### Course Number and Name

BEC405 - LINEAR INTEGRATED CIRCUITS

### Credits and Contact Hours

3 & 45

### Course Coordinator’s Name

Ms. M. Jasmin

### Text Books and References

**TEXT BOOKS:**


**REFERENCES**


### Course Description

- To understand the basic concepts of operational amplifier and its various applications.
- To understand the basics of PLL and its practical applications.
- To know about analog multipliers.
- To know about various analog switches and different A/D and D/A convertors.
- To understand the concepts of switched capacitor filters, Voltage regulator and various amplifiers.

### Prerequisites

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<tr>
<td>BEC302-Principles of Digital electronics</td>
<td>BEC402-Electronic Circuits</td>
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required, elective, or selected elective (as per Table 5-1) required

### Course Outcomes (COs)

**CO1:** Learn about the basic concepts for the circuit configuration for the design of linear integrated circuits and develops skill to solve engineering problems.

**CO2:** Develop skills to design simple circuits using OP-AMP.

**CO3:** Gain knowledge about various multiplier circuits, modulators and demodulators.

**CO4:** Gain knowledge about PLL.

**CO5:** Learn about various techniques to develop A/D and D/A convertors.

**CO6:** Develop skills to develop simple filter circuits and various amplifiers and can solve problems related to it.
### Student Outcomes (SOs) from Criterion 3 covered by this Course

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### List of Topics Covered

**UNIT I CIRCUIT CONFIGURATION FOR LINEAR ICS**

- Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, Operational Amplifier-- DC Characteristics-- Frequency response characteristics - Stability – Limitations--Frequency compensation-Slew rate.

**UNIT II APPLICATION OF OPERATIONAL AMPLIFIERS**

- Integrator Voltage to Current convertor, Instrumentation amplifier, Sine wave Oscillators, Low pass and band pass filters, comparator, Multivibrator and Schmitt trigger, Triangle wave generator, Precision rectifier, Log and Antilog amplifiers, Non-linear Linear and Nonlinear Circuits using operational amplifiers and their analysis, Inverting and Non inverting Amplifiers, Differentiator function generator.

**UNIT III ANALOG MULTIPLIER AND PLL**

- Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications ,Voltage controlled Oscillator, Closed loop analysis of PLL, AM, PM and FSK modulators and demodulators. Frequency synthesizers, Compander ICs.

**UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTOR**

- Analog switches, High speed sample and hold circuits and sample and hold IC’s, Types of D/A converter Current driven DAC, Switches for DAC, A/D converter, Flash, Single slope, Dual slope, Successive approximation, DM and ADM, Voltage to Time and Voltage to frequency converters.

**UNIT V SPECIAL FUNCTION IC**

- Timers, Voltage regulators - linear and switched mode types, Switched capacitor filter, Frequency to Voltage converters, Tuned amplifiers, Power amplifiers and Isolation Amplifiers, Video amplifiers, Fiber optics ICs and Opto couplers, Sources of Noises, Op Amp noise analysis and Low noise OP-Ampls.