**Topic 8 Computer Programming**

***Programming paradigms and programming languages.***

The phrase programming paradigm refers to a way of conceptualizing and structuring the tasks a computer performs. Today’s most popular programming paradigms are:

* Event-driven - Focuses on selecting user interface elements and defining event-handling routines that are triggered by various mouse or keyboard activities.
* Procedural - Emphasizes linear steps that provide the computer with instructions on how to solve a problem or carry out a task.
* Object-oriented - Formulate programs as a series of objects and methods that interact to perform a specific task.
* Declarative - Focuses on the use of facts and rules to describe a problem.

Programming languages can be divided into two major categories: low-level languages (machine languages and assembly languages) and high-level languages (based on human languages).

***OOP.***

Object-oriented programming (OOP) is a programming paradigm based on the concept of "objects", which can contain data and code. The data is in the form of fields (often known as attributes or properties), and the code is in the form of procedures (often known as methods).

OOP languages are diverse, but the most popular ones are class-based, meaning that objects are instances of classes, which also determine their types. A class is a template for a group of objects with similar characteristics.

In object-oriented jargon, inheritance refers to passing certain characteristics from one class to other classes. A superclass is any class from which attributes can be inherited. A subclass (or «derived class») is any class that inherits attributes from a superclass. The set of superclasses and subclasses that are related to each other is referred to as a class hierarchy.

A method is a segment of code that defines an action. A method is activated by a message, which is included as a line of program code, sometimes referred to as a «call». Polymorphism, sometimes called «overloading», is the ability to redefine a method in a subclass. It allows programmers to create a single, generic name for a procedure that behaves in unique ways for different classes. Polymorphism provides OO programs with easy extensibility and can help simplify program code.

***Game programming.***

Game programming is the creation of software that runs video games, including the game engine, user interface, physics engine, graphics, sound, and AI. The most commonly used programming languages in game programming include C++, Java, and Python, and game programmers must have a deep understanding of computer science and mathematics, as well as a strong sense of design and a passion for gaming.

***AI (VR, AR, MR, machine learning, deep learning).***

Artificial intelligence is a technology, or rather a branch of modern science that studies ways to train a computer, robotic equipment, analytical system to think intelligently as a person. Example tasks in which this is done include speech recognition, computer vision, translation between (natural) languages, as well as other mappings of inputs.

VR (Virtual reality) - an artificial digital environment where users also hear sounds and see artificial images around them.

AR (Augmented reality) - this technology allows you to see the real world by supplementing it with digital content.

MR (Mixed reality) is a kind of augmented reality, but more interactive because the user interacts with it.

Machine learning is a class of artificial intelligence methods, the characteristic feature of which is learning through the use of solutions to many similar problems.

Deep learning is part of a broader family of machine learning methods based on artificial neural networks with representation learning.

***Robotics.***

Robotic involves the development of technical systems based on various disciplines such as electronics, mechanics, cybernetics, and computer science. Robotics can be applied in different areas such as construction, industry, household, medical, aviation, military, space, and underwater. Building and programming robots are challenging tasks, but specialized programming languages such as ROS, Python, and MATLAB simplify the process. Robotics programming includes different approaches such as behavior-based robotics, control-based robotics, and evolutionary robotics.

A robotic technological complex (abbreviated RTC) is a system consisting of one or more high-tech devices that operates autonomously and performs multiple cycles. In general, there are three main **types** of robotic complexes:

RTC of the first type. They are formed on the basis of an industrial robot and auxiliary devices. In this case, the robot loads and unloads the equipment. RTC of the second type. They consist of several industrial robots, as well as secondary devices. At the same time, industrial robots in this case, in addition to unloading and loading, transport parts between operations.

In the RTC of the third type, industrial robots, in addition to the above functions, are engaged in other work.