| ECL331 | ANALOG INTEGRATED CIRCUITS AND SIMULATION LAB | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| | | PCC | 0 | 0 | 3 | 2 |

**Preamble:** This course aims to (i) familiarize students with the Analog Integrated Circuits and Design and implementation of application circuits using basic Analog Integrated Circuits (ii) familiarize students with simulation of basic Analog Integrated Circuits.

**Prerequisite:** ECL202 Analog Circuits and Simulation Lab

**Course Outcomes:** After the completion of the course the student will be able to

| | |
|---|---|
| **CO 1** | Use data sheets of basic Analog Integrated Circuits and design and implement application circuits using Analog ICs. |
| **CO 2** | Design and simulate the application circuits with Analog Integrated Circuits using simulation tools. |
| **CO 3** | Function effectively as an individual and in a team to accomplish the given task. |

**Mapping of course outcomes with program outcomes**

| | PO1 | PO 2 | PO3 | PO 4 | PO5 | PO 6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | | | | | | 2 | | | 2 |
| **CO2** | 3 | 3 | 3 | 2 | 3 | | | | 2 | | | 2 |
| **CO3** | 2 | 2 | 2 | | 2 | | | | 3 | 2 | | 3 |

**Assessment**
**Mark distribution**

| **Total Marks** | **CIE** | **ESE** | **ESE Duration** |
|---|---|---|---|
| 150 | 75 | 75 | 3 hours |

**Continuous Evaluation Pattern**

Attendance : 15 marks
Continuous Assessment : 30 marks
Internal Test (Immediately before the second series test) : 30 marks

**End Semester Examination Pattern:** The following guidelines should be followed regarding awardof marks

(a) Preliminary work : 15 Marks

(b) Implementing the work/Conducting the experiment : 10 Marks

(c) Performance, result and inference (usage of equipments and trouble shooting): 25 Marks

(d) Viva voce : 20 marks

(e) Record : 5 Marks

**General instructions:** End-semester practical examination is to be conducted immediately after the second series test covering entire syllabus given below. Evaluation is to be conducted under the equal responsibility of both the internal and external examiners. The number of candidates evaluated per day should not exceed 20. Students shall be allowed for the examination only on submitting the duly certified record. The external examiner shall endorse the record.

**Course Level Assessment Questions (Examples only)**

**Course Outcome 1 (CO1):** Use data sheets of basic Analog Integrated Circuits and design and implement application circuits using Analog ICs.

1. Measure important opamp parameters of µA 741 and compare them with the data provided in the data sheet
2. Design and implement a variable timer circuit using opamp
3. Design and implement a filter circuit to eliminate 50 Hz power line noise.

**Course Outcome 2 and 3 (CO2 and CO3):** Design and simulate the application circuits with Analog Integrated Circuits using simulation tools.

1. Design a precission rectifier circuit using opamps and simulste it using SPICE
2. Design and simulate a counter ramp ADC

**List of Experiments**

**I.** Fundamentals of operational amplifiers and basic circuits [Minimum seven experiments are to be done]

1. Familiarization of Operational amplifiers - Inverting and Non inverting amplifiers, frequency response, Adder, Integrator, Comparators.
2. Measurement of Op-Amp parameters.
3. Difference Amplifier and Instrumentation amplifier.
4. Schmitt trigger circuit using Op–Amps.
5. Astable and Monostable multivibrator using Op-Amps.
6. Waveform generators using Op-Amps - Triangular and saw tooth
7. Wien bridge oscillator using Op-Amp - without & with amplitude stabilization.

8. RC Phase shift Oscillator.
9. Active second order filters using Op-Amp (LPF, HPF, BPF and BSF).
10. Notch filters to eliminate the 50Hz power line frequency.
11. Precision rectifiers using Op-Amp.

**II.** Application circuits of **555 Timer/565 PLL/ Regulator(IC 723) ICs** [ Minimum three experiments are to be done]

1. Astable and Monostable multivibrator using Timer IC NE555
2. DC power supply using IC 723: Low voltage and high voltage configurations, Short circuit and Fold-back protection.
3. A/D converters- counter ramp and flash type.
4. D/A Converters - R-2R ladder circuit
5. Study of PLL IC: free running frequency lock range capture range

**III. Simulation experiments [The experiments shall be conducted using SPICE]**

**1.** Simulation of any three circuits from Experiments 3, 5, 6, 7, 8, 9, 10 and 11 of section I

**2.** Simulation of Experiments 3 or 4 from section II

**Textbooks**

1. D. Roy Choudhary, Shail B Jain, “Linear Integrated Circuits,”
2. M. H. Rashid, “Introduction to Pspice Using Orcad for Circuits and Electronics”, Prentice Hall