International Information Technology University JSC

Faculty of Information Technology

Department of Computer Engineering and Information Security

Approved
Vice-Rector of Academic and
Educational Affairs of IITU JSC, PhD
_____ Umarov T.F.
«___» _____ 2019

SYLLABUS
(ACADEMIC PROGRAM)

Course (code, title): AiP 1204 Algorithmization and Programming

Major (code, title): B057 Information technology

Educational program (code, title): 6B06108 Data science and Machine Learning, 6B06109 Networking and System Administration, 6B06110 Software Engineering, 6B06107 Applied Cybernetics)

Year: 1; **Semester:** 2; **Number of credits**: 5 ECTS

Lectures: 15 hours

Laboratory classes: 15 hours

Practical classes: 15 hours

T/SIS: 105 hours

Total: 150 hours

Final assessment form: Examination

Almaty 2019

Academic program of the course (code, title) «AaP 1204 Algorithmization and Programming» has been developed on the basis of Standard Academic Program.

Academic program has been reviewed at the meeting of «Computer Engineering and Information Security» department.

Minutes №. 1, dated «27» August 2019

Head of the Department _____ PhD, Assoc. prof. N.T. Duzbayev

Author _____ MSc, Lecturer, O.S. Tokanov

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

Minutes № 1 dated «29» August 2019.

Director of the Department _____ A.Mustafina

Signature

for Academic Affairs

1. GENERAL INFORMATION	
Faculty	Information Technology
Major code and title	B057 Information technology
Educational program code and title	6B06108 Data science and Machine Learing, 6B06109 Networking and System Administration, 6B06110 Software Engineering, 6B06107 Applied cybernetics
Year, semester	1 year, 2 semester
Subject category	Compulsory Elective Profiling
Number of credits (ECTS)	5
Prerequisites	Algorithmization and Programming course is based on knowledge obtained by the student at "Introduction to Programming" course.
Postrequisites	Knowledge obtained during the course will be used for courses of "Operating Systems", "SDP4-Performance, Data Structures and Algorithms", "Information theory", "Organization of information systems and networks", "Instrumental tools for program elaboration".
Lecturer	Tokanov Olzhas, Lecturer, master of technics and technologies, Room 409, E-mail: tokanovolzhas@gmail.com Office hours: Thursday, 10:00-12:00
Instructors	Alpysbay Nursultan, Lecturer, master of technics and technologies, Room 409, E-mail: alpysbainursultan@gmail.com Office hours: Thursday, 10:00-11:00 Bekaulov Nurbek, Lecturer, master of technics and technologies, Room 409, E-mail: nbekaulov@gmail.com Office hours: Tuesday, 11:00-12:00

2. GOALS, OBJECTIVES AND LEARNING OUTCOMES OF THE COURSE

Course goal is the formation of knowledge on the basics of algorithms and using them to develop programms.

The objectives of the course are:

- the concept of algorithm;
- algorithms of sorting and searching;
- the concept of Big O notation;
- the concept of dynamic memory;
- the concept of pointer;
- the basic concept of OOP;
- templates of C++ language.

Learning outcomes of the course

Students successfully completing the course will be able to:

- Compare different algorithms regard to their memory space and compilation time;
- Manage the memory using pointers;
- Elaborate necessary data structures depending on requested task;
- Write programs in OOP style;
- Analyse the effectivity of algorithms.

3. Course description

The purpose of studying the discipline "Algorithmization and programming" is to help develop students with algorithmic thinking, because it teaches to solve a difficult task, in particular, non-technical or non-mathematical origin, to obtain, prepare and analyze the results of their solving, to

draw conclusions about the achievement of the goal and the correctness of the planned actions, use the principles of problem-oriented and object-oriented approaches not only to solve tasks in computer science or other subjects but also in everyday activities. Formation of the knowledge and skills necessary for solving problems using a personal computer and modern software.

4. Course policy

Attendance: should be regular. In this course the student does not obtain points for attendance. In case the student is not able to attend the lessons for some reason, he will be responsible for learning all material, which was learnt during unattended lessons. If the student did not attend more than 20% of the lessons without reasonable excuse, the teacher has a right to mark him as "not graded", and the student will not be admitted to exam.

Class work: Duration of lectures and practical lessons is 50 minutes, duration of laboratory classes 100 minutes. During the lectures, laboratory classes and practical lessons the tutor has a right to expel those students who hinder the classes and misconduct. In case of systemic misconduct, the student dispensed from the classes. Mobile phones should be switched off during the lessons. Home work is obligatory. During work of students with teacher, the latter checks home work and gives the points.

Control work: During control works the teacher provides samples and tasks, which should be in line with the learned material. The duration of the control work depends on the number of samples and tasks, but it should not exceed 50 minutes.

At the end of each section, the teacher conducts control works based on theoretical issues. The teacher has a right to include themes, which were provided to the students for independent learning. The duration of control works is typically 30-50 minutes, and the teacher provides 5-8 questions. The student, which was seen with cheat sheets or misconduct during control work, will be expelled from class without a right to re-take the control work.

Appraisal of the student's knowledge is based on rating system.

Final exam: At the end of the course the students will pass final exam, which is evaluated as 40 points (maximum). Final grade is a sum of rating points and exam points, and can be maximum 100 points.

5. LITERATURE

Basic literature:

1. Introduction to Programming with C++ (3rd Edition), Y. Daniel Liang, 2015
2. C++ Fundamentals, Francesco Zoffoli, 2019
3. C++ Crash Course: A Fast-Paced Introduction, Josh Lospinoso, 2019

Supplementary literature:

4. Thinking In C++. Second Edition by Bruce Eckel, 1995
5. The Art of Computer Programming. 3: Sorting and Searching (2nd ed.), 1998

6. Course schedule

Week/ date	Course topics	References	Lectures (h/w)	Practical sessions (h/w)	Lab. sessions (h/w)	TSIS (h/w)	SIS (h/w)
1	Arrays, Strings	2	1	1	1	1	6
2	Sorting algorithms: Heap, Quick, Merge	5	1	1	1	1	6
3	Searching algorithms: linear and binary	5	1	1	1	1	6

4	Dynamic memory	1	1	1	1	1	6
5	The basics of pointer	1	1	1	1	1	6
6	Arihmetics of pointers	3	1	1	1	1	6
7	Pointers to pointers	3	1	1	1	1	6
8	Introduction to structs	2	1	1	1	1	6
9	Nested structs	2	1	1	1	1	6
10	Introduction to OOP	3	1	1	1	1	6
11	Difficult tasks about structs	3	1	1	1	1	6
12	Templates. Introduction	4	1	1	1	1	6
13	Stacks	4	1	1	1	1	6
14	Vectors	1	1	1	1	1	6
15	Overloading operators	3	1	1	1	1	6
	Total hours:		**15**	**15**	**15**	**15**	**90**

7. List of topics/ assignments for laboratory classes

№	Topic Title	Number of hours	References	Form of reporting	Deadline
1	2	3	4	5	6
1	Choose the best sorting algorithm	3	5	Oral assignment	21.02.2020
2	Manipulate the memory with pointer	4	1, 3	Writing report	06.03.2020
3	Develop structs	4	2, 3	Writing reports	15.03.2020
4	Use the basic types of templates	4	1, 3, 4	Oral assignment	05.04.2020

8. List of topics/ assignments for practical classes

№	Topic Title	Number of hours	References	Form of reporting	Deadline
1	2	3	4	5	6
1	Choose the best searching algorithm	3	5	Oral assignment	21.02.2020
2	Do ariphmetical operations with pointer	4	1, 3	Writing report	06.03.2020
3	Working with nested structs	4	1, 3	Writing reports	15.03.2020
4	Develop high level programs with data structures	4	1, 3, 4	Writing reports	12.04.2020

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	Sort different types of information	20	5	Oral assignment	15.02.2020
2	Solve ACM type tasks with pointers	20	1, 3	Oral assignment	10.03.2020
3	Connect structs with real life situations	25	2, 3	Writing report	20.03.2020
4	Create your own template	25	1, 3, 4	Oral assignment	25.04.2020

10. System for evaluating student performance in a discipline:

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
1st attestation	Oral assignment	100	0,2	**100**
	Writing report by solving tasks	100	0,4	
	Working during practical classes	100	0,1	
	Mid-term	100	0.3	
2nd attestation	Oral assignment	100	0,2	**100**
	Writing report by solving tasks	100	0,4	
	Working during practical classes	100	0,1	
	End-term	100	0.3	
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:

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.