ECE318:CMOS VLSI DESIGN

L:3 T:0 P:0 Credits:3

Course Outcomes: Through this course students should be able to

CO1 :: Draw CMOS Logic Circuits and CMOS Transmission gates

CO2 :: Apply static CMOS combinational and sequential logic at the transistor level, including mask layout.

CO3 :: Focus on the greater depth with the operation of MOS and its structure.

CO4 :: Analyze the frequency response of amplifier.

CO5 :: Compose new designs for different logical circuits with MOSFET

CO6 :: Develop in-depth analytical and design capabilities in digital CMOS circuits and chips

Unit I

MOS Transistor : Basic Principle of MOS transistor, The Metal Oxide Semiconductor (MOS) Structure, The MOS system under External Bias, Structure and Operation of MOS Transistor (MOSFET), The Threshold Voltage, MOSFET current-voltage characteristics, Substrate Bias Effect (Body Effect)

Unit II

Fabrication of MOSFET and Scaling : Fabrication process flow, The CMOS n-Well process, Layout design rules, Full-Custom Masks Layout Design, MOSFET scaling & small -geometry effects, MOSFET Capacitances

Unit III

MOS Inverters (Static and Switching Characteristics) : Introduction to static characteristics, Voltage Transfer Characteristics, Noise Immunity & Noise Margin, Power & Area Consideration, Resistive-Load Inverter, Enhancement-Load Inverter, Depletion-Load Inverter, CMOS Inverter, Delay-Time Definitions, Propagation Delay Time, Calculation of Delay Times, Inverter Design with Delay Constraints

Unit IV

Combinational MOS Logic Circuits : CMOS Logic Circuits, Complex Logic Circuits, Pass Transistor Circuits, CMOS Transmission gates

Unit V

Sequential MOS Logic Circuits : Behavior of Bi-stable elements, SR Latch Circuit, Clocked Latch and Flip-Flop Circuits, Schmitt Trigger Circuit

Unit VI

Dynamic and BiCMOS Logic Circuits : Basic Principles of Pass Transistor Circuits, Dynamic CMOS Circuit Techniques, High-Performance Dynamic CMOS, BJT Structure & Operation, Basic BiCMOS Circuit Behavior, Switching Delay

Text Books:

1. CMOS DIGITAL INTEGRATED CIRCUITS by SUNG-MO-KANG & YUSUF LEBLEBICI, MC GRAW HILL

References:

1. CMOS VLSI DESIGN by NEIL H.E.WESTE ,DAVID HARRIS & AYAN BANERJEE,, PEARSON