Learning Outcomes – Computers Essentials

Series Learning Outcomes

At the end of this series you'll be able to:

- Describe the foundational structure of computers
- Define the different uses and sizes of computers used around the world
- Identify and describe the key computer industry jobs
- Define and describe each layer of the computer, namely:
    - Applications layer
    - Programming language layer
    - Assembly language layer
    - Machine code layer
    - Instruction set architecture layer
    - Microarchitecture layer
    - Gates and registers layer
    - Transistors layer
- And contrast key considerations in the creation and operation of engines; such as abstraction, standardisation, size, speed, cost, maintenance, memory size, security, portability, performance, complexity, integration, power consumption and manufacturability

Video 2 Learning Outcomes – Core Concept

At the end of this video you'll be able to:

- Identify the key layers of computer architecture
- Describe the function of each layer
- And identify key engineering considerations in designing a computer architecture, including abstraction and standardisation

Video 3 Learning Outcomes – Uses and Popularity

At the end of this video you'll be able to:

- Identify the tasks that computers are used for
- Define how to measure computer speed with frequency and operations per second
- Quantify the approximate computing power of different computers
- Quantify the number of computer types currently in use

- And identify key considerations in selection of computers for a particular use, namely: finding the right balance between size and speed; and cost to manufacture and maintain

Video 4 Learning Outcomes – Computer Industry Jobs

At the end of this video you'll be able to:

- Identify the popular occupations in the computer industry
- Define the role of each occupation
- Describe the type of work that each occupation may be involved with
- Define the layers of abstraction and types of computer system that each occupation interacts with
- Quantify the approximate numbers of each occupation in the US job market
- And identify key considerations in the delineation of the computer industry job market; namely abstraction and standardisation

Video 5 Learning Outcomes – Applications Layer

At the end of this video you'll be able to:

- Identify examples of applications
- Define the role of the applications layer
- Describe how the applications layer supports the theory of abstraction
- Describe a calculator example to follow through each layer
- And identify key engineering considerations in the applications layer such as; speed, memory size, familiarity to the user, ability to be run on many computers, and security

Video 6 Learning Outcomes – Programming Language Layer

At the end of this video you'll be able to:

- Identify examples of programming languages
- Define the role of the programming language layer
- Describe different types of programming languages, such as application languages, artificial intelligence languages, database languages, hardware languages, and internet languages
- Describe how a programming language works through the use of variables, logic decisions, data, functions and sub processes
- Describe the process for creating a simple calculator program

- And identify key engineering considerations in the programming language layer such as; speed, memory size, familiarity to the user, and portability

Video 7 Learning Outcomes – Assembly Language Layer

At the end of this video you'll be able to:

- Define the role of the assembly language layer
- Describe how an assembly language works through the use of instructions such as MOV, ADD, SUB, PUSH, POP, JMP and INT
- Describe the underlying processes supporting the creation of a simple calculator program
- And identify key engineering considerations in the assembly language layer such as; abstraction and standardisation

Video 8 Learning Outcomes – Machine Code Layer

At the end of this video you'll be able to:

- Define the role of the machine code layer
- Define hexadecimal and describe its use
- Describe how an assembly language is converted into machine code for the computer to read
- Describe the underlying processes supporting the creation of a simple calculator program in the machine code layer
- And identify a key engineering consideration in the Machine Code layer; abstraction

Video 9 Learning Outcomes – Instruction Set Architecture Layer

At the end of this video you'll be able to:

- Define the role of the instruction set architecture
- Identify popular ISAs in use such as x86 and ARM
- Define the components of an ISA such as rules on registers, memory and instructions
- Describe the importance of ISAs and their limitations
- And identify a key engineering consideration in the Instruction Set Architecture layer such as standardisation

Video 10 Learning Outcomes – Microarchitecture Layer

At the end of this video you'll be able to:

- Define the role of microarchitecture
- Identify popular microarchitectures in use such as Ivy Bridge and Amber Lake
- Define the components of a microarchitecture such as the Control Unit, Arithmetic Logic Unit, Registers and Buses
- Describe the characteristics of microarchitectures such as transistor size, number of transistors and number of cores
- And identify key engineering considerations in the micro architecture layer such as performance, cost, complexity, integration, power consumption and manufacturability

Video 11 Learning Outcomes – Gates and Registers Layer

At the end of this video you'll be able to:

- Identify common logic gates and describe their functions
- Describe how logic gates can be used to create registers and ALU, the logic centre of the processor
- Describe the function of the clock signal
- And identify key engineering considerations in the Gates and Registers layer, such as performance, cost, complexity and manufacturability

Video 12 Learning Outcomes – Transistors Layer

At the end of this video you'll be able to:

- Identify common transistor types and their uses
- Describe how logic gates are built using transistors
- And identify a key engineering consideration in the Gates and Registers layer; manufacturability