**ELE4112 MICROPROCESSOR BASED SYSTEMS**

| Hours per Semester | | | | Weighted Total Mark | Weighted Exam Mark | Weighted Continuous Assessment Mark | Credit Units |
|---|---|---|---|---|---|---|---|
| LH | PH | TH | CH | WTM | WEM | WCM | CU |
| 45 | 30 | 00 | 60 | 100 | 60 | 40 | 4 |

**Rationale**

This course introduces microprocessor architecture and discusses the design of systems based on micrporocessors and microcontrollers.

**Course Objectives**

- To provide students with an understanding of microprocessor-based systems and their use in instrumentation, control and communication systems
- To Investigate microprocessor-based systems, produce software for a microprocessor-based system, interface microprocessor-based systems and understand usage of programmable logic controllers

**Detailed Course Content:**

**Microprocessor-based systems:** **[16 Hours]**

Historical and technological background, Types of microprocessor: speed of processing and data transfer, cost, i/o facilities, physical size; types drawn from 8,16,32 bit systems, single chip/microcontroller and multi-chip systems, dedicated/embedded and PC/workstation systems, CISC and RISC processors, Intel and Motorola types. Applications: control systems (e.g. car engine management, robotics, distributed control systems, printers); instrumentation systems (e.g. data acquisition and logging systems, indicator display systems, 'intelligent' panel instruments); communication systems (e.g. facsimile machines, modems, radio transmitters, radar systems); commercial systems (e.g. eftpos systems, electronic bank teller machines, hand-held stock loggers, PCs)

**Software for a microprocessor-based systems** (micro programming): **[18 Hours]**

Design software: algorithms in the form of a structure chart showing actions and conditions or in pseudo code (structured English), in sufficient detail to allow coding to proceed. Specification: the specifications should be sufficiently demanding to require modularization and the passing of data between modules. Specifications should focus on the use of microprocessor-based system in applications requiring interfacing to devices such as lights, switches, motors, heaters, dumb terminals, keypads, LCD and LED displays, printers, ADCs and DACs and other computer systems.

**Interfacing:** **[11 Hours]**

Interfacing techniques; Timing and synchronization interfaces; IC peripheral chips; Programmable parallel interface: devices in this category include M68230 PIT, 8255 PPI, 6522 VIA and Z80PI0. Interrupts should also be considered. Programmable serial interface: devices in this category include M68681 DUART, 8250 UART, M6850 ACIA. Serial interface standards (RS-232 and RS-422/RS-423); Memories and interface circuits; Direct Memory Access; Sliced processors. Instructions and addressing modes.; Operating Systems Compilers, and programming considerations.

**Learning Outcomes**

Having successfully completed the module, you will be able to:

- demonstrate knowledge and understanding of digital techniques and hardware design principles necessary to underpin your education in your chosen engineering discipline and apply them to the design of modern electronic systems.
- analyse and design logic circuits using programmable logic and will develop a basic understanding of hardware descriptions in software.
- design, understand and implement combinational and sequential logic designs using programmable logic devices,
- develop hardware descriptions in SystemVerilog and use them in digital design applications.

- combine theory and experience in developing new concepts and creatively apply them in new designs.

**Method of Teaching /Delivery**
The course will be taught by using lectures, tutorials and assignments.

**Mode of Assessment**
Assignments, tests and final examination. Their relative contributions to the final grade are :

| Requirement | Percentage contribution |
|---|---|
| Course work (Assignments, tests) | 40% |
| Final examination | 60% |
| Total | 100% |

**Recommended and Reference Books**


- T J Kazmierski, Digital Techniques and Microprocessors - Lecture Notes , 2009.
- M M Mano, M D Ciletti, Digital Design, 4th Edition,P earson Prentice Hall, 2007.
- J F Wakerly, Digital Design - Principles and Practices, 4th Edition, Pearson Prentice Hall, 2006.
- R J Tocci, N S Widmer, G L Moss, Digital Systems - Principles and Applications, 10th Edition, Pearson Prentica Hall, 2007.


**Possible Lecturers:**
Dr. J. Butime
Mr. D. Nsubuga Mubiru
Mr. P. Bogere
Mr. G. Bakkabulindi
Dr. Ing. L. L. Kaluuba