

CSC101

Introduction to ICT

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Lecture - 9



Program Development and Programming Languages

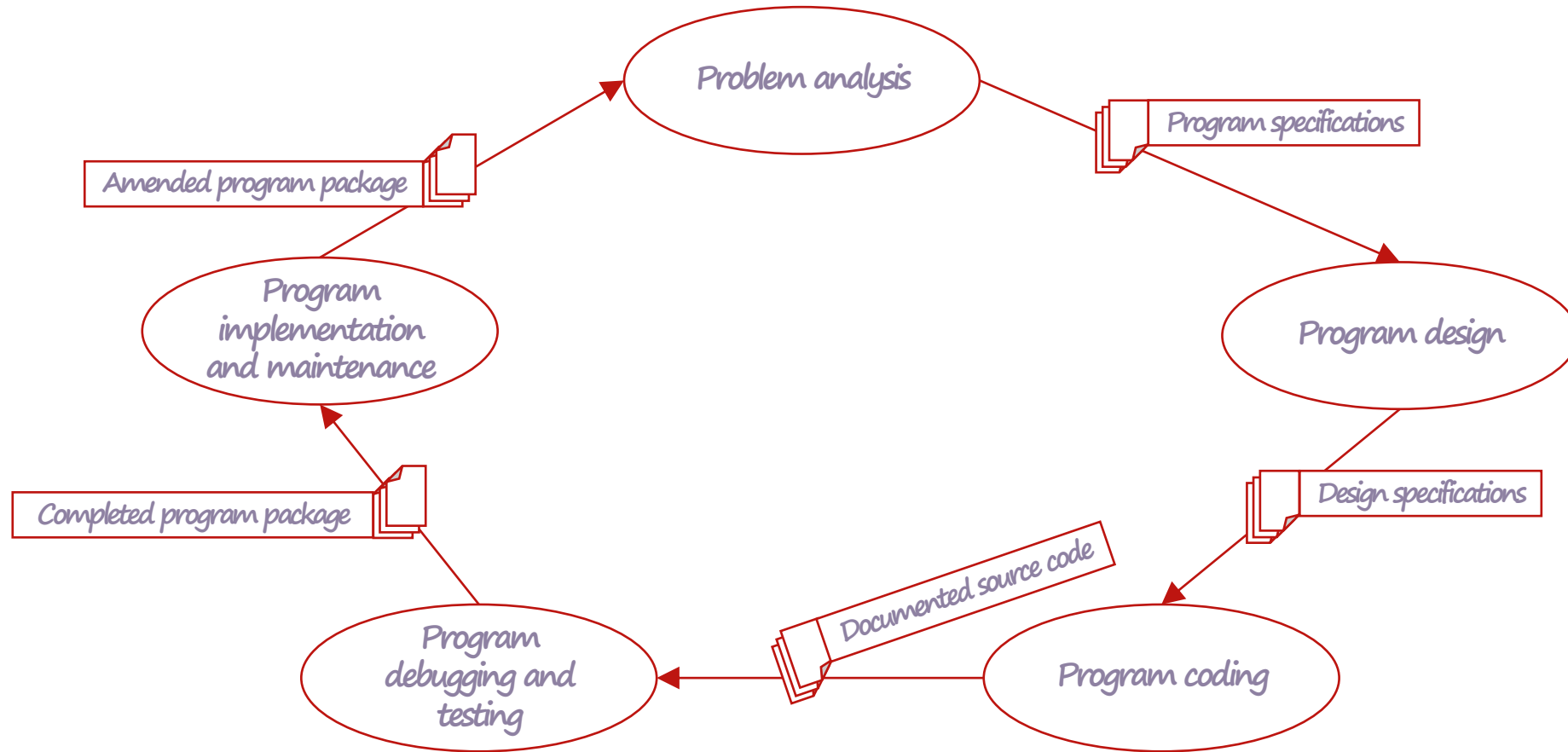


Program Development Life Cycle

- ⚽ The overall process of creating computer programs is called program development
- ⚽ Program development life cycle (PDLC) contains five phases of program development
 - ⚽ Problem analysis
 - ⚽ Program design
 - ⚽ Program coding
 - ⚽ Program debugging and testing
 - ⚽ Program implementation and maintenance



Program Development Life Cycle





Problem Analysis (PDLC)

- ⚽ The problem is considered, and the program specifications are developed
 - ⚽ specifications developed during this phase are reviewed by the systems analyst and the programmer (the person who will code the program)
- ⚽ Goal: To understand the functions the software must perform
- ⚽ Documentation: Includes program specifications (what it does, timetable, programming language to be used, etc.)



Program Design (PDLC)

- ⚽ The program specifications are expanded into a complete design of the new program
 - ⚽ good program design is extremely important
- ⚽ Program design tools
 - ⚽ Structure charts: depict the overall organization of a program
 - ⚽ Pseudocode: uses natural language statements to outline the logic of a program
 - ⚽ Algorithm: an unambiguous specification of how to solve a problem
 - ⚽ Flowcharts: graphically show how a computer program will process data
 - ⚽ Unified Modeling Language (UML) models: set of standard notations for creating business models
 - ⚽ widely used in object-oriented programs, includes class diagrams, use case diagrams, etc.
 - ⚽ Structure theorem: A pattern for controlling the flow of logic in a computer program, module, or method
 - ⚽ Sequence: series of statements that follow one another
 - ⚽ Selection: multiple paths, direction depends on result of test
 - ⚽ Repetition: repeat series of steps



Program Design (PDLC)

- ⚽ *Good program design is essential as it saves a lot of time*
- ⚽ *Good program design principles;*
 - ⚽ *be specific*
 - ⚽ *all things the program must do, needs to be specified*
 - ⚽ *one-entry-point/one-exit-point rule*
 - ⚽ *no infinite loops or other logic errors*
 - ⚽ *design should be tested to ensure logic is correct*
 - ⚽ *desk check, tracing tables*
- ⚽ *Documentation: Includes design specifications*



Program Coding (PDLC)

- ⚽ The program code (source code or the set of instructions) is written using a programming language
- ⚽ When choosing a programming language, consider;
 - ⚽ suitability to the application
 - ⚽ integration with other programs
 - ⚽ standards for the company
 - ⚽ programmer availability
 - ⚽ portability if being run on multiple platforms
 - ⚽ development speed



Program Coding (PDLC)

- ⚽ Coding standards are rules designed to standardize programming
 - ⚽ makes programs more readable and easier to maintain
 - ⚽ includes the proper use of comments to:
 - ⚽ identify the programmer and last modification date
 - ⚽ explain variables used in the program
 - ⚽ identify the main parts of the program
- ⚽ Pretested error-free code segments can be re-used repeatedly with minor modifications
 - ⚽ can greatly reduce development time
- ⚽ Documentation: Includes documented source code



Program Debugging and Testing (PDLC)

- ⚽ The process of ensuring a program is free of errors (bugs) and works as it is supposed to
- ⚽ Before they can be debugged, coded programs need to be translated into executable code
- ⚽ Source code: coded program before it is compiled
- ⚽ Object code: machine language version of a program
- ⚽ Language translator: Program that converts source code to machine language
- ⚽ Types of language translators;
 - ⚽ Compilers: converts an entire program into machine language before executing it
 - ⚽ Interpreters: translates one line of code at one time



Program Debugging and Testing (PDLC)

- ⚽ Debugging: Finds initial errors
- ⚽ Compiler errors: program doesn't run
 - ⚽ typically syntax errors that occurs when the programmer has not followed the rules of the programming language
- ⚽ Run time error: error that occurs when the program is running
- ⚽ Logic errors: program will run but produces incorrect results
- ⚽ Dummy print statements can help locate logic errors and other run time errors



Program Debugging and Testing (PDLC)

- ⚽ Testing: Occurs after the program appears to be correct to find any additional errors
 - ⚽ should use good test data
 - ⚽ tests conditions that will occur when the program is implemented
 - ⚽ should check for coding omissions (product quantity allowed to be < 0 , etc.)
- ⚽ Alpha test (inside organization)
- ⚽ Beta test (outside testers)
- ⚽ Documentation: Completed program package (user's manual, description of software commands, troubleshooting guide to help with difficulties, etc.)



Program Implementation and Maintenance (PDLC)

- ⚽ Program implementation: Once the system containing the program is installed (up and running), the implementation process is complete
- ⚽ Program maintenance: Process of updating software so it continues to be useful
 - ⚽ it is normally very costly
- ⚽ Documentation: Amended program package



Programming Languages

- ⚽ Programming language is a computer language that consists of instructions designed for the computers
- ⚽ Processors only understand machine code (0's and 1's), which is difficult to understand
- ⚽ Thus various programming languages are being used which are more understandable than the machine code and provides greater portability

- ⚽ Categories of programming languages
 - ⚽ Low-level languages: Difficult to code, machine dependent
 - ⚽ example, Assembly language
 - ⚽ High-level languages: Closer to natural languages, machine independent
 - ⚽ example, C, Visual Basic, C#, Python, Java



Programming Languages

- ⚽ Based on the programming paradigm, one can broadly classify programming languages into three categories
 - ⚽ Structured programming
 - ⚽ Procedural programming
 - ⚽ Object-oriented programming
- ⚽ Key Difference between the three programming paradigms
 - ⚽ Structured programming emphasizes on separating a program's data from its functionality
 - ⚽ Procedural programming consists of a set of procedure calls and a set of code for each procedure
 - ⚽ Object oriented programming are based on entities known as objects



Common Programming Languages

⚽ FORTRAN

- ⚽ *High-level programming language used for mathematical, scientific, and engineering applications*
- ⚽ *Used for high-performance computing tasks*

⚽ COBOL

- ⚽ *Designed for business transaction processing, mostly used in financial institutions*
- ⚽ *Makes extensive use of modules and submodules, newer version is COBOLNET*

⚽ Pascal

- ⚽ *Created as a teaching tool to encourage structured programming*
- ⚽ *Contains a variety of control structures used to manipulate modules systematically*

⚽ BASIC

- ⚽ *Easy-to-learn, high-level programming language that was developed to be used by beginning programmers*
- ⚽ *The more recent object-oriented version of BASIC, called Visual Basic or VB, uses a visual environment*



Common Programming Languages



C



A structured programming language designed for system programming



It can be used to develop software like operating systems, databases, compilers, etc.



C++



A cross-platform and object-oriented versions of C language



A powerful general-purpose programming language which is used to develop operating systems, games, etc.



C#



A general-purpose, multi-paradigm programming language



Developed by Microsoft and mostly used to create Web applications



JavaScript



JavaScript or JS, is a high-level, interpreted programming language



Dynamic, weakly typed, prototype-based and supports multi-paradigm



Used to make dynamic webpages interactive and provide online programs, including video games



Common Programming Languages

⚽ PHP

- ⚽ *PHP or Hypertext Preprocessor is a server-side Web scripting language, used for making dynamic Web pages*
- ⚽ *Widely-used, efficient, general purpose and open source programming language*

⚽ Java

- ⚽ *High-level, object-oriented programming language frequently used for Web-based applications*
- ⚽ *Compiles programs into bytecode that can run on any computer having Java Virtual Machine (JVM)*
- ⚽ *Used to write Java applets, scroll text on Web page, games, calculators, etc.*

⚽ Python

- ⚽ *High-level programming language for general-purpose programming*
- ⚽ *Features a dynamic type system and automatic memory management*
- ⚽ *Supports multiple programming paradigms, including object-oriented, imperative, functional, and procedural*
- ⚽ *Has a large and comprehensive standard library*



THANK YOU