Key terms used throughout this chapter

central processing unit (CPU) – responsible for the execution or processing of all the instructions and data in a computer

integrated circuit – usually a chip made from a semi-conductor material which carries out the same tasks as a larger circuit made from individual components

von Neumann architecture – a type of computer architecture which introduced the concept of the stored program in the 1940s

Arithmetic & Logic Unit (ALU) – the component of the CPU that carries out all arithmetic and logical operations

accumulator (ACC) – temporary general-purpose register that stores numerical values at any part of a given operation

memory address register (MAR) – a register that stores the address of the memory location currently being read from or written to

current instruction register (CIR) – a register that stores the current instruction being decoded and executed

memory data register (MDR) – a register that stores data that has just been read from memory or data that is about to be written to memory

program counter (PC) – a register that stores the address where the next instruction to be read can be found

control unit – the component of a computer's CPU that ensures synchronisation of data flow and programs throughout the computer by sending out control signals along the control bus

system clock – produces timing signals on the control bus to ensure synchronisation takes place

clock cycle – clock speeds are measured in terms of GHz; this is the vibrational frequency of the system clock which sends out pulses along the control bus; for example, a 3.5 GHZ clock cycle means 3.5 billion clock cycles a second

immediate access store (IAS) – memory that holds all data and programs needed to be accessed by the control unit

backing store – a secondary storage device (such as HDD or SSD) used to store data permanently even when the computer is powered down

cache – is temporary memory using static RAM to hold frequently used data/instructions by the CPU thereby increasing CPU performance. More generally, cache means any area of storage used to quickly access frequently-used data - other examples include web cache, database cache, DNS cache

register – a temporary component in the CPU which can be general or specific in its use; it holds data or instructions as part of the Fetch–Decode–Execute cycle

address – a label for a memory location used by the CPU to track data

memory location – a numbered place in memory where values can be stored

system buses – a connection between major components in a computer that can carry data, addresses or control signals

address bus – the system bus that carries the addresses throughout the computer system

data bus – the system bus that allows data to be carried from CPU to memory (and vice versa) or to and from input/output devices

control bus – the system bus that carries signals from control unit to all other computer components

unidirectional – can travel in one direction only; used to describe data

bidirectional – can travel in both directions; used to describe data

word – a group of bits used by a computer to represent a single unit; for example, modern computers often use 64-bit word lengths

overclocking – changing the clock speed of a system clock to a value higher than the factory/recommended setting

core – a unit on a CPU made up of an ALU, control unit and registers; a CPU may contain a number of cores

dual core – a CPU containing two cores

quad core – a CPU containing four cores

Fetch–Execute–Decode – a cycle in which instructions and data are fetched from memory, decoded and finally executed

Basic Input/Output System (BIOS) – a suite of programs on firmware that are used to perform the initialisation of a computer system during the boot-up process

opcode – part of a machine code instruction that identifies what action the CPU has to perform

operand – part of a machine code instruction that identifies what data is to be used

instruction set – the complete set of machine code instructions used a particular microprocessor

embedded system – a combination of hardware and software designed to carry out a specific set of functions

barcode – a series of dark and light lines of varying thickness used to represent data; the code has to be scanned using laser or LED light source

key field – the field that uniquely identifies a record in a file

quick response (QR) code – a matrix of dark and light squares which represent data; the pattern can be read and interpreted using a smartphone camera and QR app

frame QR code – a type of QR code that includes a space for advertising

DAC (digital to analogue converter) – device that converts digital data into electric currents that can drive motors, actuators and relays, for example

ADC (analogue to digital converter) – a device that converts analogue data (for example, data read from sensors) into a form understood by a computer

charge couple device (CCD) – a light sensitive cell made up of millions of tiny sensors acting as photodiodes

virtual keyboard – an onscreen keyboard which uses the features of the touch screen to emulate a physical keyboard

touch screen – a screen that allows the user to select or manipulate a screen image using the touch of a finger or stylus; touch screens most frequently use capacitive, infra-red or resistive technology

repetitive strain injury (RSI) – pain felt in the muscles, nerves and tendons caused by a repetitive action (for example, excessive clicking of a mouse button over a period of time)

optical mouse – a pointing device that uses a red LED to track the movement of the device and then relays its coordinates to a computer

pointing device – an input device that allows the user to control the movement of an onscreen cursor or to allow onscreen selection by clicking a button on the device

complementary metal oxide semi-conductor (CMOS) – a chip that generates an electric current (or pulses) when light falls on its surface

digital signal processor (DSP) – a processor that calculates, for example, the coordinates of a pointing device based on the pulses of electricity received

optical character recognition – technology that can convert hard copy text or images into a digital format to be stored in a computer memory

computer sided design (CAD) – software used to create drawings (for example, to send to a 3D printer or to produce blue-prints of a microprocessor design)

computed tomographic (CT) scanner – technology that can create a 3D image of a solid object by slicing up the object into thin layers (tomography)

capacitive touch screen – a type of touch screen that uses the change in the screen's capacitance (the ability to store an electrical charge) when it is touched by a finger or stylus

infra-red touch screen – a type of touch screen that uses infra-red beams and sensors to detect where the screen has been touched

resistive touch screen – a type of touch screen that uses two conductive layers which make contact where the screen has been touched

actuator – an output device that converts electrical energy into mechanical movement

digital micromirror device (DMD) – a chip that uses millions of tiny mirrors on its surface to create a video display

thermal bubble – inkjet printer technology whereby tiny resistors create heat and form an ink bubble which is ejected onto paper in an inkjet printer

piezoelectric crystal – a crystal located in an ink reservoir within an inkjet printer; the crystal vibrates and forces ink out onto paper

direct 3D printing – a 3D printing technique in which the print head moves in the x, y and z directions

binder 3D printing – a 3D printing method that uses a two-stage pass; the first stage uses dry powder and second stage uses a binding agent

cathode – a negative electrode

snode – a positive electrode

organic LED (OLED) – a light-emitting diode that uses the movement of electrons between a cathode and an anode to produce an on-screen image; it generates its own light so no backlighting is required

loudspeaker – an output device that converts electric current into sound

memory – the devices within the computer that are directly accessible by the CPU; there are two types of memory – RAM and ROM; memory is different to hard disk drives, for example, which are known as storage devices

random access memory (RAM) – primary memory that can be written to or read from

read only memory (ROM) – primary memory that cannot be written to (changed) and can only be read

dynamic RAM (DRAM) – a type of RAM chip that needs to be constantly refreshed

static RAM (SRAM) – a type of RAM chip that uses flip flops and doesn't need to be constantly refreshed

volatile – describes memory that loses its contents when the power is turned off

refresh – recharge every few seconds in order to maintain charge; for example with a device such as a capacitor

flip flop – electronic circuit with only two stable conditions

latency – the lag in a system; for example, the time it takes to find a track on a hard disk, which depends on the time it takes for the disk to rotate around to its read-write head

SSD endurance – the total guaranteed number of times data can be written to or read from a solid state drive (SSD) in its usable life cycle

optical storage – a type of storage that uses laser light to read and write data, and includes CDs, DVDs and Blu-ray discs

dual layering – using two recording layers in storage media such as DVDs and some Blu-rays

virtual memory – a memory management system that makes use of secondary storage and software to enable a computer to compensate for the shortage of actual physical RAM memory

disk thrashing (HDD) – a problem in a hard disk drive (HDD) caused by excessive swapping in and out of data causing a high rate of head movements during virtual memory operations

thrash point – the point at which the execution of a program comes to a halt because the system is so busy moving data in and out of memory rather than actually executing the program

data redundancy – the unnecessary storing of the same data on several storage devices at the same time

cloud storage – a method of data storage where data is stored on offsite servers; the physical storage may be on hundreds of servers in many locations

network interface card (NIC) – a hardware component (circuit board or chip) that is required to allow a device to connect to a network, such as the internet

router – a device that enables data packets to be moved between different networks, for example, to join a LAN to a WAN

static IP address – an IP address that doesn't change

MAC address – a unique identifier which acts as a network address for a device; it takes the form NN-NN-NN-DD-DD-DD, where NN is the manufacturer code and DD is the device code

dynamic IP address – a temporary IP address assigned to a device each time it logs onto a network

dynamic host configuration protocol (DHCP) – a server that automatically provides and assigns an IP address