

EX54: Linear Integrated Circuits and Design

Course Overview:

The physical world is inherently analog, indicating that there is always need for analog circuitry. Today the growth of any industry is dependent upon electronics to a great extent. Integrated circuit is electronics. This subject acquaints students with general analog principles and design methodologies using practical devices & application. It focuses on process of learning about signal conditioning, signal generation, instrumentation, timing & control using various IC circuits. This course covers the fundamentals of the analysis and design of analog integrated circuits. It is geared towards those with limited or NO background in analog ICs, and provides a thorough introduction to this material. It begins by reviewing transistor device models, progresses to single and two-stage amplifiers, and moves on to multi-stage amplifiers. A variety of techniques for implementing current sources, and temperature and supply-independent bias sources are covered, and the tradeoffs between them. A large portion of the class then covers feedback theory and application, and frequency response of linear analog circuits and the design of operational amplifiers. By the end of this course, the student should have a firm grasp of fundamental analysis and design techniques required for the proper design and implementation of analog ICs. This course is a study of the characteristics and applications of analog integrated circuits including operational amplifiers and specialized linear integrated circuits. Circuits investigated include inverting, non-inverting and differential amplifiers, non-linear circuits, active filters, equalizers, oscillators, timers, and power supply regulator IC's. Lab experiments will cover the course topics and verify lecture theory. In the laboratory the use of computer simulations using SPICE as a simulation tool for testing the designed circuits is also recommended.

For those students with no background in analog ICs, this course provides an excellent coverage of the fundamentals that are required for mastery of more advanced courses.

Pre-Requisite:

Digital System Design I and II, BEC-I, EDC, Control Systems

Course Educational Objectives (CEO):

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| CEO 1 | To explain fundamentals of operational amplifiers and their configurations. |
| CEO 2 | To analyze, design and demonstrate linear applications, data converters, active filters and waveform generators with operational amplifiers. |
| CEO 3 | To explain and design various special purpose integrated circuits such as voltage regulators, monolithic timer, VCO, PLL. |
| CEO 4 | To design and analyze circuits using integrated circuits for industrial applications. |

Evaluation System:

- Theory Examination: 100 marks
- Practical: 25 marks
- Term Work: 25 marks

- Total: 150 marks

Recommended Books:

- Sergio Franco, Design with operational amplifiers and analog integrated circuits, Third edition, McGraw Hill International edition, 2002.
- Ramakant A.Gayakwad, 'OP-AMP and Linear IC's', Prentice Hall / Pearson Education, 1994.
- Robert Coughlin and F Driscoll, Operational Amplifiers and Linear Integrated circuits, sixth edition, Pearson Education Asia, 2001
- D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd., 2000.
- Donald A. Neamen, Electronic Circuit Analysis and Design, Second edition, McGraw Hill International edition 2001
- James M. Fiore, Op Amps and Linear Integrated circuits, First reprint, Thomson Asia Pte. Ltd., 2001
- K.R.Botkar, 'Integrated Circuits'. Khanna Publishers, 1996.