Ahsanullah University of Science and Technology
Department of Computer Science and Engineering (CSE)

Course Outline

Course No	:	CSE 2209
Course Title	:	Digital Electronics and Pulse Techniques
Credit Hour	:	3.0
Semester (Session)	:	Fall 2019
Student Year & Student Semester	:	2nd Year, 2nd Semester
Course Teacher(s)	:	Shoeb Mohammad Shahriar Assistant Professor

Course Objective/Course Outcome (CO):

CO_1:	To understand various kinds of logic families constituting various electrical devices (e.g.- diodes, transistors etc.).
CO_2:	To create the appropriate truth table from a description of a combinational logic function
CO_3:	To learn how signals are used to represent digital values in different logic families, including characterization of the noise margins.
CO_4:	To design different complex logic gates using MOSFETs.
CO_5:	To create a gate-level implementation of a combinational logic function described by a truth table using AND/OR/Inverter gates, MUXes or ROMs.
CO_6:	To design and implement sequential circuits.
CO_7:	To gather basic ideas of different pulse techniques for RC circuits.
CO_8:	To discuss how to interface digital circuits with analog components (ADC, DAC etc.)
CO_9:	To gain knowledge regarding different Multivibrators.

Text/ Reference books:

- Microelectronics: Digital and Analog Circuits and Systems, International Student Edition by Jacob Millman. McGraw-Hill International Book Company, 1979.
- Millman's Pulse, Digital and Switching Waveforms, 2nd Edition by Jacob Millman and Herbert Taub.
- Digital Integrated Electronics, McGraw-Hill International by Herbert Taub and Donald Schilling.

Lecture Plan:

Week	Topics/Contents	Course Outcome
01	➢ Concepts of diodes, Positive logic and Negative Logic, Diodes Logic Gate with some examples. ➢ Positive Logic OR Gate, Negative Logic OR Gate.	CO_1 CO_1, CO_2

	➢ Negative Logic AND Gate, Positive Logic AND Gate, Basic ideas of Transistor, Different region of operations.	CO_1, CO_2
02	➢ Positive and Negative logic Inverter using a p-n-p transistor. ➢ NAND and NOR Diode Transistor Logic (DTL) gates, definition of Noise Margin, Fan-in and Fan-out. ➢ Modified (Integrated Circuit) DTL gates with the calculation of Noise Margin, Fan-out and Fan-in.	CO_1, CO_2 CO_1, CO_3 CO_1, CO_3
03	➢ High-Threshold-Logic (HTL) gate with familiar examples. ➢ Transistor-Transistor Logic (TTL) gate with suitable examples, different types of Output Stages. ➢ Class Test – 01.	CO_1, CO_2 CO_1, CO_2
04	➢ Resistor-Transistor Logic (RTL) with its Noise Margin, Fan-in and Fan-out. ➢ Direct-Coupled Transistor Logic (DCTL) with examples. ➢ Comparison of different Logic Families.	CO_1, CO_3 CO_1, CO_2 CO_1
05	➢ Basic Structure of MOSFET and different modes of operations. ➢ NMOS Inverter, MOSFET NAND Gate. ➢ CMOS Logic Gates with different examples.	CO_4 CO_4 CO_4
06	➢ Constructing CMOS and NMOS Gate for different Boolean Functions. ➢ CMOS Transmission Gate with familiar examples. ➢ Transmission Gate based on MUX and ROM.	CO_4 CO_4 CO_5
07	➢ Class Test – 02. ➢ Dynamic MOS Shift Registers with working principle. ➢ Ratio-less Shift-Register Stages, Basic RAM organization.	 CO_6 CO_6
08	➢ Clipper circuit with different examples.	CO_1
09	➢ High-Pass RC Circuit with Step Voltage input. ➢ High-Pass RC Circuit with Pulse input. ➢ High-Pass RC Circuit with Square Wave input, Percentage Tilt and related Math.	CO_7 CO_7 CO_7
10	➢ Class Test – 03. ➢ High-Pass RC Circuit as a Differentiator, Amplification of High-Pass circuit. ➢ High-Pass RC Circuit with Ramp input and Transmission Error, related Math.	 CO_7 CO_7

11	➢ Low-Pass RC Circuit with Step Voltage input, Pulse input, related Math. ➢ Low-Pass RC Circuit as an Integrator, Ramp input and Transmission Error. ➢ Low-Pass RC Circuit with Square Wave input, related Math.	CO_7 CO_7 CO_7
12	➢ Low-Pass RC Circuit with Exponential Input, related Math. ➢ Low-Pass RC Circuit with Sinusoidal Input, related Math. ➢ Class Test – 04.	CO_7 CO_7
13	➢ Different types of Multivibrators. ➢ Analog to Digital Conversion. ➢ Analog to Digital Conversion.	CO_9 CO_8 CO_8
14	➢ Digital to Analog Conversion. ➢ Review Class. ➢ Review Class.	CO_8

Note: *This Lecture Plan is subject to change. Course teacher will slow down or speed up each chapter to meet the needs of students*.

Marks Distribution:

Attendance and Class Performance	10
Class Test	20
Final Exam	70
Total	**100**

FOUR class tests will be taken (as it is a 3 credit course) and best THREE will be considered for "Class Test" marks.