MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

Federal State Budgetary Educational Institution of Higher Education

«SAINT-PETERSBURG STATE UNIVERSITY OF ECONOMICS» (UNECON)

APPROVED:
Vice-rector for study and methodical work
Veronika G. Shubaeva
«13» июня 2022.

Введение в искусственный интеллект / Introduction to artificial intelligence

Syllabus of the course

Specialty	*38.03.02 Management*
Specialization	*Business management and digital innovations*
Level of higher education	*Bachelor*
Form of training	*Full-time*
Year of enrolment	*2022*

Authored by:

Lecturer, Ivakhnenko Daria Aleksandrovna

Total number of hours	108	**Form of final attestation:**
incl:		
contact work	28	Test: semester 6
self-study	80	
practical training	0	
control hours	0	

Hours distribution:

Semester:	6
Type of classes	Hours
Contact hours	4
Practical training	24
Laboratory work	
Total contact hours	28
Self-study	80
Control hours	0
Total academic hours	108
Total credits	3

Saint-Petersburg
2022

CONTENTS

1. LEARNING OBJECTIVES

Objective:	Demonstrate to students the possibilities of modern methods of artificial intelligence for solving applied economic problems, present the basic methods of machine learning and their areas of application.

2. COURSE PLACE IN THE PROGRAMME STRUCTURE

The discipline B1.O.DV. Introduction to artificial intelligence is a part of Block 1.

3. EXPECTED LEARNING OUTCOMES

Code and name of graduate competence	Code and name of the competence achievement indicator	Expected learning outcomes
UC-1 – Able to search, critical analysis and synthesis of information, apply a systematic approach to solve tasks	UC-1.3 – Chooses the best option for solving the problem, arguing his choice	To know: areas of application of artificial intelligence and the main tools for solving applied problems using machine learning methods. To be able to: formulate applied problems in the form of machine learning problems and choose methods for solving them. To master: the skills of analyzing the tasks and presenting them in the form of a machine learning task.

4. COURSE STRUCTURE AND CONTENT

Code and name of the topics	Course content	Academic hours			
		Contact work			Self-study
		Lectures	Practices	Workshops	
Topic 1. Principles of artificial intelligence. Areas of application of artificial intelligence. Algorithm for constructing predictive models.	Introduction to modern methods of artificial intelligence. Main classes of problems. Review of areas of application of artificial intelligence. Classes of machine learning models. Methods for assessing the quality of predictive and predictive models.	1	2		2
Topic 2. Metric methods of machine learning and their practical application.	Nearest neighbor method. Areas of application of the nearest neighbors method. Choosing the number of neighbors in the metric classifier. Selection of the distance function in various applied problems of data analysis.	1	4		18
Topic 3. Linear models in classification and regression problems.	Linear regression model. Logistic regression model. Areas of application of linear models. Features of learning linear predictive models.	1	8		24

Probabilistic approaches to the construction of predictive models.	Probabilistic approaches in data mining problems. The simplest text classification model based on the naive Bayesian approach.				
Topic 4. Decision trees. Basic principles of decision-making automation in data analysis problems.	Introduction to logical methods of machine learning. Decision tree elements. Basic principles of decision making based on logical methods. Advantages and disadvantages of decision trees.	1	6		24
Topic 5. The simplest model of a neuron. Elements of neural networks. Areas of application of artificial neural networks.	Areas of application of artificial neural networks. The concept of neural network architecture. The concept of a neuron. Principles of functioning of artificial neural networks. The simplest model of a neuron. Advantages and disadvantages of artificial neural networks.		4		12
Control hours:					**0**
Total hours:		**4**	**24**	**0**	**80**

5. TEACHING AND LEARNING TOOLS OF THE COURSE

5.1 Recommended literature

Bibliographic description of the publication (author, title, type, place and year of publication, number of pages)	**Digital resources**
Brink, H. Machine Learning / H. Brink, D. Richards, M. Feverolf. St. Petersburg: Peter, 2017. - 336 p.	http://ibooks.ru/reading.php?short=1&productid=355472
Galushkin, A.I. Neural networks: fundamentals of theory / A.I. Galushkin. - Moscow: Gor. line-Telecom, 2012. - 496 p.	https://znanium.com/catalog/product/353660
Novikov F.A. Symbolic Artificial Intelligence: The Mathematical Foundations of Knowledge Representation: A Study Guide. — Electron. Dan. - M. : Yurayt Publishing House, 2019. - 278 p.	https://urait.ru/bcode/434065
Teofili, T. Deep Learning for Search Engines: A Practical Guide / T. Teofili; per. from eng. D. A. Belikova. - Moscow: DMK Press, 2020. - 318 p.	https://znanium.com/catalog/product/1094920

5.2 List of software (including national production)

- 7-Zip
- LibreOffice
- ОС Альт образование 10
- Anaconda Individual Edition

- Python

5.3 List of reference systems and modern professional databases

№	Name of reference systems and professional databases
1.	Digital library Grebennikon.ru – www.grebennikon.ru
2.	Science Digital Library eLIBRARRY – www.elibrary.ru
3.	Science Digital Library КиберЛеника – www.cyberleninka.ru
4.	Database ПОЛПРЕД Справочники – www.polpred.com
5.	Database OECD Books, Papers & Statistics on the platform OECD iLibrary www.oecd-ilibrary.org
6.	Legal reference system КонсультантПлюс (installed resource UNECON or www.consultant.ru)
7.	Legal reference system «ГАРАНТ» (installed resource UNECON or www.garant.ru)
8.	Information and referral system «Кодекс» (installed resource UNECON or www.kodeks.ru)
9.	Digital library system BOOK.ru - www.book.ru
10.	Digital library system ЭБС ЮРАЙТ – www.urait.ru
11.	Digital library system ЗНАНИУМ (ZNANIUM) – www.znanium.com
12.	Digital library UNECON – opac.unecon.ru

6. TECHNICAL FACILITIES

There are special rooms for lectures, seminars, coursework, group and individual consultations, current and interim assessments, as well as rooms for self-study.

The premises are equipped with equipment and teaching aids.

The rooms for students' independent work are equipped with computers with Internet connection and access to the university's electronic learning environment.

Name of classroom	Classroom location
Classroom 2021 Laboratory "Laboratory complex"Specialized furniture and equipment: Educational furniture for 22 seats (22 computer tables, 22 black chairs) Educational furniture for 42 seats (21 desks), teacher's workplace (computer table 1 pc.) board, chalk 3-section 1 pc., marker board on wheels 1 pc., clock 1 pc., pulpit 1 pc., table 1 pc., bedside table 1 pc., chair from 4 pcs., rack hanger 2 pcs., blinds 3 pcs. Computer i5-8400/8GB/500GB_SSD/Viewsonic VA2410-mh - 23 pcs., Installation of demonstration training films - 1 pc., Computer included system unit Intel pentium x2 g3250 keyboard+mouse L (500gb hard drive, philips monitor 21.5') - 1 PC. Sets of demonstration equipment and visual aids: multimedia applications for lecture courses and practical exercises, interactive educational visual aids.	191023, St. Petersburg, Griboedova canal, 30-32, lit. A, Б, P
Classroom 3006 Training classroom (for conducting lecture-type classes and seminar-type classes, course design (term papers), group and individual consultations, current control and intermediate certification), equipped with a multimedia complex. Specialized furniture and equipment: Educational furniture for 30 seats (tables - 15 pcs., chairs - 30 pcs.), teacher's workplace, marker board on wheels - 1 pc., pulpit - 1 pc., chair - 2 pcs. Portable multimedia kit: Notebook HP 250 G6 1WY58EA, Multimedia projector LG PF1500G. Sets of demonstration equipment and visual aids: multimedia applications for lecture courses and practical	191023, St. Petersburg, Griboedova canal, 30-32, lit. A, Б, P

exercises, interactive educational visual aids.	
Classroom 2070 Training classroom (for conducting lecture-type classes and seminar-type classes, course design (term papers), group and individual consultations, current control and intermediate certification) is equipped with a multimedia complex. Specialized furniture and equipment: Educational furniture for 54 seats, teacher's workplace, marker board - 1 pc., Chair - 1 pc., Table - 1 pc., Chair - 1 pc., Computer Intel i3-2100 2.4 Ghz / 500 /4/Acer V193 19" - 1 pc., Interactive projector Epson-EB-455Wi - 1 pc. Sets of demonstration equipment and educational visual aids: multimedia applications for lecture courses and practical exercises, interactive educational visual aids.	191023, St. Petersburg, Griboedova canal, 30-32, lit. A, Б, P
Classroom 2034 Computer room (for practical classes, course design (coursework) using computer technology), equipped with a multimedia system. Specialized furniture and equipment: Educational furniture for 25 seats, teacher's workplace (table 1pc., chair 1pc.), marker board 1pc, Rack hanger 2pcs, chairs 3pcs.Computer I5-7400/8Gb/1Tb/DELL S2218H - 21pcs, Network switch Cisco WS-C2960-48TT-L (Catalyst2960) 48-ports 10/100Mbps+2p - 1 pc, Switchboard Cisco Catalyst 2960 24 WS-C2960-24PC-L - 1 pc. Sets of display equipment and visual aids: multimedia applications for lecture courses and practical sessions, interactive teaching and visual aids.	191023, St. Petersburg, Griboedova canal, 30-32, lit. A, Б, P

7. METHODOLOGICAL GUIDELINES FOR STUDENTS

The following documents should be made available to the trainee before the start of the course:

- training and methodological documentation;
- local normative acts regulating the main issues of the organisation and implementation of educational activities, including those regulating the procedure for current monitoring and interim assessment of students;
- the schedule of consultations of the teaching staff.

The level and depth of mastering the discipline is determined by the active and systematic work of students in lectures, seminars, independent work, including in terms of identifying the most significant and relevant problems for further study. A special condition for qualitative mastering of the discipline is an effective organisation of work, which allows distributing the academic workload evenly in accordance with the schedule of the educational process.

When preparing for classes, students have the opportunity to attend consultations with the staff of UNECON according to the timetable set out in the schedule of consultations.

The students' in- and out-of-classroom work should aim to form:

- the fundamentals of the learner's world view and scientific understanding;
- basic knowledge relevant to the training area and the declared professional field, forming the target and professional basis for training;
- professional competences oriented towards the needs of the labour market;
- an individual trajectory by mastering a unique set of professional competences that complement the learner's competence model, through a focus on specific professional specialised areas of knowledge defined by labour market representatives;

- metha-skills for learners, such as teamwork and leadership, data analysis, digital skills, project design and implementation, intercultural interaction.

8. SPECIFICATIONS FOR TEACHING DISABLED PERSONS

Students with disabilities, if necessary, are taught on the basis of an adapted work programme using special teaching methods and didactic materials that take into account the particularities of their psychophysical development, individual capacities and health status.

In order for disabled persons and persons with disabilities to master the curriculum, the University shall ensure that:

- for the visually impaired and visually impaired: availability of information on the timetable in accessible places and adapted forms for learners who are blind or visually impaired; presence of an assistant to assist the learner as needed; production of alternative formats of teaching materials (large print or audio files);
- for the hearing-impaired and hearing-impaired: adequate sound reproduction of information;
- for persons with disabilities and persons with mobility impairments: the possibility of unimpeded access for students to classrooms, restrooms and other areas of the department, as well as their stay in these areas.

Learners with disabilities and persons with disabilities are provided with printed and/or electronic educational resources in forms adapted to their disabilities. The education of students with disabilities may be organised with other students or in separate groups or organisations.

ASSESSMENT RESOURSES

1.1 Control tasks and assignments for interim attestation

Is not provided by the work programme of the discipline.

1.2 Topics for written task

Is not provided by the work programme of the discipline.

1.3 Interim checkpoints

Number	Type	Method of conduct	Topic number
1	Essay	with the help of technical means and information systems	1-5
2	Test	in writing	1-4
3	Monitoring	with the help of technical means and information systems	1-5

1.4 Other assessment objects

Is not provided by the work programme of the discipline.

1.5 Self-study

Name of self-study	Topic number
Preparation of messages, reports	2,3,5
Preparation for lectures and practical classes	2-5
Development of individual / group projects	2-4

1.6 Grading scale

Scales of assessment and procedures for assessing learning outcomes of the discipline are regulated by the Regulations on the current control of progress and interim attestation of students in higher education programmes and the Regulations on the scoring and rating system.

A grading and rating system is used to assess the learning outcomes of the discipline:

The final control of the discipline is an examination (or a differentiated test), the final grade being formed in accordance with the scale given in the table below:

Points	Grade
<55	Not passed
>=55	Passed

Grading scale

2 (points to 54)	Demonstrates a lack of understanding of the problem. Many of the requirements of the assignment are not met. An initial perception of the material is demonstrated. The work is incomplete and/or plagiarised.
3 (points 55-69)	Demonstrates a partial understanding of the problem. Most of the requirements of the task have been met. Mastery of the elements of the assigned material. The material is mostly clear and coherent.
4 (points 70-84)	Demonstrates considerable understanding of the issue by the discipline. All requirements of the assignment are fulfilled. The content of the completed tasks is disclosed and examined from different perspectives.
5 (points 85-100)	Demonstrates full understanding of the problem. All requirements of the assignment are fulfilled. Demonstrates proficiency in the discipline. The completed assignments are holistic, complete, structured, present different points of view and demonstrate creativity.