

Faculty of Information Technology
Department of Information Systems

Approved
Vice-Rector of Academic and Educational Affairs of
ITU JSC
_____ Umarov T.F.
«__» _____ 20__

**SYLLABUS
(ACADEMIC PROGRAM)**

Course (code, title): 11763 Big Data ingestion /Storage (BDA-2)
(code, title):

Major (code, title): 6B070300 Information System
(code, title):

Educational program 6B070300 - Information systems
(code, title)

Year: 4 **Semester:** 1 **Number of credits:** 5 ECTS

Lectures: 15 hours

Laboratory classes: 15 hours

SIS: 90 hours

TSIS: 15 hours

Total: 150 hours

Final assessment form: Project

«IITU» JSC

Academic program of the course (code, title) 11763 Big Data ingestion /Storage (BDA-2) has been developed on the basis of Standard Academic Program.

Academic program has been reviewed at the meeting of Information Systems department.

Minutes № 1 dated «17» 08 2020

Head of the Department _____ Kassymova A.B. PhD, associate professor
signature full name, title, degree

Author _____ Sultan Daniyar, Master, lecturer
signature full name, title, degree

The working academic program was approved at the meeting of the Educational and Methodological Board of JSC "IITU"

Minutes № 1 dated " 28 " 08 2020.

Director of the Department _____ A. Mustafina
for Academic Affairs *Signature*

1. GENERAL INFORMATION	
Faculty	Information Technology
Major code and title	5D070300 Information System
Educational program code and title	5D070300 Information System
Year, semester	4 year, 1 semester
Subject category	Data Science
Number of credits (ECTS)	5
Prerequisites	BDA-1
Postrequisites	BDA-3
Lecturer	Sultan Daniyar Rakhmankululy, lecturer, master, office 802, 9sultaniitu6@gmail.ru , 8-747-552-3348
2. GOALS, OBJECTIVES AND LEARNING OUTCOMES OF THE COURSE	
Course goal:	
This course is a great introduction to both fundamental programming concepts of the Python programming language. By the end of the semester, students should be familiar with Python syntax and be able to put into practice what have been learned and should be able to demonstrate it in a final project of this course. Students would be taught the methodology for programming with Python based on main three modules: conceptual, logical, and physical database design. Design, based on the widely accepted Entity–Relationship model, with normalization used as a validation technique. Python is an example of a high-level language like other high-level languages such as: C and its derivatives; C++, C#, Java and Perl.	
The objectives of the course are	
Give course is aimed for highly motivated students with little or no prior experience in programming. The course will focus on planning and organizing programs, as well as the grammar of the Python programming language.	
Learning outcomes of the course	
After completing the course, the students will:	
Be able to	
<ul style="list-style-type: none"> • develop algorithms and models for applications in the Python programming language; • develop informational, functional and software in the Python programming language; • programming in an integrated environment object-oriented Python programming. • apply the knowledge from the course for the development of its educational program in computer science; • use the programming skills that allow you to create applications that can improve current activities and enable the emergence of new ideas. 	
Be qualified in	
<ul style="list-style-type: none"> • Creation/manipulation application; • gain skills of computational thinking and modeling acquired to date; 	
Know:	
<ul style="list-style-type: none"> • The basic ideas of programming • How to write programs in good style 	
To debug and test programs	
3. Course description	
This course aims to teach one of the rapidly growing and popular Python programming languages. The basis covers such important concepts as object-oriented programming, functional programming, event-driven program (GUI-applications). Python is freely available for many platforms (such as Unix, Windows, Linux, RiscOS, MAC, Sun), and programs written on it is usually portable across platforms without any changes. This makes it possible to apply for the study of language, any available hardware platform.	
4. COURSE POLICY	
Students are forbidden to:	
<ul style="list-style-type: none"> – submit any tasks after the deadline. Late submissions are graded down. – cheat. Plagiarized papers shall not be graded; – be late for classes. Being tardy three times amounts to one absence; – retake any tests, unless there is a valid reason for missing them; – use mobile phones in class; – chew gum in class. 	

Students should always

- be appropriately dressed (formal/semi- formal styles are acceptable);
- show consideration for and mutual support of teachers and other students;
let the teacher know of any problems arising in connection with their studies.

During classes students can use online platforms like MS Teams(mostly), Zoom,DL, etc

5. LITERATURE

Basic literature:

1. Simon Haykin, Neural Networks: A Comprehensive Foundation, Prentice Hall, 2016, 842 p.
2. M. Bhuyan, D. Bhattacharyya, and J. Kalita, “Network anomaly detection: Methods, systems and tools,” IEEE Commun. Surv. Tuts., vol. 16, no. 1, pp. 303–336, First Quart. 2014.
3. Ian Goodfellow, Deep Learning, The MIT Press, 2016, 775 p.
4. Video lectures: https://www.youtube.com/watch?v=-ETQ97mXXF0&ab_channel=edureka%21

Supplementary literature:

6. Hernandez OJ, Rodriguez JD, Alzate, L, Lucania M, Inza I, Lozano JA. “Approaching sentiment analysis by using semi-supervised learning of multi-dimensional classifiers”. Neurocomputing, 92, 98-115, 2012
7. Tariq Rashid, Make Your Own Neural Network, CreateSpace Independent Publishing Platform; 1 edition, 2016, 222 p.
8. Christopher M. Bishop, Pattern Recognition and Machine Learning (Information Science and Statistics), Springer, 2011, 738 p.
9. Kohonen, Teuvo, Self-Organizing Maps, Springer, 2017, 457 p.
10. <http://neuralnetworksanddeeplearning.com/>

6. Course schedule

Wee k/ date	Course topics	Referen ces	Lectures (h/w)	Practical sessions (h/w)	Lab. sessions	TSIS (h/w)	SIS (h/w)
1	Introduction to Python programming, terminology and main concepts, Basic Syntax, variable and Data Types. Operators	[1], [4], [5]	1	1	1	1	6
2	String Manipulation (Accessing Strings, Basic Operations, String slices, user input, functions)	[1], [2],[3], [4],[5], [6], [7]	1	1	1	1	6
3	Conditional Statements (If, If- else, Nested if-else). Looping (For, While, Nested loops) and Control Statements (Break, Continue, Pass)	[1], [2], [5], [6], [7]	1	1	1	1	6
4	Lists. Accessing list. Operations. Working with lists Function and Methods Dictionaries. Accessing values in dictionaries. Working with dictionaries. Properties. Functions Tuple Accessing tuples Operations Working Functions and Methods	[1], [2], [3], [4], [5], [6], [7], [8], [9], [10]	1	1	1	1	6
5	Input-Output. Printing on screen. Reading data from keyboard. Opening and closing file. Reading and writing files Functions	[1], [4]	1	1	1	1	6

6	Functions. Defining a function. Calling a function Types of functions Function Arguments Anonymous functions	[2], [3], [4],[5], [6], [7]	1	1	1	1	6	
7	Midterm	[1], [2],[3], [4],[5], [6], [7],[9]	1	1	1	1	6	
8	GUI Programming Tkinter programming Tkinter widgets Interface design	[1], [2], [3], [4], [9],[10]	1	1	1	1	6	
9	Text Files and Modules The Tkinter Scrollbar Read Text File Lines Saving text files Python Code Libraries Using Third-party Modules	[1], [2], [3], [4], [5], [6], [7]	1	1	1	1	6	
10	Python Classes Using Classes Class Functionality Inheritance Python Refactoring	[1], [2], [3], [4], [5], [6], [7]	1	1	1	1	6	
11	A Database Project Create a Database with phpMyAdmin MySQL Database Tables Configuring the Project Tkinter Form Tabs Adding Widgets to Tkinter Tabs Tab Activation Images in Labels	[1], [5], [6], [7]	1	1	1	1	6	
12	A Database Coding Connect to a MySQL Database Get Database Records Database Rows Scroll forward and Backward The Add New Record Tab The Add New Record Button Insert New Record Searching for a Record	[1], [4], [5], [6], [8]	1	1	1	1	6	
13	Python Data Structures, Strings and Files. Dictionaries and Sets: The Intro to Data Science	[1], [4], [5], [6]	1	1	1	1	6	
14	Array-Oriented Programming with NumPy Exceptions: Files and Exceptions	[4], [5]	1	1	1	1	6	
15	Pre-final session	[2], [3], [4], [5]	1	1	1	1	6	
Total hours:			150	15	15	15	15	90

7. List of topics/ assignments for laboratory classes

No laboratory classes

8. List of topics/ assignments for practical classes

№	Topic Title	Number of hours	References	Form of reporting	Deadline
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1	2	3	4	5	6
1	main concepts, Basic Syntax, variable and Data Types Operator	1	[1],[2]	Program, discussion	End of the 1-th week
2	String Manipulation	1	[1],[2]	Program, discussion	End of the 2-nd week
3	Conditional Statements	2	[1],[2],[3],[4],[5],[6],[7],[8],[9],[10]	Program, discussion	End of the 3-rd week
4	Lists Cost function.	2	[1],[2],[3],[4],[5],[6],[7],[8],[9],[10]	Program, discussion	End of the 4-th week
5	Input-Output	2	[1],[2],[3],[4],[5],[6],[7],[8],[9],[10]	Program, discussion	End of the 5-th week
6	Functions	2	[1],[2],[3],[4],[5],[6],[7],[8],[9],[10]	Program, discussion	End of the 6-th week
7	Revision week	2	[1],[2],[3],[4],[5],[6],[7],[8],[9],[10]	Program, discussion	End of the 7-th week
8	GUI Programming	2	[1],[2],[3],[4],[5],[6],[7],[8],[9],[10]	Discussion	End of the 8-th week
9	Modules	2	[1],[2],[3],[4],[5],[6],[7],[8],[9],[10]	Discussion Examples.	End of the 9-th week
10	Classes	2	[1],[2],[3],[4],[5],[6],[7],[8],[9],[10]	Discussion. Examples.	End of the 10-th week
11	Creation of Database with Python Tuple	2	[1],[2],[3],[4],[5],[6],[7],[8],[9],[10]	Discussion. Examples.	End of the 11-st week
12	Database Coding in Python	2	[1],[2],[3],[4],[5],[6],[7],[8],[9],[10]	Discussion. Examples.	End of the 12-th week
13	Exceptions: Files and Exceptions	2	[1],[2],[3],[4],[5],[6],[7],[8],[9],[10]	Discussion. Examples.	End of the 13-th week
14	The Intro to Data Science	2	[1],[2],[3],[4],[5],[6],[7],[8],[9],[10]	Discussion. Examples.	End of the 14-th week
15	Exam week	2	[1],[2],[3],[4],[5],[6],[7],[8],[9],[10]	Discussion. Examples.	End of the 15-th week

9. List of topics/assignments for Student Independent Study

Proper organization of students' independent study is the key to the formation of skills in mastering, learning, assimilation and systematization of acquired knowledge, ensuring a high level of academic performance in the learning process

№	Topic/Assignment title	Number of hours	References	Form of reporting	Deadline
1	2	3	4	5	6
1	Main techniques in deep learning	3	[1],[2],[3], [4],[5],[6],[7],[8],[9]	Discussion	End of the 1-st week
2	Artificial neuron. Classification of neural networks	3	[1],[2],[3], [4],[5],[6],[7],[8]	Discussion	End of the 2-nd week
3	Single-layer perceptron	3	[1],[2],[3], [4],[5],[6],[7],[8]	Discussion	End of the 3-rd week
4	Two-layer perceptron.	3	[1],[2],[3], [4],[5],[6],[7],[8]	Discussion	End of the 4-th week
5	Algorithms of training. Algorithm of training with the teacher.	3	[1],[2],[3], [4],[5],[6],[7],[8]	Discussion Discussion	End of the 5-th week
6	Training without a teacher	3	[1],[2],[3], [4],[5],[6],[7],[8]	Discussion	End of the 6-th week

7	Algorithm of back propagation	3	[1],[2],[3], [4],[5],[6],[7],[8]	Discussion	End of the 7-th week
8	Deep learning	3	[1],[2],[3], [4],[5],[6],[7],[8]	Discussion	End of the 8-th week
9	Deep learning Convolution network	3	[1],[2],[3], [4],[5],[6],[7],[8],[9]	Discussion	End of the 9-th week
10	Stars of Grossberg.	3	[1],[2],[3], [4],[5],[6],[7],[8]	Discussion	End of the 10-th week
11	Networks with feedbacks.	3	[1],[2],[3], [4],[5],[6],[7],[8]	Discussion	End of the 11-st week
12	Maps of Kohonen.	3	[1],[2],[3], [4],[5],[6],[7],[8]	Discussion	End of the 12-th week
13	Training of the Kohonen network.	3	[1],[2],[3], [4],[5],[6],[7],[8], [10]	Discussion	End of the 13-th week
14	Application of Kohonen maps	3	[1],[2],[3], [4],[5],[6],[7],[8], [10]	Discussion	End of the 14-th week
15	Deep learning. Problems.	3	[1],[2],[3], [4],[5],[6],[7],[8]	Discussion	End of the 15-th week

10. System for evaluating student performance in a discipline:

Option 2

Each type of educational work is evaluated on a 100-point scale and is included in the average assessment of the current control, taking into account the weighting coefficient in accordance with the table

Period	Assignments	Maximum score	Weighting coefficient	Total
1 st attestation	Practice	100	0,3	100
	Tests	100	0,3	
	SIS	100	0,1	
	MidTerm	100	0,2	
	Working during practical classes	100	0,1	
2 nd attestation	Practice	100	0,3	100
	Tests	100	0,3	
	SIS	100	0,1	
	EndTerm	100	0,2	
	Working during practical classes	100	0,1	
Exam				100
Total	0,3*1stAtt+0,3*2ndAtt+0,4*Ex			100

*If the number of absences exceeds 20%, student will be automatically scheduled for a Retake (summer semester)

11. Assessment criteria:

Option 2

The point-rating letter system for assessing the educational achievements of students with their interpretation in the traditional grading scale:

Letter Grade	Numerical equivalent	Points (%)	Traditional system assessment	General description of grading criteria
A	4,0	95-100	Excellent	The student has knowledge of the subject in the full scope of the curriculum, understands the discipline deeply enough; shows a high level of knowledge that exceeds the volume provided by the syllabus, gives an exhaustive answer
A-	3,67	90-94		The student has knowledge of the

				subject in the full scope of the curriculum, understands the discipline deeply enough; gives an exhaustive answer
B+	3,33	85-89	Good	The student shows a complete, well-founded knowledge of the subject, but the answers did not always highlight the main idea, rational methods of calculation were not always used; the answers were mostly brief and sometimes unclear.
B	3,0	80-84		
B-	2,67	75-79		
C+	2,33	70-74		
C	2,0	65-69	Satisfactory	The student demonstrates sufficient knowledge of the subject, but without proper depth and justification, the answers are unclear and without proper logical sequence.
C-	1,67	60-64		
D+	1,33	55-59		
D	1,0	50-54		
FX	0,5	25-49	Unsatisfactory	The student demonstrates insufficient knowledge of the subject, positive answers were not given to individual questions.
F	0	0-24		The student demonstrates a very low level of knowledge of the subject.

12. Assessment and evaluation materials (exam questions)

- Environment Setup
- Basic Syntax
- Variable Types
- Basic Operators
- Decision Making
- Loops
- Numbers
- Strings
- Lists
- Tuples
- Dictionary
- Date & Time
- Functions
- Modules
- Files I/O
- Exceptions
- Advanced Tutorial
- Classes/Objects
- Reg Expressions
- CGI Programming
- Database Access
- Networking
- Sending Email
- Multithreading
- XML Processing
- GUI Programming
- Further Extensions