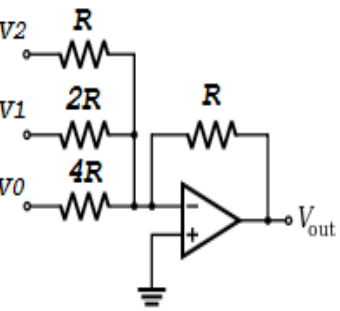

SOURCE: *http://electronics-course.com/image/d2a-summing-amplifier.png*

19EC212 ANALOG CIRCUITS

Hours Per Week :

L	T	P	C
3	-	2	4

PREREQUISITE COURSE: Electronic Devices and Circuits.

COURSE DESCRIPTION AND OBJECTIVES:

To gain knowledge on analysis and design of basic electronic circuits and also to introduce various linear and non-linear applications of operational amplifiers.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Analyze and design single, multistage, Tuned and Power Amplifiers.
2	Apply the concepts of op-amps to design oscillators and timers.
3	Design and Elucidate linear and non-linear applications of op-amp and other ICs.
4	Understand and analyze ADC's and DAC's.
5	Experiment to demonstrate Various Amplifiers, Timers, Converters and applications of OP-AMPs.

SKILLS:

- ✓ *Design an amplifier for Public address system.*
- ✓ *Construct an oscillator for audio and Radio frequency applications.*
- ✓ *Design Multivibrators for a given application.*
- ✓ *Design Modulators like PWM, PPM, FSK.*
- ✓ *Implement Data converters.*

UNIT - I **L-9**

SINGLE-STAGE AND MULTI-STAGE AMPLIFIERS: Single-stage BJT and FET amplifiers (CE/CS, CB/CG, CC/CD), Voltage gain, Input resistance, Output resistance, h-parameter, Hybrid Pi model, T-model, Multistage Amplifiers - cascade, cascode, CE-CC amplifiers, high input impedance transistor circuits; Frequency response of BJT amplifiers and FET amplifiers.

UNIT - II **L-9**

OSCILLATORS & POWER AMPLIFIERS: Oscillators, Barkhausen's criterion, Classification of oscillators - working of hartley, colpitts, RC phase shift, wein bridge and crystal oscillators, expression for frequency of oscillations using BJT; Classification of power amplifiers, Operation and efficiency of class-A, Class-B, Class-C and Class-D power amplifiers.

UNIT - III **L-9**

INTRODUCTION TO OPERATIONAL AMPLIFIER AND ITS APPLICATIONS: Differential DC amplifier, Common mode analysis, Differential mode analysis, 741 operational amplifier, Ideal and practical characteristics, Inverting and non-inverting configurations, Summing amplifier, Difference amplifier, Integrator and lossy integrator, Differentiator and practical differentiator, Logarithmic Amplifiers, Instrumentation amplifier, Comparators, Multivibrators.

UNIT - IV **L-9**

OP-AMP BASED OSCILLATORS & TIMERS: Op-amp Based Oscillators - Barkhausen's criterion for oscillations, Op-amp RC phase shift oscillators, Op-amp Wein bridge oscillators, Op-amp Schmitt Trigger, VCO and PLL with applications, Timers - IC555 timer, functional diagram of 555 timer, timer as a stable and monostable multivibrator.

UNIT - V **L-9**

ACTIVE FILTERS & DATA CONVERTERS: Application of Op-amp as active filter - low pass, high pass, band pass and band reject filters, design of practical filters; Op-amp based DACs and ADCs **-** characteristics of A/D and D/A converters, weighted resistor DAC, R-2R ladder DAC, flash ADC, successive approximation ADC and dual slope ADC.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

1. Frequency response of a CS FET amplifier.
2. Verify the effect of cascading on gain and bandwidth of a multistage amplifier.
3. Design of an RC phase shift oscillator using BJT.
4. Design of a colpitts oscillator using BJT.
5. Find the conversion efficiency of a class B complementary symmetry power amplifier.
6. Find the conversion efficiency of a class AB complementary symmetry power amplifier.
7. Design an instrumentation amplifier using 741 Op-Amp IC.
8. Design an integrator and a differentiator using using 741 Op-Amp IC.
9. Verify the functionality of PLL using IC 565.
10. Design an astable multivibrator to generate a clock pulse with 60% duty cycle.
11. Design a low pass filter and a high pass filter with certain cutoff frequency using 741 Op-Amp IC.
12. Verify the function of an R-2R ladder DAC circuit.

TEXT BOOKS:

1. J. Millman and C.C. Halkias, “Integrated Electronics”, 2nd edition, Tata McGraw-Hill, 2009.
2. D. Roy Choudhury, “Linear Integrated Circuits”, 4th edition, New Age International (p) Ltd, 2014.

REFERENCE BOOKS:

1. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuits Theory”, 9th edition, Pearson/Prentice Hall, 2006.
2. Sedra A.S. and K.C. Smith, “Micro Electronic Circuits”, 5th edition, Oxford University Press,2006.
3. M.H. Rashid, “Micro Electronic Circuits: Analysis and Design”, 1st edition, Thomson PWS Publications, 1999.
4. Tahira Parveen, “Operational Trans-conductance Amplifier and Analog Integrated Circuits”, I.K International Publishing House Pvt.Ltd., 2010.
5. Sergio Franco, “Design with Operational Amplifiers & Analog Integrated Circuits”, McGraw Hill,1988.
6. G.B.Clayton, “Operational Amplifiers”, 5th edition, Butterworth, 1971.