Outcomes Based Learning Matrix

Course: ENGT 204 Microprocessors and Digital Systems

Department: Engineering

Course Outcomes	Outcome Activities	Assessment Tools
Students will be able to:		
Design synchronous and asynchronous digital counters. (WC, QL, IL, CCT, Int L)	Students will learn about Ring, Johnson, and ripple counters and demonstrate how these devices are used in various applications such as stepper motor control, clocks, etc. Students will learn state machine design techniques to develop counters of arbitrary order, length, and direction. .	Students comprehension of these topics will be assessed in homework and exams. They will also be assessed by their ability to developing and evaluate these circuits through circuit construction and analysis or simulation.
Illustrate an understanding shift registers and their applications. (WC, QL, IL, CCT, Int L)	Students will study and construct flip/flop-based shift registers to understand their functionality.	Students comprehension of these topics will be assessed in homework and exams. They will also be assessed by their ability to developing and evaluate these circuits through circuit construction and analysis or simulation.
Explain the different types of computer system memory and their typical applications. (WC, QL, IL, CCT, Int L)	Students will be taught memory types, uses, decoding methods and timing properties (input setup and hold times, minimum clock period, output propagation delays). They will also learn about error correcting codes and techniques.	Students comprehension of these topics will be assessed in homework and exams.
Use programable logic to implemented digital functionality on an integrated circuit to minimize hardware, and improve circuit performance and efficiency. (WC, QL, IL, CCT, Int L)	Student will learn about different types of programmable logic technologies used to create complex digital functions. PALs, GALs, FPGAs, and FPGA based microcontrollers NIOS Software based FPGA microprocessors.	Students comprehension of these topics will be assessed in homework and exams. They will also be assessed by their ability to create and implement digital circuits on an FPGA.

Demonstrate a basic understanding of how to interface digital circuits with analog components. (WC, QL, IL, CCT, Int L)	Students will learn about ADC, DAC, sensors, etc. along with various interface busses (Parallel, IC^2, SPI, QSPI).	Students comprehension of these topics will be assessed in homework and exams.
Program PIC microcontrollers for specific functions. (WC, QL, IL, CCT, Int L)	Students will learn about low level (assembly) and high-level C programing to control various microcontroller systems.	Students comprehension of these topics will be assessed in lab assignments.
Understand the fundamental circuit blocks and operation of Microprocessors and Microcontrollers. (WC, QL, IL, CCT, Int L)	Learn the differences between Harvard and Von Neuman Architectures; CISC vs RISC processors. Discuss 8051, PIC, and Intel controllers.	Students comprehension of these topics will be assessed in homework and exams. Students will also develop and program a simple ALU in HDL code as a laboratory assignment.