**MINISTRY OF EDUCATION**

**OF AZERBAIJAN REPUBLIC**

**Azerbaijan State Oil and Industry University**

**SYLLABUS**

**Approved:** Doctor of Science in Mathematics, **Prof. A.R. Aliyev**

(Head of department)

**Signature:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Date:** 31.08.2020

**Department**: General and Applied Mathematics

**Faculty**: Information Technologies and Management

**I. Information on the Subject**

**Subject: Fundamentals of programming - 1**

**Academic load (total hours):** lectures **45**

seminar **30**

**Academic year:** 2020-2021

**Semester : 1**

**Specialty 050509 – Computer Science**

**Number of credits: 8**

**II. Information on the Instructor**

**Sevinj R. Karimova , Senior lecturer**

(name, patronymic, surname, academic title, academic degree)

**Consultation days and hours:** every week on Tuesday at 14.00

**E-mail:** kerimovasevinc66@gmail.com

**III. Required Textbooks and Manuals**

**Basic**:

# 1.Computer Architecture, Fifth Edition: A Quantitative Approach (The Morgan Kaufmann

Series in Computer Architecture and Design)  5th Edition by [John](https://www.amazon.com/John-L.-Hennessy/e/B000APA2GC/ref=dp_byline_cont_book_1)  Hennessy (Author),

[David A. Patterson](https://www.amazon.com/s/ref=dp_byline_sr_book_2?ie=UTF8&text=David+A.+Patterson&search-alias=books&field-author=David+A.+Patterson&sort=relevancerank) (Author).

2. The C programming Language. By Brian W. Kernighan and Dennis M. Ritchie.

3. Stephen G. Kochan, Programming in C. A complete introduction to the C

programming language. Third Edition.

4. Herbert Schildt. ANSI C - Made Easy. Publisher: Osborne McGraw-Hill.

ISBN: 0-07-881500-2

5. N. Kantaris .Learning to Program in C. Publisher: Babani. ISBN: 0-85934-203-4.

**Supplementary**:

# Learn C Language. https://www.tutorialspoint.com/cprogramming/index.htm

# <http://www.learncpp.com/>

# 

***Additional materials, articles and book chapters will be provided by instructor.***

**IV. Objective and Description of the Subject**

**Brief description of the course**:

Fundamentals of Computer Science, computer architecture and organization,

information representation, system software, basics of programming are studied in this course.

The purpose of the course is to provide the fundamentals of programming.

**Brief content of the subject:**

**Information representation**

number representation

Students should be able to:

1) show understanding of the basis of different number systems and use the binary,

denary , octal and hexadecimal number system

2) convert number from one number system to another

**Main memory**

Students should able to:

1) show understanding of the need for primary storage

2) explain the differences between RAM and ROM memory

3) explain the differences between Static RAM (SRAM) and Dynamic RAM ( DRAM )

**Processor fundamentals**

Students should able to:

CPU architecture

1) show understanding of the basic Von Neumann model for a computer system and the

stored program concept.

2) show understanding of the roles carried out by registers, including the difference

between general purpose and special purpose registers:

Program Counter, Memory Data Register, Memory Address Register,

Index Register, Current Instruction Register and Status Register.

3) show understanding of the roles carried out by the Arithmetic and Logic Unit (ALU) ,

Control Unit and system clock.

**System software**

Students should be able to:

Operating system

1) describe why a computer system requires an operating system

2) explain the key management tasks carried out by the operation utility programs

3) show an understanding of the need for typical utility software

used by a PC computer system

**Language translators**

Students should be able to:

show an understanding of the need for:

1) assembler software for the translation of an assembly language

program

2) a compiler for the translation of high - level language program

3) an interpreter for execution of a high - level program

4) show understanding of the various stages in the compilation

of a program : lexical analysis, code generation and optimization

**Algorithm design and problem solving**

Students should be able to :

1) show understanding that an algorithm is a solution to a problem

expressed as a sequence of defined steps.

2) show understanding that many algorithms are expressed using the

four basic constructs of assignment, sequence, selection and

repetition.

3) show understanding that simple algorithms consist of input, process,

output at various stages.

**Programming**

Students should be able to:

1) write a program in a high- level language

2) show understanding of the design, coding and testing stages in

the program development cycle

3) show understanding of how to write, translate, test and run high - level language

program.

**Objective of the course**:

1) to develop computational thinking

2) to develop an understanding of the main principles of solving

problems using computers

3) to develop an understanding of the component parts of computer

systems and how they interrelate, including software, data, hardware,

communications and people

This syllabus aims to encourage the development of computational thinking, that is

thinking about what can be computed and how by the use abstraction and

decomposition. It includes consideration of the data required. Learning computational

thinking involves learning to program, by writing computer code, because this is the means

by which computational thinking is expressed.

A student receives a basic knowledge about fundamentals of programming and the ability of

reading with understanding programs saved in an imperative programming language,

symbolic execution of simple programs for verification, and writing and running simple

programs of the size of the order of 100 lines of the code in C language.

**V. List of Lecture Topics**

|  |  |  |  |
| --- | --- | --- | --- |
| Week | Topic and Brief Description | Lecture | Seminar |
| first week | **Topic № 1.**  **Theoretical fundamentals of computer science**.  Information concept and information processes.  Information units.  **Contents:**  The concept of information, its types and properties.  Quantitative characteristics of information.  Measurement of information in technique . | 2 |  |
| first week | **Topic №2.**  **Number systems. Positional number systems.**  **Conversion of numbers from one to another positional number system .**  **Contents:**  Binary, Hexadecimal, Octal, and BCD Numbers.  Octal and Hexadecimal Number Systems.  Converting Decimal Numbers to Binary Numbers.  Conversion from binary to decimal;  from decimal to hexadecimal**;**  from hexadecimal to decimal . | 2 | 2 |
| second week | **Topic №3.**  **Coding information.**  **Representation of symbolic information**  **Encoding standards.**  **Standard ASCII. UNICODE standard.**  **Contents:** Character Representation: ASCII, EBCDIC, and Unicode | 2 | 2 |
| third week | **Topic №4.**  **Encoding of graphic information.**  **Color Models.**  **Contents:**  Models RGB, CMYK, HSV (Hue Saturation Value),   HLS (Hue Lightness Saturation). | 2 |  |
| third week | **Topic № 5.**  **PC hardware. Architecture of a personal computer.**  **Contents:**  Personal Computer Components. Hardware Components. Motherboard ( mainboard, system board,  baseboard,  planar board  or  logic board).  Microprocessor.  Memory devices.  Expansion Slots and Expansion Cards | 2 | 2 |
| fourth week | **Topic № 6.**  **The logical basics of computer.**  **Computer logic.**  **Contents:**  Logic Operations.  Binary logic.  Binary logic technologies. | 2 | 2 |
| fifth week | **Topic № 7.**  **Computer Software.**  **Types of Computer Software.**  **Operating system.**  **Operating System types.**  **Contents:**  System software.  Service software.  Utilities, their main functions.  GUI -  Graphical User Interface.  A multi-user operating system.  Multiprocessing .  Multitasking .  Multithreading . | 2 |  |
| fifth week | **Topic № 8.**  **The stages of solving problems on the computer.**  **The concept of algorithm. Properties of algorithm. Types of algorithms. Methods of description of algorithms.**  **Contents:**  Algorithms and Flowcharts.  Stages of the program development. | 2 | 2 |
| sixth week | **Topic № 9.**  **Fundamentals of programming, programming languages and programming systems. Compilers and Interpreters.**  **Contents:**  The concept of algorithmic language.  The concept of translation. Methods of describing formal languages, metalanguage.  Alphabet, syntax and semantics of algorithmic languages. | 2 | 2 |
| seventh week | **Topic № 10.**  **The C programming language .**  **Basic definitions of C programming language.**  **Contents:**  Variables and Keywords in C.  Data Types in C.  Typecasting in C. | 2 |  |
| seventh week | **Topic № 11.**  **Programming of linear algorithms.**  **Operators in C programming.**  **Contents:**  Arithmetic operators.  C Assignment Operators.  Relational Operators.  Logical Operators.  Bitwise Operators.  Operator Precedence and Associativity in C  **sizeof**  operator in C. | 2 | 2 |
| eighth week | **Topic № 12.**  **C Programming. Input Output (I/O) .**  **Contents:**  The  scanf()  function.  The printf() function. | 2 | 2 |
| ninth week | **Topic № 13.**  **Random numbers.** **The pseudo-random number generator.**  **Contents:**  rand() function  srand() function | 2 |  |
| ninth week | **Topic № 14.**  **Programming of branching algorithms .**  **Logical operators and their application in C programs.**  **Contents:**  The if statement.  The else statement.  if ... else statement.  switch statement in C.  goto statement | 2 | 2 |
| tenth week | **Topic № 15.**  **Programming tasks of branching processes. Crossing lines and solving equations.**  **Contents:**  1.Write a  program  that prompts the user to  enter a point  with x- and  y- coordinates and determines whether  the  point  is inside the shaded area in the figure.  2. The program of finding real and complex roots of a quadratic equation.  3. Solution of the cubic equation. | 2 | 2 |
| eleventh week | **Topic № 16.**  **Loops.**  **Contents:**  while loop  for loop  do ... while loop.  continue  statement.  break  statement. | 2 |  |
| eleventh week | **Topic № 17.**  **Programming of tasks using loops.**  **Contents:**  Write a C program to print all natural numbers from 1 to n using loop.  Write a C program to input a number from user and count number of digits in the given integer using loop.  Write a C program to input a number from user and print it into words using for loop. | 2 | 2 |
| twelfth week | **Topic № 18.**  **Realization of classical algorithms over data of integer types.**  **Contents:**  Armstrong Numbers, Palindromes.  The Euclidean algorithm of searching for GCD, searching for prime numbers ("Eratosthenes sieve").  Write a C program to input a number and check whether the number is perfect number or not. | 2 | 2 |
| thirteenth week | **Topic № 19.**  **C - Arrays.**  **Contents:** Declaring Arrays.Accessing Array Elements | 2 |  |
| thirteenth week | **Topic № 20.**  **Sorting of arrays.**  **Contents:**  **A Bubble sort.** | 2 | 2 |
| fourteenth week | **Topic № 21.**  **Two dimensional (2D) array (matrix)**  **in  C programming.**  **Contents:** Initialization of 2D Array. C Multidimensional Arrays. | 2 | 2 |
| fifteenth week | **Topic № 22.**  **Sequences and series.**  **Recurrent sequences.**  **The Fibonacci problem.**  **Contents:**  The Fibonacci problem. The problem of the Hanoi towers. Similar tasks. | 2 |  |
| fifteenth week | **Topic № 23.**  **Review of modern programming technologies.**  **Contents:**  Technologies, platforms and programming languages.  Choice of technology and programming platform. | 1 | 2 |

**Slides Presentation Themes**

The **deadline** for submission of presentations is

1. History and architecture of personal computers.

2. Microprocessor: basic elements and characteristics.

3. System board (motherboard).

4. Input and output devices.

5. Logical basics of information processing.

6. Logical formulas and logical circuits.

7. Some elements of the theory of algorithms. Turing machine.

8. Logic elements and switching circuits.

9. The change of generations of computers. The Evolution of Computers.

10. PC software. Operating systems for PCs.

11. Fundamentals of graphic technology.

12. Basic concepts of encoding and recording information.

      Principles of information coding.

13. Overview of the Python programming language.

14. Digital coding of numbers and texts.

15. Digital coding of images.

16. Element base of computer technology.

17. Structure of computer system software.

18. Basic hardware configuration of the personal computer.

19. Stages of algorithmic solution of the problem.

20. Stages of development of operating systems. Prospects for the development of

operating systems.

21. Types of application programs.

22. Evolution and classification of programming languages. Basic concepts of

programming languages.

23. Translators and their types.

24. Programming languages defining the future of coding.

25. Most Popular and Influential Programming Languages of 2020.

26. Overview of the Java programming language.

27. Machine Languages, Assembly Languages and High-Level Languages.

28. Overview of the C # programming language.

**VI. Form of the Exam – in writing, orally, in the form of a dialogue or**

**text**

The examination will be conducted in orally

**Remark**:

**Attendance and tardiness**

Attendance is an indispensible element of the educational process. In compliance with

Azerbaijani legislation, instructors are required to monitor attendance and inform the

Registrar and the Dean of the student’s respective School when students miss significant

amounts of class time.

Absence from lectures and laboratory works shall not exceed 20%.

Azerbaijani legislation mandates that students who fail to attend at least 80% of classes will

fail the course.

**VII. Evaluation during the semester and points layout**

**Maximum number of points**: 100points

**A) Maximum number of points earned during the semester**: 50points

A midterm exam and a final exam account for a significant portion of the grade.

The overall assessment of students will be divided as follows:

|  |  |
| --- | --- |
| Presentation | 20 points |
| According to the results of Midterm 1  (passing an exam on materials covering the period of 01.10. 2020---23.10. 2020) | 5 points |
| According to the results of Midterm 2  (passing the exam for materials covering the period of 01.10. 2020**--** 04.12. 2020). | 25 points |
| An appeal for intermediate exams is not carried out. | |

The first intermediate exam will be held one day from **26.10.2020**  **to 30.10.2020**

Second intermediate exam will be held one day from  **07.12.2020 to 11.12.2020**

**B) According to the results of the semester exam:** maximum 50 points

Each examination card has 5 questions; for each question a maximum of 10 points are given

**Remark**: The number of points earned by the student at the examination shall not be less than 17.

**C) Evaluation on the results of the semester (based on the points earned at and before the examination):**

|  |  |  |
| --- | --- | --- |
| 91 – 100 points | Excellent | A |
| 81 – 90 points | Very good | B |
| 71 – 80 points | Good | C |
| 61 – 70 points | Satisfactorily | D |
| 51 – 60 points | Passed | E |
| less than 51 points | unsatisfactorily | F |

**Instructor**: **Signature**: **Karimova Sevinj Rafiq** \_\_\_\_\_\_\_\_

(surname, name, patronymic)

**Date**: 31.08.2020