



MANIPAL UNIVERSITY JAIPUR

School of Electrical, Electronics & Communication Engineering (SEEC)

Department of Electronics & Communication Engineering
Course Hand-out

Analog Integrated Circuits & Systems| EC 1401 | 4 Credits | 3 | 0 4

Session: Jan 15 – May 15 | Faculty: Dr. Shilpi Birla| Class: Core course

A. Introduction: This course is offered by Dept. of Electronics & Communication Engineering as a core course in IV semester. This is a course on understanding internal circuit details and design of circuits based on analog integrated circuits. Much attention is given to the design of applications circuits of operational amplifiers, Timer IC 555, Phase Locked Loop, analog-to-digital and digital-to-analog converters.

B. Course Outcomes:

[1401.1] Analyse operation of the most commonly used operational amplifiers and its applications.

[1401.2] Analyse the operation of the most commonly used timer IC and PLL IC and their applications.

[1401.3] Classify the operation of the most commonly used D/A and A/D converter types and its applications.

[1401.4] To analyse and design op-amp frequency generators and multi-vibrators using timer ICs.

[1401.5] To analyse and design different circuits on hardware and software which will enhance their skills employability.

C. SYLLABUS

Operational Amplifier: Introduction: Basic Block Diagram of Op-Amp. Differential Amplifier: Types of Differential Amplifier, Analysis Using Block Diagram, Characteristics Of Differential Amplifier, Analysis of Emitter Coupled Differential Amplifier Using Small Signal Hybrid Model and MOS, Methods Of Improving Common Mode Rejection Ratio Using Constant Current Source and Current Mirror Circuits Using Mos, Current Repeaters and Active Load; Circuit Operation and Analysis of Level Shifter and Output Stage of Operational Amplifier; Transfer Characteristics of Op. Amp, Measurement of Operational Amplifier Parameters; Cmos Amplifier. Linear Applications of Operational Amplifier: Characteristics Of Ideal Operational Amplifier, Open Loop and Closed Loop Operation Of Operational Amplifier, Voltage Follower, Integrator, Differentiator, Voltage to Current Converter, Current to Voltage Converter, Difference Amplifier, Instrumentation Amplifier and Bridge Amplifier; Active Filters: Design and Analysis of First and Higher Order Low Pass, High Pass, Band Pass (Wide and Narrow Band) and Band Elimination (Wide and Narrow Band) and All Pass Active Filters. Non-Linear Applications of Operational Amplifier: Precision Half Wave and Full Wave Rectifiers, Peak Detector, Sample and Hold Circuit, Log and Antilog Amplifiers, Analog Multipliers And Dividers, Comparators, Window Detector, Schmitt Trigger, Square Wave, Triangular Wave Generators and Pulse Generator; Timer IC: Introduction, Pin Details of 555 I.C., Functional Diagram of 555 IC, Astable Multivibrator, Positive and Negative Edge Triggered Monostable Multivibrator, Linear Ramp Generator and FSK Generator. Data Converters: Principles of Digital to Analog Converter (DAC) And Analog To Digital Converters (ADC), Binary Weighted, R-2r Digital To Analog Converters, Flash Type, Successive Approximation Type, Counter Type and Servo Tracking Type and Dual Slope Analog to Digital Converters, Specifications Of ADC And DAC. Phase-Locked Loops: Functional Diagram Of Voltage Controlled Oscillator - 566 I.C. And Its Analysis, Operating Principle Of Pll, Study Of IC 565, Circuit Analysis of Phase Detector, Definition and Derivation for Free Running Frequency, Lock Range and Capture Range, Applications of PLL as Frequency Multiplier, Frequency Divider, AM and FM Demodulation and FSK Demodulation.

D. REFERENCE BOOKS

- [1] K.R. Botkar "Integrated Circuits" Khanna Publishers Delhi.
- [2] A.Holberg, CMOS Analog Circuit Design. Oxford Univ. Press. 3rd Edition
- [3] D. William, Operational Amplifiers with Linear Integrated Circuits. Prentice Hall, 2004
- [4] F. Sergio, Design with Op. Amps & Analog Integrated Circuits. Mcgraw Hill ,1997

