BTEC Level 3 Computing

Unit 1 - Principles of Computer Science

Types of programming and mark-up languages

The features, applications, impact and implications of using different programming paradigms to develop code to solve problems.

Types of programming and mark-up languages

What is a programming language?

A programming language is a set of rules and symbols that we use to tell a computer what to do.

It is like a special language that humans can understand (mostly), and that computers can understand perfectly.

We use programming languages to write instructions (code) that the computer then executes to perform tasks, solve problems, or run applications.

Some Types Of Programming Languages

- Procedural.
- Object-orientated.
- Event driven.
- Coding for the web.
- Translation.

Procedural Programming

A programming paradigm based on the concept of procedures (functions/subroutines).

Organizes code into a sequence of steps or actions.

Focuses on *how* to solve a problem.

Early and fundamental paradigm, still relevant today.

Procedural Programming

A statement is a single instruction or action in a program.

Examples:

x = 10; (Assignment)

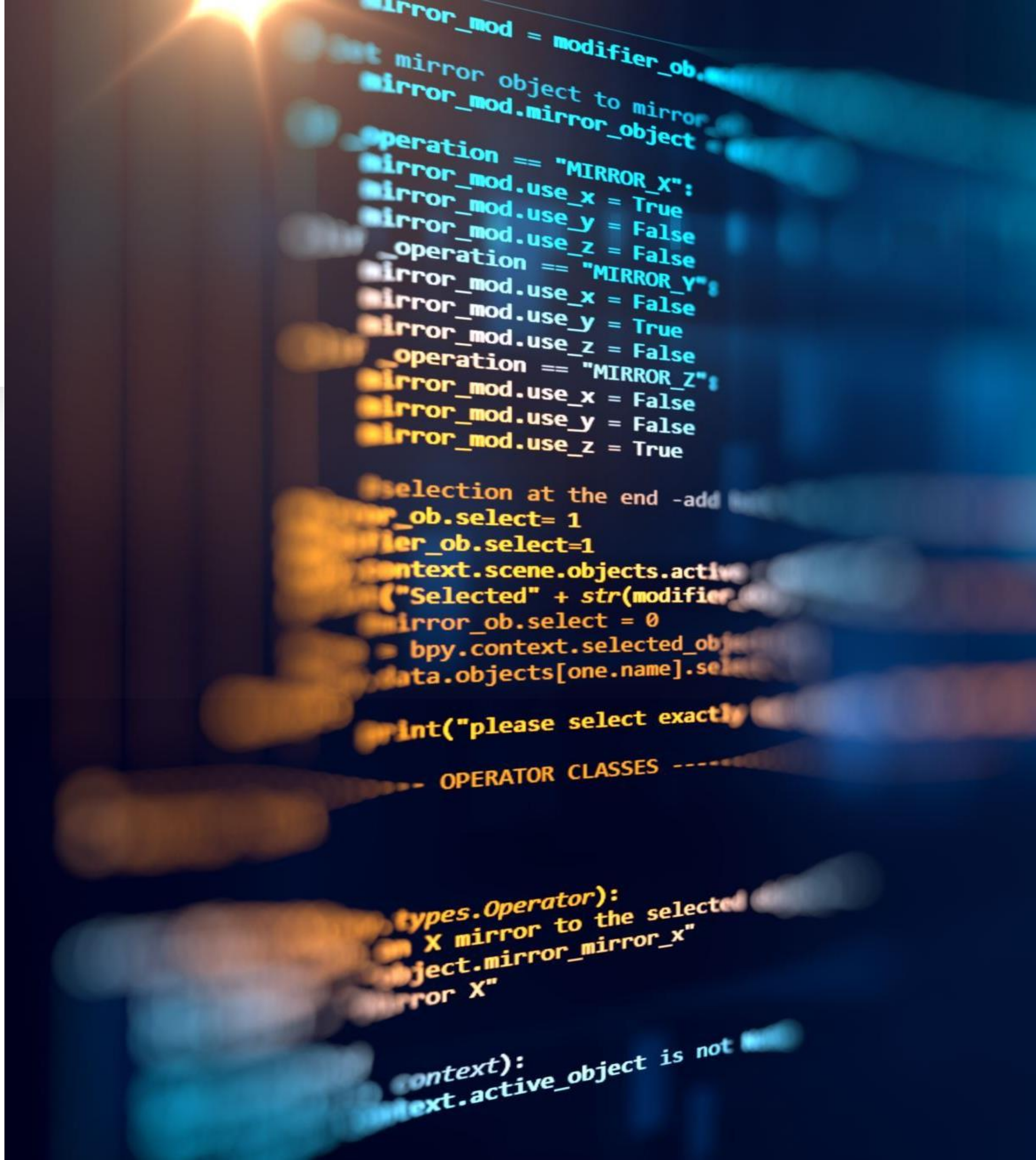
print("Hello"); (Output)

return value; (Return from a function)

Statements are executed sequentially unless control flow is altered.

Procedural Programming Structures

- Procedural programming consists of organized structures:
- Statements: Basic commands executed sequentially.
- Blocks: Groups of statements enclosed (e.g., within `{}` in C).
- Procedures: Reusable code sections that perform tasks.
- Functions/Sub-routines: Similar to procedures but can return values.



Statements in Procedural Programming

- Smallest execution unit in a program.
- Examples: variable declarations, assignments, function calls.
- Typically executed one after another.

Blocks in Procedural Programming

- A group of statements enclosed within `{}` or indentation.
- Python uses indentation.
- Used to define function bodies, loops, or conditionals.
- Helps in organizing and structuring code.

Procedures in Procedural Programming

A reusable set of statements that perform a task.

Helps in modular programming by breaking code into smaller parts.

Does not necessarily return a value.

Functions and Sub-routines

- Similar to procedures but can return values.
- Takes input (parameters) and produces an output.
- Example: `int add(int a, int b) { return a + b; }`

Control Structures in Procedural Programming

- Control the flow of program execution.

- Three main types:
- Sequence
- Conditional
- Iterative

Sequence Control Structure

- Default flow of execution (top to bottom).
- Each statement runs one after the other.
- Example:
- int x = 10;
- x = x + 5;
- print(x);

Conditional Control Structure

- Allow programs to make choices based on conditions.

- Include if/else statements and switch/case structures.
- Example:
- `if age >= 18:`
- `    allow_access()`
- `else:`
- `    show_error_message()`

Control Structures Iterative

- Execute code blocks multiple times.
- Include for loops and while loops.
- Control program flow based on conditions.
- Example:
- `while stock_available:`
- `    process_order()`
- `    update_inventory()`

Procedural Programming Structures

Uses a structured approach with statements, blocks, functions, and procedures.

Control structures guide execution flow: sequence, conditional, iterative.

Helps in writing modular, reusable, and easy-to-debug code.

Advantages of Procedural Programming

- Easy to understand and implement.
- Efficient memory management.
- Code reusability through procedures.
- Clear program flow.
- Suitable for small to medium-sized applications.

Disadvantages of Procedural Programming

- **Complexity:** Hard to manage big projects.
- **Data:** Data is exposed, less protection.
- **Reuse:** Limited code reuse.
- **Design:** Top-down design can be tough.
- **Maintenance:** Changes are risky, many places to update.
- **Events:** Not ideal for event-driven apps.
- **Duplication:** Code might get repeated.

Next Time

Object-Oriented Programming