

Module Title:	Computer Hardware 2
Language of Instruction:	English
Credits:	5
NFQ Level:	6
Module Delivered In	7 programme(s)
Teaching & Learning Strategies:	Combination of lecture and laboratory sessions. Lectures will provide traditional theory. Laboratory sessions will employ formative practical/assessment sheets.
Module Aim:	To familiarize the student with computer hardware, assembly language and programmable logic controllers.
Learning Outcomes	
<i>On successful completion of this module the learner should be able to:</i>	
LO1	Understand the basic operations and structure of a computer system, and its components.
LO2	Have a simple understanding of assembly language code, and be able to develop simple programs
LO3	Understand the basic operation and structure of a programmable microcontroller. and demonstrate practical skills in developing simple circuits and programs for them.
Pre-requisite learning	
Module Recommendations <i>This is prior learning (or a practical skill) that is recommended before enrolment in this module.</i>	
No recommendations listed	
Incompatible Modules <i>These are modules which have learning outcomes that are too similar to the learning outcomes of this module.</i>	
No incompatible modules listed	
Co-requisite Modules	
No Co-requisite modules listed	
Requirements <i>This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.</i>	
No requirements listed	

Module Content & Assessment

Indicative Content

Introduction and Fundamentals

Basic architecture of a generalised computer system - Input devices, output devices, secondary storage devices, CPU, ALU, bus systems, data, address and control bus, transfers between components (involving, and not involving main memory); consequences of changing data and address bus widths; Multiple buses on most systems.

CPU

Control unit, ALU, registers, instruction execution cycle.

Primary Memory

RAM and ROM characteristics; Structure and operation.

BIOS

POST; BIOS routines; ROM bootstrap loader.

The Bootstrap Process

RAM and ROM considerations; Bootstrap process; Future considerations?

Programmable Microcontrollers

Safety in the microcontroller laboratory; What is a microcontroller? - examples; ARDUINO (or equivalent); Sensors, Actuators, Transducers; Host computer; Stand alone operation; Shields;

IDE

Microcontroller IDE; Installation; Configuration; Editor; Compiler; Uploading; Debugging; Microcontroller memory types and capacities;

Programming

Programming language and environment; Sketches; Program structure; Common library functions; Serial Monitor; Program efficiency; Random numbers;

Circuit basics

Electricity basics; Voltage, Current and Power; Resistors (including colour coding); Ohm's law; Diodes; LEDs; Capacitors; Serial Connections and Parallel connections; Breadboard prototyping; Momentary action switches; Toggle switches; Switch debouncing; Pull down (and pull up) resistors;

More advanced techniques

Pulse Width Modulation; Duty Cycles; Analogue and Digital I/O; Tone generation

More advanced components and issues

Multicolour LEDs; Colour changing LEDs; RGB encoding; Temperature sensors; Data Sheets; Calibration; Potentiometers; Servo Motors, Decoupling Capacitors; Piezo electric speakers (active and passive); Sound; Light sensitive resistors; DC motors; MOSFETs; Diode protection; Secondary power sources; LCD display panels and support libraries; Character generation; Tilt switches; Seven segment display modules; SN74HC595 shift registers;

Assembly Language

Assembly instructions; Multiple source code files; Inputting and outputting numbers; Subroutines; Linker usage; Operating system function calls (software interrupts); passing and returning parameters;

Assessment Breakdown

	%
Continuous Assessment	25.00%
Practical	50.00%
End of Module Formal Examination	25.00%

Continuous Assessment

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Examination	Theory examination	1,2,3	25.00	Week 8

No Project

Practical

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Practical/Skills Evaluation	Laboratory work	2,3	50.00	Every Week

End of Module Formal Examination

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Formal Exam	Theory examination	1,2,3	25.00	End-of-Semester

Module Workload

Workload: Full Time		
<i>Workload Type</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	Every Week	1.00
Laboratory	Every Week	2.00
Estimated Learner Hours	Every Week	3.00
Total Hours		6.00

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_KCCYB_B	Bachelor of Science (Honours) in Cyber Crime and IT Security	2	Mandatory
CW_KCCIT_B	Bachelor of Science (Honours) in Information Technology Management	2	Mandatory
CW_KCSOF_B	Bachelor of Science (Honours) in Software Development	2	Mandatory
CW_KCCYB_D	Bachelor of Science in Cybercrime and IT Security	2	Mandatory
CW_KCCSY_D	Bachelor of Science in Information Technology Management	2	Mandatory
CW_KCSOF_D	Bachelor of Science in Software Development	2	Mandatory
CW_KCCOM_C	Higher Certificate in Science in Computing Programming	2	Mandatory