

INTEGRATED CIRCUIT DESIGN

Module I

The CMOS Inverters and CMOS Logic Gates – the Static View:

Introduction to CMOS Inverter, Introduction to Static CMOS Design, The Dynamic Behavior, Power, Energy, and Energy-Delay, Complementary CMOS, Pass-Transistor Logic, Transmission gates, Technology Scaling and its Impact on the Inverter Metrics

Dynamic CMOS Logic, Timing Metrics:

Dynamic CMOS Design, CMOS Logic Design Perspectives, Timing Metrics: Timing Metrics for Sequential Circuits, Classification of Memory Elements

Module-II

Basic Building Blocks:

Inverter with Active Load, Cascode, Cascode with Cascode Load, Source Follower, Threshold Independent Level Shift, Improved Output Stages

Current and Voltage Sources:

Current Mirrors, Current References, Voltage Biasing, Voltage References

CMOS Operational Amplifiers:

General Issues, Performance Characteristics, Basic Architecture, Two Stages Amplifier, Frequency Response and Compensation, Slew Rate

Module-III

Overview of Mixed-Signal Testing – Mixed-signal circuits, Test and diagnostic equipments, Mixed-signal testing challenges, The Test Specification Process – Device datasheets, Generation of test plan, Components of a test program, DC and Parametric Measurements – Continuity, Leakage currents, Power supply currents, DC references and regulators, Impedance measurements, DC offset measurements, DC gain measurements, DC power supply rejection ratio, DC common-mode rejection ratio, Comparator DC tests, Voltage search techniques, DC tests for digital circuits, Measurement Accuracy – Terminology, Calibration and checkers, Dealing with measurement errors, Basic data analysis, Tester Hardware – Mixed-signal tester overview, DC resources, Digital subsystem, AC source and measurement, Time measurement system, Computing hardware.

IDDQ Testing , Design for Testability , Built-In Self-Test , Boundary Scan , Analog Test Bus , System Test and Core Test

Module-IV

Overview of LDMOS, Power MOS, Floating Gate MOS

Emerging Technology: Overview of HEMT, FinFET, Organic FET (OFET), Graphene nano-ribbon field effect transistor (GNRFET).

IC Design for Internet of Everything (IoE): Overview of Analog IC, Digital & Memory IC, Mixed-Signal IC, RF/MM-Wave/Terahertz IC