Course Code	Course Name	L-T-P-C		Year of Introduction
06EC6025	**Analog Integrated Circuit Design -1**	**4-0-0-4**		**2015**

Course Objectives
To give the Student an idea about:-
  1. The operation of the MOS transistor
  2. Understand the behaviour of the MOS transistor in circuits
  3. Understand how MOS transistors are modelled for CAD tools
  4. The analysis of the Single stage amplifiers

Syllabus
Operation and modeling of MOS transistor; Short channel effects and modelling of MOS devices; Noise and frequency response analysis of single stage amplifiers.

Course Outcome

Students who successfully complete this course will be able to analyze quantitatively the behaviour of MOS transistor in various regions of operation; use the time domain and frequency domain concepts in analysing the circuits; to design a CMOS based system, component, or process within realistic constraints.

Text Books
  1. YannisTsividis and Colin McAndrew , "Operation and Modeling of the MOS Transistor", 3/e, 2010, OUP .

  2. R. Jacob Baker, Harry W Li, David E Boyce, " CMOS – Circuit Design, Layout, and Simulation",3rd Edition, 1998.

  3. BehzadRazavi , "Design of Analog CMOS Integrated Circuits", Tata McGraw Hill 2008.

  4. Philip E Allen, Douglas R Holberg, "CMOS Analog Circuit Design" International Student(Second) Edition, First Indian Edition 2010.

Course Plan			
Module	Content	Hours	Sem. Exam

			Marks
I	**2-Terminal MOS Structure** - Flat Band Voltage, Potential Balance and Charge, Effect of Gate-Body Voltage on Surface Condition General Analysis. Inversion: charge sheet approximation, Strong and Weak Inversion, Small Signal Capacitance. **3-Terminal MOS Structure** - Contacting Inversion Layer, General Analysis, Body-effect, Pinch-off voltage. Introduction, Regions of Operation.	14	25
II	**4-Terminal MOS Structure** – Introduction, Complete All-Region Model – Current Equations, Simplified All-Region Models: Linearizing Depletion Region Charge, Source-Referenced Simplified All- Region Models. **INTERNAL TEST 1** Strong Inversion: Complete Strong Inversion Model-NonSaturation, Source-Referenced Simplified Strong Inversion Models	14	25
III	**Short Channel Effects**: Scaling Theory, Threshold Voltage Variation, Mobility Degradation with Vertical Field, Velocity Saturation, Hot Carrier Effects. **MOS Device Models**: Level 1 Model, Level 2 Model, Level 3 Model , BSIM Series, Other Models, Charge and Capacitor Modeling, Temperature Dependence. **Noise**: Statistical Characteristics of Noise, Noise Spectrum, Amplitude Distribution, Correlated and Uncorrelated Sources. Types of Noise: Thermal, Flicker, Shot Noise Representation of Noise in Circuits. **INTERNAL TEST 2**	12	25
IV	**Single-Stage Amplifiers** - Introduction to basic amplifier Configurations - Resistive Load **Active Loads**: Gate-Drain Connected Loads: CS, CD and CG, Frquency Response, Noise Analysis, Current-Source Load: CS, CD and CG, Frequency Response, Noise Analysis,	12	25

	Cascode, Folded Cascode, Push-pull amplifier- Noise Analysis		
	END SEMESTER EXAM		