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| 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 |