AMITY UNIVERSITY
UTTAR PRADESH

Course Title: Analog and Digital Electronics Circuits
Credit Units: 5
Course Code:
Course Level:UG

L	T	P/S	SW/FW	PSDA	TOTAL CREDIT UNITS
3	1	2	-	-	5

Course Objectives: The objective of this course is to introduce the students about the application of semiconductor devices in linear analog circuits. This course is to familiarize the students with the analysis and design of circuits by using transistor, FET and operational amplifier. Detail analysis of biasing techniques, frequency response compensation, feedback, stability, noise, and nonlinearity and introduction to advanced analog technique is presented including the topics on PLL, VCO, multivibrators and wave form generators.

Pre-requisites: Basic Electronics Engineering, Basic

Course Contents/Syllabus:

	Weightage (%)
Module I: Small Signal Analysis of Transistors and Application of Op-Amp	**25**
Basic of Bipolar Junction Transistor (BJT) configuration-common –emitter, common-collector, common-base: Analysis of Common-Emitter transistor amplifier Hybrid model at low frequencies-analysis of Bipolar Junction transistor amplifier using h parameters, Emitter follower: Miller's theorem: CE amplifier with an emitter resistance. Basic of Field effect transistor (JFET, MOSFET): Small signal model – common drain, common source, common gate, operating point Introduction of open loop and closed loop configuration op-amp parameters, Inverting and non-inverting configuration, Barkhausen criterion voltage gain of inverting and non-inverting configurations.	

Applications – adders, voltage to current, current to voltage converter, integrators, differentiators, voltage follower (voltage buffer), summer, subtractor, comparators, log/antilog circuits using Op-amps, precision rectifiers. Current mirrors	
Module II: Feedback Amplifiers and Power Amplifier	**20**
Feedback in Amplifiers: voltage-current, voltage-voltage, current-voltage, current-current Power dissipation in transistors, difference with voltage amplifiers Amplifier classification (Class A, Class B, Class C, Class AB) class AB push pull amplifier,collector efficiency, cross over distortion	
Module III : Fundamental of Digital Techniques	**15**
Analog & digital signals, DeMorgan's theorems 1`s complement and 2`s complement, BCD subtraction using 9's and 10's complement methods , introduction of weighted and non weighted codes BCD to Gray and Gray to BCD code conversion Standard representation of logical functions (SOP and POS forms,5-variable K-map simplification, don't care conditions)	
Module IV : Combinational Circuits	**20**
Serial adder ,Parallel Adder and Parallel subtractor Difference between serial and parallel adder, Multiplexer, de-multiplexer, decoder & encoder, code converters, , BCD to seven segment decoder/encoder 1 & 2 bit comparators Implementation of logic functions using multiplexer/de-multiplexer and decoder, Implementation of 16×1 MUX using 4×1 MUX, 4×16 decoder using 3×8 decoder etc.	
Module V: Sequential Circuits and Logic Families	**20**
Difference between combinational and sequential circuits, Latch, Flip-flops: SR, JK, D & T flip flops – Truth table, Excitation table, Conversion of flip-flops, set up and hold time, race around condition, Master Slave flip flop, Counters: Asynchronous/ripple & synchronous counters – up/down, Ring counter, sequence detector. Introduction to Logic families: Special characteristics (Fan out, Power dissipation, propagation delay, noise margin), working of RTL, DTL, TTL,ECL and CMOS families	

List of Lab Experiments:

1. Design of differential amplifier
2. To design and study the op amp as an adder, subtractor.
3. To design and study op-amp as integrator and differentiator
4. To design voltage series feedback amplifier
5. To design precision rectifiers using operational amplifier
6. To design and study class-B push pull amplifier
7. To design half adder, full adder, half subtractor, full subtractor using gates and verify their truth tables
8. To implement control circuit using multiplexer
9. To design a BCD to seven segment decoder converter and verify the truth table.
10. To design a 4-bit BCD to Excess-3 code converter
11. To verify the truth table of R-S , D , J-K and T-flip flops.
12. To design a 3-bit asynchronous UP-counter using J-K flipflops.
13. To design a 3-bit synchronous Down counter using J-K flip flops

Student Learning Outcomes:

After completion of this course the students will have

1. Identify and describe operation of semiconductor devices.
2. Analyze where and how analog components are used
3. analysis of amplifier circuits using small - signal equivalent circuits to determine various parameters
4. Construct OP-AMP/BJT application based circuits

Pedagogy for Course Delivery:

- Class Room Lectures, assignments, Quizzes'/Viva
- Hands on Embedded kits

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	Total (%)
80	**20**	**100**

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment					End Term Examination
Components (Drop down)	A	CT	S/V/Q	HA	
Weightage (%)	5	10	8	7	70

Lab/ Practical/ Studio Assessment:

Continuous Assessment/Internal Assessment					End Term Examination		
Components (Drop down	A	PR	LR	V	**PR**	**V**	70
Linkage of PSDA with Internal Assessment Component, if any							
Weightage (%)	5	10	10	5	35	35	

Textbook:

1. Moris Mano : Digital Design, fourth edition Pearson Education India, 2008, ISBN -8131714500, 9788131714508.
2. R. P. Jain: Modern Digital Electronics, fourth edition Tata McGraw-Hill Education, 2010 , ISBN 0070669112, 9780070669116.
3. Thomas L. Floyd: Digital Fundamentals, 10th edition Pearson Education India, 2011,ISBN 813173448X, 9788131734483.
4. Malvino and Leech: Digital Principles & Applications, 7th edition Tata McGraw Hill,1995 ,ISBN 0070141703, 9780070141704.
5. Adel S. Sedra and K. C. Smith: Microelectronic Circuits, Fifth Edition, 2007, ISBN-10: 0195338839.
6. Ramakant Gaekwad: Operational Amplifiers and Linear Integrated Circuits fourth Edition, 2000,
7. Millman J. and Halkias .C., " Integrated Electronics ", 2nd Edition, Tata McGraw-Hill, 2001
8. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuit Theory”,8th Edition., PHI, 2002.
9. S.Salivahanan, et.al, “Electronic Devices and Circuits”, TMH, 2008.
10. Mohammad Rashid: Microelectronics Circuits(analysis And Design), 2nd Edition, Cengage Learning India Pvt Ltd, New Delhi (12 January 2009) • ISBN- 10: 0495667722 ISBN-13: 978-0495667728