods of calculating the agronomic, energy and economic efficiency of innovation implementation

3.COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

Mastering the discipline "Information Technologies" is aimed at forming the following competencies (part of the competencies) among students:

Table 3.1. The list of the higher education programme components/disciplines that contribute to the achievement of the expected learning outcomes as the course study results

Competence code	Competence descriptor	Previous courses/modules*	Subsequent courses/modules*
GK-1	Able to carry out search, critical analysis of problem situations on the basis of a systematic approach, to develop an action strategy		Mathematical Modeling and Design; Research Practice; Scientific research work / Научно-исследовательская работа;
GK-7	Able to search for the necessary sources of information and data, perceive, analyze, memorize and transmit information using digital means, as well as with the help of algorithms when working with data received from various sources in order to		Research Practice; Undergraduate practice / Преддипломная практика; Organization of Integrated Plant Protection Systems; Instrumental methods of research; Plant immunity; Biotechnology in Plant Protection;

Competence code	Competence descriptor	Previous courses/modules*	Subsequent courses/modules*
	effectively use the information received to solve problems, to evaluate information, its reliability, to build logical conclusions on the basis of incoming information and data		Scientific research work / Научно-исследовательская работа;
OPK-1	Able to solve the tasks of developing the field of professional activity and (or) organization based on the analysis of scientific and industrial achievements;		Biotechnology in Plant Protection; Biological Method of Plant Protection; Instrumental methods of research; Mathematical Modeling and Design; Plant Quarantine; Virology; Organization of Integrated Plant Protection Systems; Plant immunity; Scientific research work / Научно-исследовательская работа; Research Practice;
OPK-3	Able to use modern methods of problem solving in the development of new technologies in professional activities		Scientific research work / Научно-исследовательская работа; Research Practice; Organization of Integrated Plant Protection Systems; Instrumental methods of research;
OPK-7	Able to own the tools for working with large arrays of structured and unstructured information, use modern digital methods of processing, analysis, interpretation and visualization of data in order to solve the tasks of professional and research activities in the field of agronomy		Scientific research work / Научно-исследовательская работа; Research Practice; Instrumental methods of research;

Competence code	Competence descriptor	Previous courses/modules*	Subsequent courses/modules*
PK-1	Able to collect, process, analyze and systematize scientific and technical information, domestic and foreign experience in the field of agronomy		Scientific research work / Научно-исследовательская работа; Research Practice; Undergraduate practice / Преддипломная практика; Plant Quarantine; Biotechnology in Plant Protection; Organization of Integrated Plant Protection Systems; Plant immunity;
PK-6	Able to provide consultations on innovative technologies in agronomy		Biological Method of Plant Protection; Organization of Integrated Plant Protection Systems; Research Practice;

* To be filled in according to the competence matrix of the higher education programme.

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

Possible wording

The total labor intensity of the discipline "Information Technology" is 3 credits for full-time education.

Table 4.1 – Types of educational work by periods of mastering the OP HE for full-time education

Type of academic activities		Total academic hours	Semesters/training modules			
			1	2	3	4
<i>Contact academic hours</i>		34	34			
<i>including:</i>						
Lectures (LC)						
Lab work (LW)						
Seminars (workshops/tutorials) (S)		34	34			
<i>Self-studies</i>		46	46			
<i>Evaluation and assessment (exam/passing/failing grade)</i>		28	28			
Course workload	academic hours_	108	108			
	credits	3	3			

5. COURSE CONTENTS

Table 5.1. Course contents and academic activities types

Course module title	Course module contents (topics)	Academic activities types
Module 1: The role of information technology in the development of modern society. The concept of an information system (IS).	Topic 1.1. A brief historical background. Information and management. The main processes of information transformation. Stages of information technology development. Computer information technologies and their types.	S
	Topic 1.2. The concept of information systems. The composition and general structure of information systems. The main purpose of information systems. The needs of information systems. Synthesis and decomposition of IC. IP models. The life cycle of the IP.	S
	Topic 1.3. Classification of information systems. Factual and documentary information systems. Geoinformation systems. Information technology. Types of information technology	S
Module 2: Storage structures and access methods	Topic 2.1. Data processing systems (data centers). File systems for data processing and trends in their development. Data structures for FSO and access methods. The model of a simple sequential file. The index organization of the file.	S
	Topic 2.2. Search methods in the index. Organization of direct access. Hashing algorithms. Overflow handling. A list organization.	S
	Topic 2.3. A binary tree. Balanced trees. B is a tree. Access methods for multiple keys. A multi-disk file. The inverted file. A two-linked tree.	S
Module 3: The evolution of information systems and databases	Topic 3.1. Early approaches to database organization. Systems based on inverted lists, hierarchical and network databases. Examples. Strengths and weaknesses of early systems. The main features of systems based on inverted lists.	S
	Topic 3.2. Hierarchical systems. Hierarchical data structures. Network systems. Network data structures. Data manipulation. Integrity constraints.	
Module 4: The concept of databases (DB).	Topic 4.1. Basic concepts of databases. Database properties. Requirements for the organization of the database. The data bank. Components of the data bank. The administrator of the data bank	S
	Topic 4.2. Database management System (DBMS). Levels of data representation. The life cycle of the database. The database design process. The principle of top-down design with successive iterations. Topic	S
	Topic 4.3. Design expertise. Requirements analysis.	S

* - to be filled in only for **full**-time training: *LC* - lectures; *LW* - lab work; *S* - seminars.

6. CLASSROOM EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

Table 6.1. Classroom equipment and technology support requirements

Type of academic activities	Classroom equipment	Specialised educational / laboratory equipment, software, and materials for course study (if necessary)
Seminary	An auditorium for seminar-type classes, group and individual consultations, ongoing monitoring and intermediate certification, equipped with a set of specialized furniture and multimedia presentation equipment.	
Self-studies	A classroom for independent work of students (can be used for seminars and consultations), equipped with a set of specialised furniture and computers with access to the electronic information and educational environment.	

* The premises for students' self-studies are subject to **MANDATORY** mention

7. RESOURCES RECOMMENDED FOR COURSE STUDY

Main readings:

1. Agronomy DOI 10.5772/intechopen.78102 Webshop link <https://www.intechopen.com/books> ISBN 9781838812232, 9781838812225, 9781838812249 Publisher IntechOpen Publisher website <https://www.intechopen.com/> Publication date and place 2020 Imprint IntechOpen Classification Agronomy & crop production Pages 108

2. Belchenko, S. A. Innovative technologies in crop production : a textbook for universities / S. A. Belchenko. — St. Petersburg : Lan, 2025. — 108 p. — ISBN 978-5-507-51685-8. — Text : electronic // Lan : electronic library system. — URL: <https://e.lanbook.com/book/455582>

Additional readings:

1. Organization of consulting activities in agriculture : a textbook for universities / V. I. Nechaev, I. S. Sandu, G. M. Demishkevich [et al.] ; edited by V. I. Nechaev. — 2nd ed., revised. — St. Petersburg : Lan, 2025. — 320 p. — ISBN 978-5-507-50748-1. — Text : electronic // Lan : electronic library system. — URL: <https://e.lanbook.com/book/461144>

2. Griguletsky, V. G. Digital technologies in agriculture. Digital models of growth and productivity of agricultural plants : a textbook for universities / V. G. Griguletsky. Saint Petersburg : Lan Publ., 2024. 316 p. ISBN 978-5-507-49433-0. — Text : electronic // Lan : electronic library system. — URL: <https://e.lanbook.com/book/417659>

Internet sources

1. Electronic libraries (EL) of RUDN University and other institutions, to which university students have access on the basis of concluded agreements:

- RUDN Electronic Library System (RUDN ELS) <http://lib.rudn.ru/MegaPro/Web>
- EL "University Library Online" <http://www.biblioclub.ru>
- EL "Yurayt" <http://www.biblio-online.ru>

- EL "Student Consultant" www.studentlibrary.ru
- EL "Lan" <http://e.lanbook.com/>

2. Databases and search engines:

- electronic foundation of legal and normative-technical documentation <http://docs.cntd.ru/>
- Yandex search engine <https://www.yandex.ru/>
- Google search engine <https://www.google.ru/>
- Scopus abstract database <http://www.elsevierscience.ru/products/scopus/>

*Training toolkit for self- studies to master the course *:*

The set of lectures on the course «Information Technology»

* The training toolkit for self- studies to master the course is placed on the course page in the university telecommunication training and information system under the set procedure.

DEVELOPERS:

position, department	name and surname
position, department	name and surname
position, department	name and surname

HEAD OF EDUCATIONAL DEPARTMENT:

name of department	name and surname
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HEAD OF HIGHER EDUCATION PROGRAMME:

position, department	name and surname
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