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**SECOND SEMESTER 2019-2020**

# Course Handout Part II

Date: 06-01-2020

In addition to Part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : ECE F341 **/** EEE F341**/** INSTR F341

## Course Title : Analog Electronics

Credits : 4

Instructor-in-charge : Souvik Kundu

Other Instructor : Prashant Kumar Pattnaik

Tutorial Instructors : Souvik Kundu, Prashant Kumar Pattnaik, and Sumit Kumar Chatterjee

Lab Instructors : Souvik Kundu, Prashant Kumar Pattnaik, Chetan Kumar V, Joshna P, Mary, TBA

**Scope and Objective of the Course**

The aim of the course is to deal with various electronic techniques and building blocks used in analog signal processing applications. Discrete and Integrated electronic circuits will be studied. Experiments and projects using discrete IC modules will be carried out in the laboratory.

Course Outcomes

After learning the course, students will be able to

* Design analog electronic circuits using opamps and discrete components for linear and non-linear signal processing (real time) applications.
* Analyze a given analog integrated circuit and evaluate its performance.
* Convert analog to digital and digital to analog signal of desired accuracy and resolution using data converters
* Design voltage regulators and power supply using regulator ICs and sinusoidal and non-sinusoidal signal generators using opamaps and timer ICs

**Textbooks:**

1. TB1 L.K. Maheshwari, Analog Electronics, PHI, 2005
2. TB2 L.K. Maheshwari and M.M.S. Anand, Laboratory Experiments & PSPICE Simulation in Analog Electronics Experiments, PHI, 2005.

**Reference books**

1. R1. A.S. Sedra, K.C. Smith, Microelectronic Circuits, 5th Ed., Oxford, 2004.
2. R2. S. Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, 3rd Ed. McGraw Hill.
3. R3. Ramakant A. Gayakwad, “Op-Amps and Linear Integrated Circuits”, 4th Ed., 2015, Pearson.

**Course Plan:**

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| **Lecture No.** | **Learning objectives** | **Topics to be covered** | **Chapter in the Text Book** |
| 1-2 | Key concepts dealing with the basics of circuit theory and electronic devices are reviewed | Introduction & review of concepts | TB1 Ch 1 |
| 3-6 | Introduce the basics of ideal and practical op-amps | Op-amp basics, concept of negative feedback and virtual short, Effect of real op-amp parameters on circuit performance | Class notes |
| 7-9 | Introduce the applications of ideal and practical op-amps in analog electronic systems | Linear applications of op-amps Special purpose Op-amp circuits | Class notes and  TB1 Ch 2 and 3 |
| 10-15 | This part discusses the important features and practical realization of active filters. Switched-capacitor filters are also included. | Active filters | Class notes and  TB1 Ch 4 |
| 16-20 | Applications of Op-amps in realization of nonlinear functions such as log and antilog amplifiers, multipliers, dividers are included. Precision circuits, comparators, Schmitt trigger, analog switches, sample-and-hold circuits, analog multipliers, etc. are also introduced. | Non-linear Op-amp circuits | Class notes and  TB1 Ch 5 |
| 21-27 | Sinusoidal and non-sinusoidal signal generators using op-amps and timer ICs are introduced. This part also introduces phase locked loop along with other integrated circuits. | Signal generators, 555 timer based circuits and Phase lock loop | Class notes and  TB1 Ch 6 |
| 28-31 | This part discusses the voltage regulators and also the design of power supply using regulator ICs. | Voltage Regulators | Class notes and  TB1 Ch 7 |
| 32-36 | IC power amplifiers and tuned amplifiers are discussed in this part. | IC Power Amplifiers and tuned amplifiers | Class notes TB1 Ch 8 and 9 |
| 37- 42 | This part includes the study of analog-to-digital and digital-to-analog converters. The performance measures and design aspects of data converters will be covered in this part. | A/D and D/A Converters | Class notes and  TB1 Ch 10, |

Lab Experiments:

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| --- | --- | --- |
| S.No | Experiment | Reference to Text |
| 1 | Common Emitter Amplifier | TB2 Exp 2 |
| 2 | Basics Op-amp Configurations | TB2 Exp 6 |
| 3 | Characterization of Op-amp | TB2 Exp 5 |
| 4 | Study of Feed Back Amplifiers Using Op-amps | TB2 Exp 8 |
| 5 | Instrumentation and Programmable Amplifier | TB2 Exp 7 |
| 6 | Study of Active Filters Using Op-amps  Low Pass, High Pass & Band Pass | TB2 Exp 9 |
| 7 | Precision Circuits | TB2 Exp 12 |
| 8 | Sinusoidal and Non-Sinusoidal Oscillators | TB2 Exp 15 |
| 9 | Integrated Circuit Timer & Phase Locked Loop | TB2 Exp 16, Exp 17 |
| 10 | IC Fixed and adjustable Voltage Regulators | TB2 Exp 19 |
| 11 | Data Converters (DAC and ADC) | TB2 Exp 24 & 25 |

**Evaluation Scheme:**

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| --- | --- | --- | --- | --- |
| **Component** | **Duration** | **Weightage (%) and Marks** | **Date & Time** | **Nature of Component** |
| Midsem | 1:30 Hours | 20% (60) | 5/3 9.00 - 10.30AM | Closed Book |
| Quiz | -- | 16.66% (50) | To be announced in Class | Open book |
| Assignments | -- | 13.33% (40) | To be announced in Class | Open Book |
| Laboratory | -- | 20% (60) | Regular practicals and lab test notice will be announced on CMS | Demo / Regular Practicals/ Lab Exam – Open book |
| Comprehensive | 3 Hours | 30% (90) | 09/05 AN | Closed Book |
| TOTAL |  | 100% (300) |  |  |

**Chamber Consultation Hour:** To be announced in Class

**Notices:** Notices, if any, concerning the course will be put up on CMS/ EEE Notice Board.

**Make-up Policy:** Make-up will be given on **genuine** grounds only. i) Prior application should be made for seeking the make-up examination. ii) Written and signed documentary evidence needs to be furnished by the Hostel Warden/ID confirming the reason for absence from scheduled examination. No make-up will be given for the quiz.

**Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

**Dr. R. N. Ponnalagu**

**INSTRUCTOR-IN-CHARGE**