**ELE3104 Applied Digital Electronics**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| Period per  Week | | | Contact Hour 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 is designed to introduce the fundamental concepts of digital electronics,

with laboratories aimed at giving students the practical experience in design and measurement pertinent to digital circuits.

**Objectives**

 To advance the theory of digital electronics to areas of application

 To expose students to the state-of-the-art technologies in digital electronics

 To articulate the advantages and limitation of digital electronics technologies with view of stimulating research interests

**Subject Content**

 Unsigned Number Systems (Decimal, Binary, Octal, Hex and Base Conversion)

 Codes (BCD, Gray, ASCII and Parity)

 Basic Digital Logic Gates (AND / OR) and Truth Tables

 Boolean Algebra (Postulate and Theorems, Equation Reductions and Circuit

Implementations)

 DeMorgan’s Theorems (NAND and NOR Gates and Implementation)

 Sum of Product Circuits

 Karnaugh Maps and Circuit Simplifications

 Multiplexers, Demultiplexers, Decoders and other Medium Scale Integration

(MSI) Circuits

 Basic SR Flip-Flops (NAND & NOR Implementations and Limitations)

 D Latch, Clocked and Edge Triggered D Flip-Flops

 Edge Triggered JK Flip-Flop

 One Shot Multivibrators and 555 Type Timers

 Ripple Counter

 Sequential Logic (Synchronous Counters, Shift Registers, and Basic State

Machine Concepts)

 Memory Systems (RAM, ROM, PROM, EPROM etc)

 Programmable Logic (an extension of the PROM - PAL, PLA, and other PLD

devices. FPGAs)

**Learning Outcomes**

On completion of this course the student will be able to:

 Represent numerical values in various number systems and perform number conversions between different number systems.

 Demonstrate the knowledge of: operation of logic gates (AND, OR, NAND, NOR, XOR, XNOR) using IEEE/ANSI standard symbols; Boolean algebra

including algebraic manipulation/simplification, and application of DeMorgan’s theorems; Karnaugh map reduction method.

 Demonstrate the knowledge of operation of basic types of flip-flops, registers, counters, decoders, encoders, multiplexers, and de-multiplexers.

 Analyze and design digital combinational circuits including arithmetic circuits

(half adder, full adder, multiplier).

 Analyze sequential digital circuits.

 Demonstrate knowledge of the nomenclature and technology in the area of memory devices: ROM, RAM, PROM, PLD, FPGAs, etc

**Recommended and Reference Books**

*[1]* Agarwal, Anant and Jeffrey H. Lang, *Foundations of Analog and Digital*

*Electronic Circuits,* Morgan Kaufmann Publishers, Elsevier, July 2005.

*[2]* Ronald J. Tocci and Neal S. Widmer, *Digital Systems: Principles and*

*Applications*, Prentice Hall, India, 2004

*[4]* Douglas A. Pucknell, *Fundamentals of Digital Logic Design with VLSI Circuit*

*Applications*, Prentice-Hall, 1990

*[5]* Ronald J. Tocci, *Digital Systems: Principles & Applications,* 6th ed., Prentice

Hall, 1995.