RK.UNIVERSITY

SYLLABUS

Course Title	Analog Electronics	
Course Code	EL425	
Course Credit	Lecture	: 03
	Practical	: 01
	Tutorial	: 00
	Total	: 04

Course Learning Objectives

At the end of this course students will be able to:

- Formulate the concept of ideal operational amplifier; identify its major properties and main type of Op-amps circuits
- Employ Op-amp in circuits and troubleshoot issues
- Estimate and analyse output waveform for integrator and differentiator circuit
- Synthesize and design active filters and oscillators for engineering application
- Design multivibrator circuits using timers

Detailed Syllabus

Sr. No.	Name of chapter & Details	
	SECTION-I	
1	**Differential Amplifier** DC and small signal analysis, CMRR, Current mirrors, Active load and cascade configurations, frequency response.	**5**
2	**Operational Amplifiers** Block diagram, Parameters of OP-Amps, Ideal properties, Equivalent circuit, Difference amplifiers, Inverting& Non-inverting configuration, Different configuration, Voltage-Series feedback, Voltage Shunt Feedback, Differential Amplifier, Open loop voltage gain, Slew rate.	**5**
3	**Op-amp Applications** DC amplifier, AC amplifier, Peaking Amplifier, Summing, Scaling and Averaging Amplifiers in inverting and non-inverting configuration, Voltage to current converter, Op-amp as integrator and differentiator, Precision diode, Logarithmic and Anti-logarithmic Amplifier.	**5**
4	**Active Filter Design** First order and second order filter design-Low pass, High pass, Band pass, Band Reject & All pass.	**3**

5	**Oscillator** Oscillator principle, Harmonic Oscillators- Phase shift oscillator, Wien bridge oscillator, Hartley Oscillator, Colpitts Oscillator, Relaxation Oscillator- Schmitt Trigger(square wave), Triangular wave oscillator, Saw tooth wave generator.	**3**
	TOTAL	**21**
	SECTION-II	
6	**Comparator and Converter** Basic Comparator, zero crossing detector, inverting & non-inverting comparator, voltage limiters, positive and negative clippers & clappers, half wave & full wave rectifier using op-amp, Peak detector, Sample and Hold circuit.	**6**
7	**Voltage Regulators** Voltage Regulators, Design of Series Voltage Regulator, Series regulator with Current Pre-regulator.	**4**
8	**Timer** Internal circuit diagram, Pin configuration, stable, Monostable and Bistable operation of 555 Timer IC.	**5**
9	**Data Converters** Classification, Digital to Analog conversion-Binary weighted resistor DAC, R- 2R ladder DAC, Analog to Digital Conversion-Flash type, Counter type, Successive Approximation, Dual slope, Comparison of ADC.	**7**
	TOTAL	**21**

Instructional Method and Pedagogy

- Laboratories will be conducted with the aid of multi-media projector, black board, OHP etc.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Seminar/ will be conducted.

Reference Books

1. R. A. Gayakwad, "*Op-Amps and Linear Integrated Circuit*", Prentice Hall of India, 2002.
2. B. Razavi, "*Design of Analog CMOS Integrated Circuits*", McGraw Hill 2001
3. P. E. Allen and D. R. Holberg, "*CMOS Analog Circuit Design*", 2/e, Oxford University Press, 1997
4. D. Johns, K. Martin, "*Analog Integrated Circuit Design*" Wiley, 1997
5. Coughlin Robert, F. Driscoll Rrederick, F," *Operational Amplifiers and Linear Integrated Circuits*",Prentice Hall of India,6/e,2000
6. Millman Jacob Halkias Christos," *Integrated Electronics : Analog and Digital Circuits and Systems*" Tata McGraw-Hill Publishing
7. Anand Kumar, "*Fundamentals of Digital Circuits* "Prentice Hall of India, 2/e, 2010

School of Engineering
(Electrical Department)

List of Experiments

Subject Code

Subject Name:Analog Electronics

Sr. No	Aim of experiment
1	**Explain** 741 Op-Amp IC and Identify different pins.
2	**Demonstrate** Op-Amp as inverting and non-inverting amplifier.
3	**Estimate** CMMR of Op-Amp.
4	**Design** summing amplifier, scaling amplifier and averaging amplifier for inverting configuration.
5	**Design** summing amplifier, scaling amplifier and averaging amplifier for non-inverting configuration.
6	**Design** voltage to current converter using Op-amp.
7	**Construct** differentiator amplifier using Op-amp.
8	**Construct** integrator amplifier using Op-amp.
9	**Design** first & second order low pass filter using Op-Amp.
10	**Design** first & second order high pass filter using Op-Amp.
11	**Design** first & second order band pass filter using Op-Amp.
12	**Develop** square wave, triangular wave and saw tooth wave oscillator using Op-Amp.
13	**Create** RC phase shift oscillator using Op-Amp.
14	**Design** Op-Amp as clapper and analyze input output waveform.
15	**Operate** 555 timer IC in monostable, astable and bistable mode configuration.