

Unit 58: Microprocessor Systems

Unit code: T/601/1414

QCF level: 4

Credit value: 15

- **Aim**

This unit will develop learners' understanding of microprocessor-based systems and their use in instrumentation, control or communication systems.

- **Unit abstract**

This unit will develop learners' understanding of the practical aspects of device selection and the interfacing of external peripheral devices. Learners will also study the key stages of the development cycle – specify, design, build, program, test and evaluate.

The first learning outcome requires learners to investigate and compare the applications of microprocessor-based systems. Following this, learners will experience and develop software designs and write programs for a microprocessor-based system. The final learning outcome considers the design of programmable interface devices such as UARTs, PPIS, I/O mapped devices and memory-mapped devices. At this point, learners should be able to carry out the design, build, program and test of a programmable interface. This will include the selection and use of devices and the writing and testing of suitable software in assembler or high-level language.

- **Learning outcomes**

On successful completion of this unit a learner will:

- 1 Understand microprocessor-based systems
- 2 Be able to design software, write and test programs for a microprocessor-based system
- 3 Be able to design and build programmable interface devices.

Unit content

1 Understand microprocessor-based systems

Microprocessor device families: comparison of three families based on speed, cost, input/output (I/O) facilities, instruction set, physical size

Applications: control systems eg car engine management, robotics, distributed control systems, coin-operated machines, printers; instrumentation systems eg data acquisition and logging systems, indicator display systems, 'intelligent' panel instruments, test equipment; communication systems eg modems, radio transmitters, radar systems; commercial systems eg electronic funds transfer at point of sale systems (EFTPOS), electronic bank teller machines, hand-held stock loggers, personal computers

2 Be able to design software, write and test programs for a microprocessor-based system

Design software to a given specification: algorithms in the form of a structure chart showing actions and conditions or in pseudo code (structured English)

Write programs: for applications requiring interfacing to external devices eg lights, switches, motors, heaters, keypads, liquid crystal displays (LCD) and light emitting diode (LED) displays, printers, analogue to digital (ADCs) and digital to analogue (DACs) converters; use of assemblers and high-level language compilers eg C, Visual BASIC, Java

Test software compliance with specification: suitable test data (inputs and expected outputs) should be prepared prior to running programs and results of the tests should be documented; use of software debugging tools eg Integrated Development Environment (IDE), In-Circuit Emulation (ICE), simulators

3 Be able to design and build programmable interface devices

Programmable interface devices: evaluation of serial and parallel interfaces eg UARTs, PPIs, I/O mapped devices, memory-mapped devices; and control signals eg interrupts; polling; handshaking; port current rating

Design, build, programme and test: a programmable interface; select and use devices; write and test suitable software in assembler or high-level language

Learning outcomes and assessment criteria

Learning outcomes On successful completion of this unit a learner will:	Assessment criteria for pass The learner can:
LO1 Understand microprocessor-based systems	1.1 compare types of microprocessor device families 1.2 evaluate three typical applications of microprocessor-based systems
LO2 Be able to design software, write and test programs for a microprocessor-based system	2.1 design software to a given specification using a structured design technique 2.2 write programs to implement designs using an appropriate computer language 2.3 test software to ensure it meets the given specification
LO3 Be able to design and build programmable interface devices	3.1 evaluate and choose programmable interface devices for a particular situation 3.2 design, build, program and test an interface for an external device to a microprocessor-based system.

Guidance

Links

This unit may be linked with *Unit 66: Electrical, Electronic and Digital Principles*.

Essential requirements

Learners will need access to a microprocessor-based development system. Centres will also need to provide software development systems (personal computers/workstations/terminals capable of running program development software), a software-editor and assembler/compiler debugging tools for the target processor.

The software development system and the target microprocessor-based system may be the same (for example a personal computer).

Employer engagement and vocational contexts

The delivery of this unit will benefit from centres establishing strong links with employers willing to contribute to the delivery of teaching, work-based placements and/or detailed case study materials.