Course Name : Digital Electronics
Course Code : BEE1213
Pre Requisite : -
Course Type : Core Faculty
Program Offered : BEE
: BEP
: BEC

Credit Hour : 3
Lecture Hours : 3
Tutorial Hours : -
Lab Hours : 2

Synopsis

This course emphasizes on the fundamental of digital electronics. The student is first taught about the number system and logic gates before introducing them to digital IC technology. Then they are exposed to both combinational logic network and combinational MSI logic. In concurrence with this, the fundamental of sequential logic, flip-flop, counter and shift register will be taught. Finally, the memory devices are introduced.

Course Outcomes

At the end of this course student should be able to:

CO 01: Apply various techniques for digital logic fundamental and simplification (C3)
CO 02: Analyze sequential logic system in designing counter, shift register and MSI logic circuit. (C4)
CO 03: Explain the architecture and operations of memory devices. (C2)
CO 04: Construct logic circuit and counter. (P)
CO 05: Conduct independent readings and research in designing digital electronic problems using engineering software. (A3, LLL2)

CO/PO Mapping

	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12
CO 01	X											
CO 02		X										
CO 03	X											
CO 04					X							
CO 05											X	

Key Indices:

X: assessed outcomes

Syllabus

1.0 Introduction to Digital Electronics (2 Hours)

1.1 Digital Electronics System.
1.2 Differences of Analog and Digital System
1.3 Advantages and Disadvantages of Both Systems.

(BT level 2: Understanding)

2.0 Number Systems and Codes (6 Hours)

2.1 Decimal, Binary, Octal and Hexadecimal Number Systems.
2.2 Conversion between Number Systems.
2.3 Numbering Code.
2.4 Alphanumeric Code.
2.5 Signed Number.
  2.5.1 Signed and magnitude
  2.5.2 1^{st} & 2^{nd} compliment
  2.5.3 Addition and subtraction

(BT level 3: Applying)

3.0 Logic Gates and Boolean Algebra (6 Hours)

3.1 Basic Gates and Operation.
3.2 Truth Table.
3.3 Boolean Constant, Variables and Theorems.
3.4 Implementing Circuit from Boolean Expression.
3.5 DeMorgan's Theorems.
3.6 Universality of NAND Gates and NOR Gates
3.7 Alternative Logic-Gate Representations.
3.8 Basic Concept IC Logic
  3.8.1 Fan in, fan out
  3.8.2 Delay
  3.8.3 Skew
  3.8.4 Noise margin
  3.8.5 Rising, falling time

(BT level 3: Applying)

4.0 Combinational Logic Circuit (5 Hours)

4.1 Canonical Form (POS, SOP).
4.2 Simplifying Logics Circuits Using Algebraic Simplification and Karnaugh Map Method.
4.3 Exclusive-OR and Exclusive-NOR Circuits.
4.4 Parity Generator and Checker.

(BT level 3: Applying)

5.0 Flip-Flops (6 Hours)

5.1 NAND Gate Latch.
5.2 NOR Gate Latch.
5.3 Clock Signals and Clocked Flip-Flops.
5.4 Clocked S-R, J-K and D Flip-Flop.
5.5 D Latch (Transparent Latch).

(BT level 2: Understanding)

6.0 Counters & Registers (6 Hours)

6.1 Asynchronous and Synchronous Counters.

6.2 Decoding a Counter.
6.3 Decoding Glitches.
6.4 Cascading BCD Counters.
6.5 Synchronous Counter Design.
6.6 Counter Application
6.7 Shift Registers

(BT level 4: Analyzing)

7.0 MSI Logic (7 Hours)

8.1 Encoder and Decoder.
8.2 Multiplexer and Demultiplexer.
8.3 Magnitude Comparator.
8.4 Adders

(BT level 4: Analysis)

8.0 Memory Devices and Its operation (4 Hours)

9.1 Memory Terminology
9.2 Memory Operations
9.3 ROM (types & architecture)
9.4 RAM (types & architecture)
9.5 Introduction to Flash Memory

(BT level 2: Understanding)

References

1. R.J. Tocci, "Digital Systems: Principles and Applications", 10th Ed., USA: Prentice-Hall, 2006
2. W. Kleitz, "Digital Electronics: A Practical Approach", 8th Ed., USA: Prentice-Hall, 2007
3. T. Floyd, "Digital Fundamental", 10th Ed., USA: Prentice-Hall, 2008
4. Begnell and Donovan, "Digital Electronics", 5th Ed., USA: Delmar Thomson Learning, 2006

Assessment

Quizzes	10%
Lab	10%
Assignment	10%
Test	30%
Final Examination	40%
Total	**100%**

Assessment Methods

1: Assessment on Knowledge Domain (shorter duration)
- Final Examination, Test, Quiz

2: Assessment on Knowledge Domain (longer duration)
- Assignment, Project

3: Assessment on Skills and Affective Domains
- Presentation, Laboratory Assessment, Demonstration, Self/Peer/Group Evaluation.

4: Assessment on Report as Final Product
- Thesis/Dissertation/Industrial Training Report

Teaching Approach	[Lecture and Discussion, Group Project, Active Learning, Cooperative Learning, Presentation]
Course Homepage	http://notes.ump.edu.my/fkee/BEE1213/