Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NECD529	Mixed Signal VLSI Design	3	0	0	3

Course Objective

With this course students will learn the design and analysis of fundamental mixed signal building blocks like comparators, switched capacitor circuits, ADCs, DACs and PLLs.

Learning Outcomes

At the end of the course, the students must be able to design

- The fundamental blocks like sample and hold, comparators and switched capacitor circuits
- Nyquist rate and Oversampling Analog to Digital converters
- Nyquist rate Digital to Analog converters
- Voltage controlled Oscillators and Phase locked loops.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Analog and discrete – time signal processing, introduction to sampling theory, Analog continuous – time filters: passive and active filters, Basics of analog discrete – time filters and Z-transform, Switched – capacitor filters: Non-idealities, filter architectures and applications.	10	Knowledge about different types of signals
2	Basics of data converters: Successive approximation ADCs, Dual slope ADCs, High – speed ADCs (e.g. flash ADC, pipeline ADC, Hybrid ADC structures and related architectures).	12	Design of ADC DAC, Mixed signal circuit
3	High-resolution ADCs (e.g. delta-sigma converters), DAC, Mixed-signal layout.	10	Design of high resolution ADC and DAC
4	Voltage and Current – mode signaling and data transmission, Introduction to frequency synthesizers and synchronization, Basics of PLL, Analog and Digital PLL, Delay locked loops.	10	Design of VCO, PLL
	Total	42	

Text Books:

1. CMOS Mixed Signal Circuit Design, R. Jacob Baker, Wiley Press, 2nd Edition, 2008.
2. Analog Design Essentials, Willy M. C. Sansen, Springer International Edition, 1st Edition, 2006.

Reference Books:

1. Design of Analog CMOS Integrated Circuits, Behzad Razavi, McGraw Hill Indian Edition (2ndEdition), 2017.
2. CMOS Circuit Design, Layout and Simulation, R.Jacob Baker, Wiley IEEE Press, 3rd Edition, 2010.
3. CMOS Analog Circuit Design, Phillips E. Allen and Douglas R. Holberg, Oxford Press International Edition, 3rd Edition, 2012.
4. Analog Integrated Circuit Design, Tony Chan Carusone, David A. Johns, Kenneth W. Martin, Wiley Press, 2ndEdition, 2011.