June-2011

Detailed Syllabus

Of

M. Sc. Programme
In Electronics

P. G. Department of Electronics & Instrumentation Technology
University of Kashmir
Hazratbal, Srinagar-6, J & K

Course Structure for M. Sc. Electronics

Effective from Academic Session - 2011

Semester: First

S. No.	Course No.	Course Name	Marks Written Examination	Continuos Assessment
I	ELE-101	Engineering Mathematics	80	20
II	ELE-102	Circuit Analysis and Synthesis	80	20
III	ELE-103	Linear Integrated Circuits and Applications	80	20
IV	ELE-104	Analog Communication Systems	80	20
V	ELE-105	Microprocessors: Architecture, Programming & Interfacing	80	20
VI	ELE-106	Laboratory –I	80	20
VII	ELE-107	Laboratory –II	80	20
Total			560	140
Grand Total			**700**	

Semester: Second

S. No.	Course No.	Course Name	Marks Written Examination	Continuos Assessment
I	ELE-201	Microwave Engineering	80	20
II	ELE-202	Design and Analysis of Active Filters	80	20
III	ELE-203	Computer Organization and Architecture	80	20
IV	ELE-204	Electronic Instrumentation	80	20
V	ELE-205	Power Electronics Circuits and Systems	80	20
VI	ELE-206	Laboratory- III	80	20
VII	ELE-207	Laboratory- IV	80	20
Total			560	140
Grand Total			**700**	

Semester: Third

S. No.	Course No.	Course Name	Marks Written Examination	Continuos Assessment
I	ELE-301	Physics of Semiconductor Devices	80	20
II	ELE-302	Digital Signal Processing	80	20
III	ELE-303	Control System Engineering	80	20
IV	ELE-304	HDL and Digital System Design	80	20
V	ELE-305(E1)	Microcontrollers and Embedded Systems	80	20
	ELE-305(E2)	Soft Computing		
	ELE-305(E3)	Advanced Communication Systems and Antennas		
VI	ELE-306	Laboratory-V	80	20
VII	ELE-307	Laboratory-VI	80	20
Total			560	140
Grand Total			**700**	

Semester: Fourth

S. No.	Course No.	Course Name	Marks Written Examination	Continuos Assessment
I	ELE-401	Digital Communications and Information Theory	80	20
II	ELE-402	VLSI Technology	80	20
III	ELE-403	CMOS Circuit Design: Analog and Mixed	80	20
IV	ELE-404(E1)	Computer Networks and Data Security	80	20
	ELE-404(E2)	Windows Programming		
	ELE-404(E3)	RF Circuit Design		
V	ELE-405	Seminar	x	50
VI	ELE-406	Project Work	150	50
VII	ELE-407	Industrial Training	30	20
Total			500	200
Grand Total			**700**	

Course No. ELE-101 Marks: 80

Engineering Mathematics

Unit I: Fourier Transform (10 Lectures)

Dirichlet's Condition, Determination of Fourier Coefficients, Fourier Series for arbitrary period, Half-wave expansion, Fourier Integral Theorem, Fourier Sine and Cosine integrals, Fourier Transforms: Properties of Fourier Transforms, Fourier Transform and Dirac delta function, Application of Fourier Transformation in Electronics.

Unit II: Laplace Transformation (10 Lectures)

Laplace transforms & its properties, Inverse of Laplace transform by partial fractions, solution of second order differential equation using Laplace transform, Application of Laplace transform in Electrical Networks.

Unit III: Function of Complex Variable (10 Lectures)

Analyticity of Complex variables, Cauchy Riemann Conditions, Cauchy integral Theorem, Laurent's Series, Singularities, Poles, Residues, Residue Theorem, Contour integration for Trigonometric functions (0 to 2π) , Contour Integration for functions ($-\infty$ to $+\infty$), Application of Functions of Complex variables in System Stability.

Unit IV: Numerical Methods (10 Lectures)

Eigen values and Eigen Vectors, Eigen values by iteration (Power method), Curve fitting methods: Method of least squares, first order differential equations, Methods for Partial differential equations, Implementation of Numerical Methods in C Programming.

Text Books:

1. Applied Mathematics for Engineers and Physicist by Pipes and Harvill, McGraw Hill Book Company.
2. Advanced Engineering Mathematics by Edwin Kreyzing, Wiley Eastern Ltd.
3. Advanced Engineering Mathematics by H. K. Das, S. Chand Publishing Company.

References:

1. Numerical Methods for Engineers and Scientists by A.C. Bajpai, I. M. Calus and J. A. Fairley, John Wiley & Sons
2. Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar, R. K. Jain. New Age International Publisher.
3. Statistical Methods by S. P. Gupta, S Chand and Company.
4. Numerical Methods for Engineers by Steven C. Chapra and Raymond P. Canale, TMH
5. Fourier Transformation and Laplace Transformations, Schaum Series Book , TMHCourse

No. ELE-102 Marks: 80

Circuit Analysis and Synthesis

Unit I: Graph Theory and Network Equations (10 Lectures)

Definition of Node, Branch, Graph, Sub-Graph, Path, Loop, Tree, Link and Twig, Isomorphism, Network Matrices, Incidence Matrix, Loop Matrix, Fundamental Loop, Cut - Set Matrix, Fundamental Cut Set, Relationship between Matrices, Formulation of Network Equations on the Loop and Node pair voltage bases, Fundamental Loop Mesh Equations, Nodal equations, Nodal Admittance, Source Transformations, Tellegen's Theorem and its Applications.

Unit II Two Port Parameters (10 Lectures)

Various Two Port parameters, O. C. Impedance and S. C. Admittance Parameters, h-parameters, chain Parameters, Image Impedance, Applications of various Two port Parameters to T and π networks, Relationship between different two port parameters, Interconnection of Two port equivalent networks, Indefinite Admittance Matrix.

Unit III: Network Functions and Responses (10 Lectures)

Concept of Complex frequencies, system functions of Network, Driving Point and Transfer functions, Poles and Zeros of a network function, Impulse and step response of a first order system, Poles, Zeros and Frequency response, Physical interpretation of Poles and Zeros, Oscillatory response of Poles and Zeros, Basic consideration in writing state variable equations for electrical Network, Formulation of state equations for Electrical Networks and their solutions.

Unit IV: Passive Network Synthesis (10 Lectures)

Introduction to passive network synthesis, Causality and stability, Hurwitz Positive Real Function (PRF), Basic Synthesis Procedure, Synthesis by inspection method, LC Immittance Functions *(realized by Foster-I and Foster II form, Cauer-I Form, Cauer-II Form),* RC Impedance Function, RL impedance , RC Admittance Functions.

Text Books:

1. Networks and Systems by D.R.Choudury, Wiley Eastern Ltd: New Delhi.
2. Network Analysis By M. E. Valkenburg , Prentice Hall India.
3. Basic Circuit Theory by Charles A. Desoer and Ernest S. Kun, McGraw H

References:

1. Circuit Analysis with Computer Application to Problem Solving by Gupta, Bayless and Piekari, Willey Eastern Ltd, New Delhi
2. Network Analysis theory and compute methods by donson and Watkins, Prentice Hall, New Delhi.
3. Circuit, Theory Fundamentals and Applications by Aram Budak, Prentice Hall.
4. Networks & systems by Ishfaq Hussain.

Course No. ELE-103 Marks: 80

Linear Integrated Circuits and Applications

Unit I: Operational Amplifier and Applications (10 Lectures)

Review of Op-amps, Practical Op-amp, Linear Applications, Frequency response of OP-Amps, Compensation: Pole–Zero compensation, Dominant pole compensation, Analog integration and Differentiation, Electronic analog computation, Active filters, Analog multiplexer, Logarithmic and Exponential amplifiers, Instrumentation Amplifier.

Unit II: Wave Shaping and Wave Generators (10 Lectures)

Comparators, Applications of comparators, Regenerative comparators (Schmitt-trigger), Square wave and triangular wave generators, pulse generators, voltage time-base generators, Step (Stair-case) generators, Sinusoidal Oscillators: Phase shift oscillator, Wien-bridge oscillator, Quadrature Wave Oscillator, Crystal Oscillator.

Unit III: Converters and Miscellaneous Applications (10 Lectures)

Voltage-to-Frequency and Frequency-to-Voltage Converters, Voltage-to-current and current-to-Voltage converters, Digital-to-Analog (Weighted Resistor, R-2R Ladder Network and IC Type) and Analog-to-Digital Converters (Flash, Successive Approximation, and IC type), Rectifiers, Clippers and Clampers, Peak Detector, Sample and Hold circuit.

Unit IV: Timer, PLL and Voltage Regulators (10 Lectures)

555 Timer: Applications as Astable and Monostable Multivibrator, Phase locked loop (PLL): Applications as Frequency Synthesizer, FM demodulator, PLL motor speed control, Voltage regulators: Fixed voltage regulators, Adjustable voltage regulators, switching regulators.

Text Books:

1. Microelectronics circuits By Sedra and Smith, HRW Publishing.
2. Integrated Electronics By Milliman, McGraw Hill Book Company
3. OP- Amp and Linear Integrated Circuits by R. A. Gayakward, Prentice Hall of India Ltd.

References:

1. Operational Amplifiers and Linear Integrated Circuits by Robert F. Coughlin and Frederick F. Drisiol, Gayakward, Prentice Hall of India Private Ltd.
2. Design with Operational Amplifiers and Analog Integrated Circuits, Sergio Franco, McGraw Hill, 2002.

Course No. ELE-104 Marks: 80

Analog Communication Systems

Unit I: Analysis and Transmission of Signals (10 Lectures)

Classification of signals, some useful signal operations, Signal Comparison: Correlation and Convolution, Convolution theorems, Signal representation by Orthogonal Signal Set, Aperiodic signal representation by Fourier Integral, Transform of some useful functions, some properties of Fourier Transform (Time Scaling Property, Frequency shifting property, Time shifting property), signal transmission through a linear system, ideal and practical filters, signal distortion over a communication channel, Concept of Distortion less Transmission through a system, signal energy and energy spectral density, signal Power and Power spectral density, relation between power spectral density and auto correlation.

Unit II: Amplitude (Linear) Modulation (10 Lectures)

Baseband and Carrier Communication, Amplitude Modulation with Full Carrier: Mathematical Analysis, Time domain and Frequency domain representation, Double Side band Suppressed Carrier (DSB- SC) System: Mathematical Analysis, Generation and demodulation of DSB- SC, Single Side band Suppressed Carrier (SSB- SC) System: Time domain description of SSB- SC Wave, Hilbert Transform, Properties of Hilbert Transform, Applications of Hilbert Transform, Generation and Demodulation of SSB- SC Wave, Vestigial Side Band (VSB) Modulation System: Time domain description, Generation and Demodulation, Quadrature Amplitude Modulation (QAM): Modulation and Demodulation.

Unit III: Angle (Exponential) Modulation (10 Lectures)

Concept of Angle Modulation: Phase modulation, Frequency modulation, Concept of Instantaneous frequency, Phasor Representation of Angle modulated signal , Single tone FM, Mathematical analysis of Single-tone Narrow-band FM (NBFM) and Broad-band FM (BBFM), Frequency deviation and Modulation index, Generation of NBFM and BBFM, using Direct Method, Reactance Modulator, Varactor Diode method, Indirect method of FM generation, Demodulation using Balanced frequency Discriminator, Slope detector, PLL- FM detector.

Unit IV: Performance of Analog Communication Systems (10 Lectures)

Random Process: Stationary and Ergodicity, Correlation functions and Wide sense stationary, Power spectral density of a Random process, Band pass noise model, Gaussian random process Noise in Communication System, Thermal Noise, Time-domain representation of Narrow band Noise, Filtered White Noise, Noise equivalent Band-width, Effective Noise temperature, Noise figure.AM Receiver model, Noise analysis of DSBSC and SSBSC using coherent detection, Noise in AM using Envelope detection, Noise in FM using Limiter-discriminator detection, FM threshold effect, Pre- emphasis and De-emphasis in FM.

Text Books:

1. Communication Systems by S. Haykin, Wiley Eastern Ltd, 3rd Edition
2. Communication Systems by B. P. Lathi, Wiley Eastern Ltd.
3. Communication Systems by RP Singh, S D Sapre, Tata McGraw- Hill Publishing Company

References:

1. Communication Systems by George Kennedy, McGraw Hill Book Co.
2. Principles of Communication Systems by Taub and Schilling, TMC Publishing Co.
3. Digital and Analog Communication Systems by Leon W. Couch, II, Pearsons Education.

Course No. ELE-105 Marks: 80

Microprocessors: Architecture, Programming and Interfacing

Unit I: Introduction to Microprocessors (10 Lectures)

Evolution of microprocessors and microprocessor based systems, Applications of Microprocessors. Various emerging trends in Microprocessor Design, Introduction to 8086 Microprocessor, Architecture of 8086 Microprocessor, Functions of BIU, EU, Working of 8086 Microprocessor, Various Registers of 8086 Microprocessor and their purpose, Addressing Modes of 8086 microprocessor, Memory Segmentation in 8086 Microprocessor.

Unit II: Programming (10 Lectures)

Introduction to Programming, Various level of Programming, Assembly language programming, Assembler, Linker, Debugger, Instruction set of 8086 Microprocessor, Data transfer instructions, Arithmetic and Logical instructions, Branch Instructions, Processor control instruction, String operation instructions. Assembly language Programming for 8086 microprocessor. Use of Procedures and Macros in ALP. Use of low level features of C language.

Unit III: Interrupts (10 Lectures)

Introduction to interrupts and Interrupt service subroutines, 8086 Interrupt Structures, Interrupt Vector table, various types of Interrupts, Software Interrupts, Hardware Interrupts, Multiple Interrupts, Input /Output structure, Device Access, Operating Systems Calls, BIOS Calls and Direct Device Access, 8259 Programmable Interrupt Controller-Features, Block Diagram, Control & status registers, Interfacing & Programming, Hardware Specifications of 8086 Microprocessor, Pin-out diagrams and Function of each pin, Various Types of 8086 microprocessor, Architecture and operation of 8284A Clock Generator, Buffering and Latching of 8086 Microprocessor, Bus timings, Timing Diagrams, Wait States, Minimum Mode 8086 System, 8288 Bus Controller, Maximum Mode 8086 System, Introduction to intel 32 and 64 bit processors.

Unit –IV: Interfacing (10 Lectures)

Peripheral Devices and Interfacing, Introduction to memory and its types, Memory Device specifications, Memory interfacing, Memory mapped and I/O Mapped Schemes, Use of Decoders, Even and Odd Addressing. Data Transfer Schemes, I/O Interfacing, Isolated and Memory Mapped I/O instructions, Ports. Study of Peripheral chips: Features, Block Diagram, Control & Status Registers, Operating Modes, Interfacing & Programming of: 8255 Programmable Peripheral Interface, 8237/8257 Programmable DMA controller, 8254 Programmable Interval timer, DAC0830 Digital to Analog Converters, ADC0804 Analog to Digital Converters, 8279 Keyboard and Display Controller, 8251/16550 (USART), Overview of 8087 co-processor.

Text Books:

1. Microprocessor Theory and Applications, M. Rafiq-u Zaman, McGraw Hill Publishing Company.
2. Microprocessor and x86 Programming, V. R. Vengopal, McGraw Hill Publishing Company
3. The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, and Application by W. A. Treibel and Avtar Singh, Prentice Hall.

References:

4. Introduction to 8086, 80186,80286, 80386, 80486, Pentium and Pentium Pro Processors, B. Bray, Tata McGraw Hill Publishing Company
5. Microprocessors and Interfacing Programming and Hardware, D. Hall, TMG

Course No. ELE-106 Marks: 80

Laboratory – I

Section I. (Experiments on Basic Analog Electronics)

S. No	*Title of Experiment*
1.	Implementation of the following logic gates using Diodes/ BJT's. I) NOT II) AND III) OR IV) NAND V) NOR
2.	To study and design an RC coupled amplifier using BJT and FET.
3.	To Verify that in a current mirror, the output current is equal to input current.
4.	To measure the following parameters of 741 op-amp IC. I) Open-loop gain, II) Output Offset voltage, III) CMRR, IV) Slew rate.
5.	Using op-amps design the following: I) Inverting amplifier, II) Non-inverting amplifier, III) Buffer, IV) Scale changer, V) Adder, VI) Subtractor.
6.	Using op-amps design the following: I) Differentiator, II) Integrator. III) Zero Crossing Detector, IV) Comparator.
7.	To study the frequency response of op-amp using its pole model.
8.	To design and realize voltage to current converter using op-amps with I) Floating load, II) Grounded Load, and also find its conversion factor.
9.	To design and realize current to voltage converter and also find its conversion factor.

Section II. (Experiments on Advanced Analog Electronics)

S. No		*Title of Experiment*
10.		To study and design AC coupled amplifier using op-amp.
11.	a)	To design and realize 1st order LP, HP filters using op-amp and compare their theoretical and practical values of cut-off frequency.
12.	b)	To design and realize 1st order BP and BR filters using 1st order LP and HP filters. Compare the theoretical and practical values of ω_0.
13.		Study & Design Sample & Hold circuit.
14.	a)	To design and realize analog to digital converters using Op-Amp.
15.	b)	Study of ADC Chips (AD0808)
16.	a)	To design and realize digital to analog converters using Op-Amp.
17.	b)	Study of DAC Chips (DA0808)
18.		Study analog multiplexer 4066/4051 IC for parallel to serial conversion.
19.		To design and realize Log and exponential amplifiers using Op-Amps.
20.		To design and realize OA (741IC) as Schmitt trigger and measure its hysteresis.
21.	a)	To design and realize OA based Clipper and Clamper.
	b)	To design and realize Op-Amp based full wave and half wave precision rectifier.
22.		To design and realize OA based pulse generator.
23.		To design and realize voltage controlled oscillator using op-amp.
24.	(a)	To design and realize a square wave generator using OA.
25.	(b)	To design and realize Wein-Bridge Oscillator using OA.
	(c)	To design a RC phase shift oscillator using Op-amp of a particular frequency.
		To study the 565 IC in free running mode & also compare the theoretical & practical values of Lock-in range, Pull-in range, Free running frequency.
26.		To design and test a frequency synthesizer using PLL 565 IC.
27.		555 Timer as Astable and monostable vibrator

Section III. (Experiments on Electronic Communication)

S. No		*Title of Experiment*
28.	(a)	Study of Four quadrant Analog multiplexer IC's.(AD633/AD734)
29.	(a)	Design and realize AM modulator using Square Law modulator and calculate its modulation index and power.
	(b)	Design and realize AM detector using Square Law detector and Envelope detector.
31.	(a)	Design and realize DSB-SC signal Modulator using Analog Multiplier.
	(b)	Design and realize DSB-SC signal demodulator using Coherent detection and Squaring loop.
32.		Simulation of SSB-SC modulator and demodulator using MATLAB/Simulik.
33.		Simulation of Hilbert transformer and VSB filter using MATLAB/Simulink.
34.	(a)	Derivation of modulation index in case of FM signal.
	(b)	To design and realize Direct method of FM generation and calculate its frequency deviation and modulation index.
35.		To study and realize VCO as a FM generator.
36.		To study and realize Phase locked loop FM generator.
37.		To study and realize Astable multivibrator as FM generator.
38.		To study and realize frequency discrimination method for FM demodulation.
39.		To study and realize PLL as FM detector.
40.		To study & realize Op-amp based Pre-Emphasis & De-Emphasis circuits.
41.		Field study/ Visit to Radio Kashmir Sgr. & local exchange.

Section IV. (Experiments on Circuit Analysis)

S. No		*Title of Experiment*
42.	(a)	Find the branch currents and branch voltages of a given network using mesh analysis and compare them with the theoretical values.
	(b)	Find the branch currents and branch voltages of a given network using node analysis and compare them with the theoretical values.
43.	(a)	For a T and ∏ network find open circuit and short circuit parameters.
	(b)	Verify that the overall ABCD parameters of a cascade of two networks are equal to the sum of individual ABCD parameters.
44.	(a)	Study the pole-zero response of a network function using Matlab.
	(b)	Study the effect of the variation in poles and zeros on the frequency response of a network function.
45.		Synthesize and realize a given network function using I) Foster form-I/II, II) Cauer form-I/II. Also verify the results obtained using Matlab.
46.	(a)	For any DC network show that power is maximum when load resistance is equal to the source resistance. Using Matlab plot power, voltage, and current v/s load resistance.
	(b)	Plot the response of 1^{st} and 2^{nd} order systems for the following inputs. (i) Impulse (ii) Step and (iii) Ramp.

Course No. ELE-107 Marks: 80

Laboratory – II

Section I. (Experiments on Digital Electronics)

S. No		*Title of Experiment*
1.	(a)	To design and realize Half and Full Adder Circuits using basic logic gates/universal gates.
3.	(a)	To design a 4-bit magnitude comparator using basic/universal logic gates.
4.		To design a digital clock using IC's.
5.	(a)	To design a 4:1 multiplexer and 1:4 de-multiplexer circuits using basic/universal logic gates.
	(b)	To implement a 4/5 variable Boolean function using a suitable MUX.
6.	(a)	To design a 2^n to n line encoder using basic universal logic gates.
	(b)	To design a control signal generator for 2^n :1 MUX and 1: 2^n DEMUX using decoder.
7.	(a)	Design a BCD to 7 segment decoder using IC's(7447).
	(b)	To design a circuit that can encode a particular sequence and decode the same sequence.
8.	(a)	To design a ROM that can store a particular sequence.
	(b)	To implement a 4/5 variable Boolean function using ROM and decoders.
9.	(a)	To design the following flip-flops using universal gates. I) S-R flip-flop II) D flip-flop III) J-K flip-flop and IV) T flip-flop
	(b)	Study race around condition of J-K flip-flop and design edge-triggered J-K-flip flop and M/S flip-flop to eliminate race around condition.
10.	(a)	To design an n-bit serial adder using full adder and D type flip flop IC's.
	(b)	To design a universal shift register and demonstrate SISO, SIPO, PISO and PIPO functions.
11.	(a)	To design a modulo-n Asynchronous and synchronous counter using JK/T-Flip Flop IC's.
	(b)	To design an up-down synchronous counter with direction control that can count a particular sequence.
	(c)	To design Jhonson & Ring counter.

Section II. (Experiments on Programming -Applications to Electronics)

12. a) Write a program to evaluate the sine series using the following formulas:

$$\text{Sin}(x) = x - x3/3! + x5/5! - x7/7! + \text{--------}$$

OR

$$\text{Sin}(x) = \sum_{n=0}^{\infty} [(-1)n * x(2n+1)]/(2n+1)!$$

Use recursive function.

13.. a) Write a program to evaluate the cosine series using the following formulas:

$$\text{Cos}(x) = 1 - x2/2! + x4/4! - x6/6! + \text{--------}$$

$$\text{Cos}(x) = \sum_{n=0}^{\infty} [(-1)n * x2n]/(2n)!$$

Use recursive function.

14. a) To determine the value of a given Resistor from its color Code.
b) To match a frequency with the various divisions of the frequency spectrum and display its location.

c) To check whether a transistor is NPN or PNP.

d) To accept the name of a transistor and output the package type, manufacturer, operating frequency range, and material used.

e) To accept parameters of a transformer and calculate its output voltage.

f) To accept one of the three parameters (peak voltage, average and rms) of a signal and calculate the other two parameters in half-wave and full-wave rectifier along with ripple factor.

g) To accept the changes in the current IB, IC, and IE of a transistor and calculate the current amplification factors in cases of common-base, common-emitter, and common-collector amplifiers.

h) To calculate the extreme points of a load line and operating point using the given parameters.

i) Current flowing through a Semiconductor diode is given by

$$I_D = Is[\exp(v_D/nv_{th}) - 1]$$

Where VD is Voltage across diode, Is is saturation current, n is Emission coefficient and Vth is Thermal voltage. Write a program to calculate and plot the current flowing through the diode for voltages from –4.0 Volts to 1.0 Volts in steps of 0.1.

15. a) Write down a program which will convert a decimal number to its equivalent representations in hexadecimal, octal and binary number systems. The program should display the number in all of above number systems.

b) Write a C program that converts a decimal number to its equivalent number in new base. The decimal number and the new base are to be read as command line arguments.

16. Write down a program to compute

a) Equivalent resistance of the resistors connected in
I). Series, II). Parallel.

b) Equivalent capacitance of the capacitors connected in
I). Series, II). Parallel.

c) Equivalent inductance of the inductors connected in
I). Series, II). Parallel.

17. a) Write down a program to calculate the output voltage for Damped Sinusoidal Oscillator.

b) Write down a program to calculate the oscillating frequency of a damped RLC circuit.

c) Calculate the energy stored in an inductor which is given by:

$$E = \tfrac{1}{2} \times \text{inductance} \times \text{current } 2$$

18. Write down a program to calculate the total percentage Harmonic Distortion of a device for the given strengths of fundamental and harmonic components.

19. Write down a program to evaluate F(x, y, z) which is given as:

$$F(x,y,z) = \begin{cases} R(x + y), \text{ when S1 is on and others are off} \\ R(x + z), \text{ when S2 is on and others are off} \\ R(z + y), \text{ when S3 is on and others are off} \\ R(x2+z), \text{ when S4 is on and others are off} \\ R(y2+x), \text{ when S5 is on and others are off} \\ R(x2+z2), \text{ when S6 is on and others are off} \end{cases}$$

Where x, y, z are the diode, transistor and FET currents respectively and R is the load resistor for the given specification.

20. Write a program to accept the color code of resistors and sort them in ascending or descending order of their values using arrays.

21. Write a program to read a string and a key. Encrypt the string using this key. Display the encrypted string. In the same program read the key again decrypt the string and display the original string using functions.

22. Write a computational program for solving simultaneous algebraic equations by Guassian Elimination method and use it for solving a given linear network.

Section III. (Assembly Language Programming)

S. No	*Title of Experiment*
23	Addition/Subtraction of 8, 16 and 32 bit numbers.
24	Multiplication/Division of 8, 16 and 32 bit numbers.
25	Addition of array of 8-bit and 16-bit numbers.
26	Finding Maximum and minimum in an array of 8-bit and 16-bit numbers
27	Reading a 2 digit decimal number and validating the input.
28	Display a 2 digit number.
29	To compute factorial of an integer
30	Compute of sum of a given series.
31	Display bit pattern of a register.
32	Compute LCM/GCD of two positive integers.
33	Number system conversion/code conversion
34	String operation: Copy, Change, read display
35	Addition and Subtraction of two packed BCD's numbers.
36	ASCII multiplication Display Message using : Macros C/S only C/S and DS
37	C/C++ programming File Directory operations: Rename a file Delete a file
38	Copy a file Display a text file Create/Delete a directory Change file attributes
39	Using BIOS and MS-DOS interrupts
40	Display machine configuration
41	Compute Square root of a number by Newton-Raphson method
42	Compute factorial using recursion
43	Use of procedures/Macros in Assembly Language Programming.
44	Write a short program that uses XLAT instruction to convert the BCD number 0-9 to ASCII coded numbers 30H-39H. Store the ASCII coded data in a table located within the data segment.
45	Develop a procedure that finds the area of a rectangle. Use stack for parameter passing.
46	To find the largest signed number in a given series of data.
47	To copy a block of data from one meory to another.
48	Multiplication by repetitive addition method, multiplication using MUL
49	instruction, signed multiplication, BCD multiplication.
50	16 bit by 8 bit division, division using DIV instruction, signed division, BCD division
51	Hexadecimal to ASCII conversion and vice versa
52	ASCII to packed BCD conversion and vice versa
53	Factorial of a given number using recursion.
54	Reverse a given string
55	Sorting techniques – Bubble sort, insertion sort, selection sort
56	Stepper Motor Interface
57	7 segment LED display interface

58 Use of low level features of C Language.
59 Bit wise operators, interrupt functions, and inline Assembly instructions.

Section-IV (Microprocessor Interfacing)

S. No	*Title of Experiment*
60	Write an 8086 ALP to accept the scan codes of the movement keys of keyboard with the help of BIOS Intrrupt.
61	Write a programme to encrypt and decrypt a text message stored in a file.
62	Write a programme using 8086 microprocessor to interface a two digit number using 7-segnmnt LED. Use 8086 microprocessor and 8255 PPI.
63	Write a programme to control the operation of a steeper motor using 8086 and 8251 PPI.
64	Wave form generation using DAC modules and 8008 microprocessor (Square wave, etc.)
65	Steeper motor interfacing with 8086μp
66	LED/LCD interfacing with 8086μp.
67	ADC interfacing with 8086 μp.
68	Traffic controller
69	ST/DC controller with 8086 μp.
70	Study of programmable I/O ports of 8051 μC
71	Write a TSR programme in 8086 ACD to implement Real time clock (RTC) and real time from cosmos chip by suitable INT and function and display the RTC at the bottom right corner on the screen. Access the video RAM directly in your routine.
72	Write a TSR programme in 8086 ALP to implement screen saver. It should get activated if there is no keyboard activity for a period of 7 seconds. Access the video RAM directly in your routine.
73	Write a TSR programme in 8086 ALP to handle the "Divide by zero" interrupt. Test your programme with a small code which ?? the divide by zero interrupt.
74	Write a TSR programme in 'C' that would change the color of the screen every 10 seconds.
75	Interfacing and use of 8255 in various I/O modes including ?? mode.
76	Write a 8086 ALP to programme 8254 in mode, modify the programme for h/W re-triggerable mono shot mode. Generate a square wave with a pulse of 1ms. Compare on the difference between H/W trigger and S/W trigger stroke mode. Observe the waveform at gate and out pin and IC8254 on CRO.
77	Use of 8086 trainer kits and different interfacing modules.

Semester- II

Course No. ELE-201 Marks: 80

Microwave Engineering

Unit-I: Electromagnetic Field Theory (10 Lectures)

Review of Electrmagnetics and EM spectrum, Maxwell's equations in differential and integral form. Equations of continuity for time varying fields, inconsistency of Amperes law, Displacement current (Physical interpretations), Time varying field equations Boundary condition, solution of wave equation in free space and conducting media, wave propagation in a lossless & conducting medium, wave Polarization, Reflection and Refraction of plane waves at plane boundaries: Perfect conductor, Perfect dielectric, insulator, surface impedance, Pointing vector and Pointing theorem.

Unit II: Microwave Transmission Lines (10 Lectures)

Transmission Line and Distributed parameters, Basic Transmission line equations, Solutions, Distortions in Transmission line, Condition for Distortion less line, Characteristic impedance, Propagation Constant, Reflection and Transmission coefficients, Standing wave and Standing wave ratio, Impedance matching by Stubs and Tapped Quarter wave line-Transformer, Transmission line as circuit element, Short circuited line, line transmitted by arbitrary load.

Unit –III Micro wave Waveguides and Components (10 Lectures)

Fundamentals of Microwave Waveguides, Rectangular Waveguides, solution of wave equations in rectangular coordinates, TE & TE modes in Rectangular magnitudes, excitation of modes in Rectangular Wave guides, Degenerative & dominant modes, S-Parameters:
Microwave Hybrid Circuits: Waveguide tee: E-plane tee, H-plane tee , Magic tee, hybrid rings (rat-race circuits), directional Couplers, S-Matrix of direction Coupler . Circulators and isolators. Microwave filters, Duplexers

Unit IV: Microwave Amplifiers & Oscillators (10 Lectures)

Microwave tubes: lead inductance and Inter electrode capacitive effects Transient angle effect, Gain bandwidth Limitation, Microwave Resonators: Parallel wire and Coaxial Resonators, Cavity Resonators, Klystrons: Multicavity Klystron and Reflex Klystron, Magnetron oscillator (cylindrical), Gunn Oscillator, Gunn Oscillator circuits. Parametric amplifier, Introduction to Strip lines: Micro strip and Parallel Strip lines.

Text Books:

1. Microwave Devices and circuits by Samuel Y. Liao
2. Microwave Principles By Herbert J. Reich
3. Foundations for Microwave engineering by Robert E. Collin
4. Elements of Engineering Electromagnetics by Nannapaneni Narayana Rao
5. Electromagnetic Field theory by Rishabh Anand

Course No. ELE-202 Marks: 80

Design and Analysis of Active Filters

Unit I: Filter Approximation Models (10 Lectures)

Introduction to Active filter theory, Filter approximations: Butterworth approximation, Chebyshev approximation and inverse Chebyshev approximation, Elliptic filters, Bessel filters, Frequency transformations, low- pass lowpass, low-pass highpass, lowpass-bandpass and low pass - band reject transformations.

Unit II: Active filter synthesis and Sensitivity analysis (10 Lectures)

Cascade approach, Simulated Inductance Approach, Operational Simulation of LC ladders and FDNR approach. Immitance converters and inverters, Generalized Impedance converter. Sensitivity study, Sensitivity function, magnitude and phase sensitivities, single parameter sensitivity, multiple parameter sensitivity, gain sensitivity, root sensitivity, general relation of network function sensitivities.

Unit III: Transconductance-C filter design (10 Lectures)

Introduction to current mode circuits, Operational Transconductance Amplifier (OTA): Salient Features, Circuit Description of OTA, Advantages, limitations. Elementary Transconductor Building Blocks: Resistor, Integrator, Amplifier, summer, gyrator and Modulator. First and second order Filters, High-order filters.

Unit IV: Switched Capacitor filters (10 Lectures)

MOS switch, Switched capacitor/resistor equivalence, analysis of switched capacitor filter using charge conservation equations, First-order building blocks (Inverting and Non-inverting Amplifier, Integrator and Differentiator), Sampled-Data operation, Switched capacitor first and second order Filters, Switched capacitor High-order filters.

Text Books:

1. Analog Filters, Second Edition, Kendall Su, Kluwer Academic Publishers, 2002
2. Design and Analysis of Analog Filters: *A Signal Processing Perspective*,, Larry D. Paarmann, Kluwer Academic Publishers, 2003.

References:

1. Analog Filter Design, M. E. Van Valkenburg and Rolf Schumann, Oxford University Press, 2005.
2. Demystifying Switched-Capacitor Circuits, Mingliang Liu, Newnes, Elsevier, 2006.

Course No. ELE-203 Marks: 80

Computer Organization and Architecture

Unit- I: Introduction (10 Lectures)

Review of Number Systems, Computer Level Hierarchy, Evolution of Computers, Von-Neuman Architecture, Structure and Components of Computers, Computer Functions, Instruction Execution and Instruction Cycle State Diagrams, Computer Buses, Bus Interconnection and Hierarchy, Elements of Bus Design, Bus Arbitration and Timings, introduction to High speed buses. Measuring Performance – MIPS, FLOPS, CPI/IPC, Benchmark, Geometric and Arithmetic Mean, Speedup, Amdahl's and Moore's Laws.

Unit –II: Instruction and Register Set and Input/output (10 Lectures)

Instructions and Instruction Set–Characteristics, Types, Functions, Execution, Representation, Format, Addressing Modes, CPU Registers – Organization, Programmer Visible, Status/Control, Accumulator, and general purpose registers, Stack based CPU, Micro-operations and RTL – Register Transfer, Bus and Memory Transfer, Arithmetic, logical and shift micro-operations, Implementation of simple Arithmetic, logical and shift units, Micro-operations and instruction execution, I/O Organization – I/O Module, its functions and structure, I/O Techniques, Introduction to I/O Interfaces

Unit III: Data Representation, ALU and Control Unit (10 Lectures)

Scaler Data Types Sign Magnitude, One's and Two's Complement representations of Integers, Integer Arithmetic's (Negation, Addition, Subtraction, Multiplication, Division, Incrementation and Decrementation). Booths Algorithms and Hardware Implementation. Floating Pont Representation and IEEE Standards. Floating Point Arithmetic's (Negation, Addition, Subtraction, Multiplication and Division). ALU– Fixed and Floating point ALU Organization. Control Unit – Functional Requirements, Structure, Control Signals, hardware and Micro-programmed /Wilkes Control unit, Micro-instructions and its formats, Control Memory. Introduction to Pipelining and Parallel Processing.

Unit –IV: Memory and Storage (10 Lectures)

Memory Hierarchy, types and Characteristics, Primary Memory- Types, Working, Chip Organization, Expansion, Cache Memory- Mapping Schemes, Replacement Policies, Hit and Miss, Write policies, Coherence. Computer Storage–Magnetic and Optical Storage Organization and Format, Operating System Support, Virtual Memory–Overlays, Paging, Segmentation and Fragmentation, Introduction to RAID, and CAM.

Text Books:

1. Computer Organization and Architecture by Stallings, PHI.
2. Computer Organization by M. Mano, PHI.
3. Computer Organization and Architecture By Gilmore, TMH.

References:

1. Computer Organization and Design, Patterson Henessney, Harcourt India
2. Computer Organization by J. P. Hayes.Tata McGraw Hill.

Course No. ELE-204 Marks: 80

Electronic Instrumentation

Unit I: Measurements and Transducers (10 Lectures)

Fundamentals of Measurements: General Concepts on Instruments; Introduction to Portable Instruments; Errors, Controlling and Networking of Instruments; Signals and Signal Conditioning; Noise and Interference.
Transducers: Classification of transducers, characteristics and choice of transducers; Resistance, Capacitance, Peizoelectric, Thermoelectric, Hall effect, Photoelectric, Techogenerators, Measurement of displacement, velocity, acceleration, force, torque, strain, speed, and sound, temperature, pressure, flow, humidity, thickness, pH, position.

Unit II: Digital Measurements (10 Lectures)

Counters, Digital frequency and time meters, Universal counter timer. Digital Voltmeter: General Characteristics, Ramp type DVM, Staircase ramp DVM, Successive approximation type DVM, Integrating type DVM Dual slope A/D DVM, Digital ohm meter, Digital capacitance meter, Digital modulation index meter, Digital quality factor meter, Digital tan delta meter, Digital IC tester.

Unit III: Measurement Instruments (10 Lectures)

Oscilloscopes: The basic operation of an oscilloscope, advanced techniques: Multiple time bases, Oscilloscopes with dual channels and dual time bases, Use of low cost microprocessor blocks, Digital storage oscilloscopes (DSOs): Sampling techniques, DSO characteristics, Recent developments on DSO techniques
Spectrum analyzers: Spectrum Analysis, Types of spectrum analyzer: Real time technique, Fourier transform analyzer, swept tuned analyzer, Superheterodyne spectrum analyzer
Logic analyzers: Basic operation of Logic analyzer, Digital circuit testing and logic analysis, Types of analysis.

Unit IV: Biomedical and Analytical Instrumentation (10 Lectures)

Electrophysiology: Membranes, Bioelectric Current Loops, Membrane Currents, Membrane Polarization, Action Potentials, Initiation of Action Potentials, Propagation, Stimulation, Bio magnetism.
Principles of Electrocardiography: Electrodes, sensors, signals, noise, Cardiac assists devices; Principles of Electromyography, Principles of Electroencephalography; Principles of Blood pressure; Introduction to Electron Microscope, Spectrophotometers and X-ray diffractometer.

Text Books:

1. Digital and Analogue Instrumentation testing and measurement, Nihal Kularatna, The Institution of Electrical Engineers, 2003
2. Measurement, Instrumentation and Sensors Handbook, J. G. Webster, CRC Press, 1999.
3. Digital Measurement Techniques by T. S. Rathore, Narosa Publishing House, New Delhi.

References:

1. The Biomedical Engineering Handbook, Third Edition, Biomedical Engineering Fundamentals, Edited by Joseph D. Bronzino, CRC Press, 2006.
2. Modern Electronic Instrumentation and Measurement Techniques by Cooper and Helfrick, PHI.
3. Electronic Instrumentations and Measurements by Larry Jones and A. Foster Chin, John Wiley

Course No. ELE-205 Marks: 80

Power Electronic Circuits and Systems

Unit I: Power Devices (10 Lectures)

Review of switching characteristics of semiconductor devices *(Power diodes, BJT's,),* Thyristor construction and characteristics, Methods of turning ON, Turn-off mechanism, effect of high di/dt and dv/dt , Snubber circuits, Gate triggering circuits, Device specifications and ratings, DIAC, TRIAC and UJT V-I characteristics, Base drive for BJT.

Unit II: Thyristor Circuits and Applications (10 Lectures)

Controlled rectifiers, AC voltage controllers, Principle of ON- OFF control, Principle of phase control, Single phase bi-directional controllers with resistive loads, Commutation techniques: Natural commutation, Impulse commutation, complementary commutation, external pulse commutation, Load side and line side commutation, Series and Parallel combination of SCRs.

Unit III: Switch Mode DC to DC Power Converters (10 Lectures)

Principle of step down and step up operation, Performance parameters of DC-DC converters, Design of BUCK converters, BOOST converters, BUCK–BOOST converters, Forward converter, Fly back converter, Half-Bridge converter, Push Pull converter and Full Bridge converter.

Unit IV: Inverters and Cyclo-converters (10 Lectures)

Pulse width modulation techniques, Inverter: Principle of operation, performance parameters Design of inverters, Single-phase half bridge inverter, Single phase full bridge inverter, Single phase push pull inverter, Analysis in each case (for resistive and inductive loads), Cyclo-converters: step up and step down , design of single-phase step down Cyclo-converters , Power supplies: SMPS, UPS.

Text Books:

1. Power Electronics, Circuits, Devices and Applications by M. H. Rashid, PHI.
2. Power Electronics by Mohan, Undeland, Robbins, John Wiley and Sons.

References:

1. Power Electronics by P. C. Sen, Tata McGraw Hill, Pub. Co.
2. Introduction to Thyristors and their Applications, by M. Ramamorty .
3. Industrial Electronics and Control by S. K. Bhatchayrya and S. Chatterjee TTTI, Chandigarh, Tata McGraw Hill, Pub. Co.
4. Power Electronics by MD Singh and K. B. Khanchandani, Tata McGraw Hill, Pub.

Course No. ELE-206 Marks: 80

Laboratory–III

Section I. (Experiments on Power Electronic Systems)

1. Study switching characteristics of Power transistors and power MOSFETs.
2. To study IV characteristics of SCR and find its break over voltage on state resistance, holding current and latching current
3. To study IV Characteristics of DIAC and find its breako ver voltage.
4. To study IV Characteristics of TRIAC
5. To study IV Characteristics of UJT.
6. To design and realize UJT relaxation oscillator.
7. Thrystor triggering circuits: a) To study RC triggering for SCR, b) To study SCR triggering using UJT
8. Controlled rectifiers: a) To study and realize half wave controlled rectifiers using SCR. B) To study and realize Full wave controlled rectifiers using SCR.
9. To study AC voltage control using DIAC TRIAC combinations.
10. To study self commutation of SCR.
11. To design and realize step up and step down chopper.
12. To design and realize buck Regulator.
13. To design and realize Boost Regulator.
14. To design and realize Buck-Boost Regulator.

Section II. (Experiments on Design and Analysis of Active Filters)

1. Study of CA3080 OTA chip
2. Design OTA based
   a. Voltage amplifier (I & NI)
   b. Simulated Resistor (Grounded & Floating)
   c. Simulated Inductor (Grounded & Floating)
   d. Amplifier summer
   e. Integrator (I & NI)
   f. Differentiation (I & NI)
   g. Gyrator
3. Design of OTA based low and high order fitters.
4. Designs an OP-amp based GIC and verify it for inductor simulation.
5. Design OP-amp based LP, HP, BP BS and AP filleting function using and study the effect of cascading .
6. Design LC Ladder based 2^{nd} order LP/HP/BP/BS filtering functions using simulated inductance approach.
7. Design LC Ladder based 2^{nd} order LP/HP/BP/BS filtering function using FDNR approach.
8. Study the transformation of a given filtering function into the remaining filtering functions & verify them by using theoretical transformations..
9. Design a 2^{nd} order Chebyshev LP filtering function & compare it with the designed 2^{nd} order Butterworth LP filtering function.
10. Design a 2^{nd} order Inverse Chebyshev LP filtering function & compare it with the designed 2^{nd} order Butterworth & Chebyshev LP filtering function.
11. Design the Sallen-key & GIC-module based 2^{nd} order biquads and study their sensitivity performances with respect to various components.
12. Design a simulated resistor of a givenen value using switched capacitor fitter.
13. Design of Switche capacitor building blocks (Inverting and Non-inverting amplifier, Integrator and Differentiator)
14. Design I^{st} order 2^{nd} order filtering functions using SCF.

Course No. ELE-207 Marks: 80

Laboratory–IV

Section I. (Experiments on Microwave Engineering)

1. Study of different Microwave guide components.
2. To determine the frequency and wavelength in a rectangular wave guide working on TE 10 mode.
3. To determine the standing wave ratio and reflection coefficient.
4. To measure an unknown impedance with smith chart.
5. To study VI characteristics of Gunn diode.
6. To study O/P power and frequency as a function of voltage in case of Gaunn diode.
7. Study of Magic tee.
8. Study of characteristics of Klystron tube and to determine its electronic tuning range.

Section II. (Experiments on Electronics Instrumentation)

1. Study of temperature transducers: (any 2)
   RTD, Thermocouple, Thermistor
2. Study of displacement transducers:
   a. Inductive
   b. Capacitive
   c. Resistive
3. Study of weight measurement using strain guage.
4. Study of speed measurement using:
   a. Magnetic pickup
   b. Photoelectric pick up
5. Study of pressure measurement using Bourdan tube.
6. Study of various transducers characteristics (5 Practicals).
7. Measurement of various physical parameters using modules (5 Practicals).
8. Design of Frequency meter.
9. Design of time meter.
10. Design & analyze of Ramp type DVM.
11. Design & analyze staircase type DVM.
12. Design & analyze of SAR type DVM.
13. Design & analyze of Integrator type DVM.
14. Design & analyze of Digital Ohm meter.
15. Design & analyze of Capacitance meter.
16. Design & analyze of Modulation index meter.
17. Design & analyze of quality factor.
18. Design of digital IC tester.
19. Study of DSO and measurement of electrical parameters using DSP.
20. Study of spectrum analyzer.
21. Study of logic analyzer.

Section III. (Experiments on Computer Organization)

1. To design a voting system using full and parallel adders.
2. To design a 4-bit parallel binary subtractor using adders.
3. To design 16-bit parallel binary adder using 4-bit parallel adders.
4. To design a circuit that can compare two 8-bit numbers and report the result of comparison.
5. To design 4-bit ALU.

Course No. ELE-301 Marks: 80

Physics of Semiconductor Devices

Unit I: Crystal Structure and Carrier Transport (10 Lectures)

Crystal Structure, Space lattices, Primitive and Unit Cell, Index system for crystal planes, Separation between the parallel planes of a cubic crystal, Description of Schrodinger wave equation, Physical interpretation of wave function, Kroning Penney Model, K-space diagram, Effective mass, Concept of Hole, Derivation of Density of state functions, Fermi-Dirac Distribution function, Carrier concentration at thermal equilibrium, Carrier transport Equation ,Decay of photo excited carriers, carrier lifetime, Hall effect.

Unit II: Semi conductor diodes (10 Lectures)

Abrupt and Graded PN junction, Depletion capacitance, Current- voltage characteristics of PN junction, Diffusion capacitance, Junction breakdown phenomenon, Metal-Semiconductor contact, Energy band diagrams, Schottky effect, Current transport based on thermionic Theory.

Unit III: Bipolar and Field Effect Transistors (10 Lectures)

Bipolar junction transistors, current gain parameters, minority carrier distribution and terminal currents, Eber-Moll model, Field effect transistors, JFET and MOSFET- Basic device characteristics with analysis, MOS Capacitors, MOSFET Types- Basic device Characteristics with analysis, Equivalent Circuit.

Unit IV: Microwave and Opto Electronic Devices (10 Lectures)

IMPATT: Static and Dynamic Characteristics, Small signal analysis, Transferred Electron Device, Negative differential resistivity, Transferred Electron Model, Modes of operation, Opto-Electronic Devices: P-N Junction Solar Cells, V-I Characteristics, Ideal Conversion efficiency, and spectral response

Text Books:

1. Physics of Semiconductor Devices S. M. Sze, , Wiley eastern Ltd.
2. Electronic Processes in Semiconductors, Azeroff and Brophy, McGraw Hill Publishing company.
3. Physics and Technology of Semiconductor Devices A. S. Grove, , John Wiley and Sons, New York.
4. Solid State Electronic Devices Ben G. Streetman, , Prentice Hall of India Ltd, N. Delhi.
5. S. M. Sze, VLSI Technology, McGraw Hill Publishing Company.

ELE-302 Marks**:** 80

Digital Signal Processing

Unit-I: Discrete Time Signals and Systems (10 Lectures)

Review of Signals and Discrete Time Systems, Properties of Systems, Difference Equations: FIR systems, IIR systems, Recursive Systems, Non- recursive Systems, Representation of LSI systems by Constant Coefficient Equations, Correlation: Cross- Correlation and Auto- Correlation, Properties, A/D Conversion Process: Sampling, Frequency Relationships, Aliasing, Quantization, Encoding, Anti Aliasing Filter. Fourier Series and Fourier Transform, Sampled data and discrete time convolution, Z-transform, and its Properties.

Unit –II: Discrete Fourier Transform (DFT) (10 Lectures)

Introduction, Frequency Domain Sampling, Properties of DFT, Linear Filtering Techniques based on DFT, Spectrum Analysis using DFT, Efficient Computation of DFT: FFT Algorithms, Properties of W_N, Radix- 2 FFT algorithms: Decimation in Time and Decimation in Frequency FFT algorithms.

Unit -III : Theory and Design of Finite Impulse Response (FIR) filters (10 Lectures)

Types of Digital Filters: Structure of FIR Systems, FIR Filter Design using Windows: Rectangular Windows for FIR Filter Design, Gibbs Phenomenon, Commonly used Windows functions, FIR Filter Design using Frequency Sampling, Design of Hilbert Transformers, FIR differentiators and Integrators, Finite Word length effect in Digital Filters(Brief Discussion Only).

Unit- IV: Applications of Digital signal processing (10 Lectures)

Applications of DSP in Speech Processing: Acoustic Theory of Speech Production, Digital Model of Speech Production, Speech Recognition, Speech Synthesis using Linear Prediction, Short Time Fourier Analysis of Speech, Oversampling A/D and D/A Converter, Applications of DSP in Image Processing: Image Compression, Image restoration, image Enhancement (brief description only).

Text Books:

1. Theory and Applications of Signal Processing , L. R. Rabiner and B. Gold, Prentice Hall 1985
2. Digital Signal Processing, A. V. Oppenheim and R. W. Shafer, Prentice Hall, 1985
3. Introduction to digital Signal Processing, J. G. Proakis and DG Manolakis, Prentice Hall
4. Introduction to Digital Signal Processing, Roman Kue, McGraw Hill Book Co.

ELE-303 Marks: 80

Control System Engineering

Unit I: Control Systems and System Representation. (10 Lectures)

Control Systems, types of control systems, feedback & its effects, linear & non-linear systems, superposition in linear systems, cascade and feed-forward control, Signal Flow Graph modeling of electrical and electronic systems, SISO and MIMO systems, Transfer function calculation using block diagram algebra and signal flow graph methods, Control of Physical Systems: Speed and temperature.

Unit II: Time Domain Analysis of Control Systems (10 Lectures)

Standard test signals, time response of first order and second control systems, Steady- state and transient response, Transient response specifications, S-plane root location & the transient response, Error analysis, Static and dynamic error coefficients, Controllers: Proportional, PI,PD and PID controllers.

Unit III: Stability and Frequency Analysis (10 Lectures)

Stability : Conditional an absolute stable systems, location of poles and stability, Routh-Herwitz criterion, Root-locus plot , effect of addition of poles and zeros on root locus, Frequency domain analysis, advantages and disadvantages, Frequency domain specifications, Polar plot, Bode plot, gain margin and phase margin, Nyquist criterion.

Unit IV: Introduction to Modern Control Theory (10 Lectures)

State equations, advantages of state space techniques, State space representation of electrical networks, state transition matrix, state transition equations, state diagrams, Block diagram representation of state equations, state space representation from ordinary differential equations, concepts of controllability and observability.

Text Books:

1. Modern Control Engineering by K-Ogata.
2. Feedback & Control Systems by Disteflno, Stubberud and Williams, McGraw Hill International
3. Automatic Control systems by B. C. Kuo.
4. Linear Control System Analysis & Design by D. Azzo, Houfil.

ELE-304 Marks: 80

HDL and Digital System Designs

UNIT I: Hardware Description Languages and VHDL (10 Lectures)

Hardware Description Languages: Introduction to VHDL, Design flow, Code structure: Library declarations, Entity and Architecture, Introduction to behavioral, dataflow and structural modeling. Data types: BIT, Standard logic, Boolean, Integer, real, Signed and Unsigned Data types, Arrays, Bit vector and Standard logic vectors, Operators and attributes: Assignment, Logical, Arithmetic, Relational and concatenation operators, operator overloading.

UNIT II: Concurrent, Sequential Codes and State Machines (10 Lectures)

Concurrency, Concurrent verses Sequential codes, advantages of concurrent codes, concurrent and sequential statements: WHEN (simple and selected), GENERATE, BLOCK, PROCESS, IF, ELSIF, WAIT, CASE, LOOP, Signal versus Variable, Bad Clocking, Clock Skew, Propagation delays and their modeling, Brief concepts of Finite State Machines (Melay and Moore Machines)

UNIT III: Combinational and Sequential Circuit Design. 10 Lectures)

Elements combinational and sequential circuits, VHDL modeling combinational systems: Gates, Binary adders and Subtractors, Multiplexers, Demultiplexers, encoders, decoders, code converters, comparators, Boolean functions using Multiplexer. Shanons expansion theorm, VHDL Modelling of Sequential Circuits: Flip-Flops, Shift Registers, Counters UP-DOWN, Johnson and Ring Counters.

UNIT IV: System Design and Programmable Logic Devices. (10 Lectures)

Introduction to PACKAGES and COMPONENTS, FUNCTIONS and PROCEDURES, Port Mapping, Digital system design: VHDL modeling of ALU, Pseudo random Number Generator, Traffic Light Controller, Barrel shifter, Programmable Logic Array (PLA), Programmable Array Logic(PAL), Introduction to Complex Programmable Logic Devices (CPLD) And Field Programmable Logic Arrays(FPGA), Advantages of FPGAs, Application Specific integrated Circuits (ASIC), FPGA design flow and Hardware Description Languages.

Text Books and References:

1. Pedroni V. A., Circuit Design with VHDL, PHI, 2008.
2. J.Bhasker, VHDL Primer, Pearson Education, India.
3. Perry D. L., VHDL Programming by Example, TMH,2000.
4. Wakerly J. F., Digital Design – Principles and Practices, Pearson Education,2008.
5. Brown S. and Vranesic Z., Fundamentals of Digital Logic with VHDL Design, TMH.2008.

ELE-305(E1) Marks: 80

Microcontrollers and Embedded Systems

UNIT–I: Architecture of Microcontroller (10 Lectures)

Micro controllers & Embedded Processors: Microcontroller versus General-purpose Microprocessors, Microcontrollers for Embedded systems, Types of Embedded Systems. Embedded System applications, choosing a Microcontroller, 8051 Architecture: 8051 Microcontroller hardware, input/output pins, ports and circuits, external memory, counter and timer, serial data input and output, interrupts, other members of 8051.

UNIT–II: 8051 Instructions and Programming (10 Lectures)

Addressing modes: immediate and register addressing modes, accessing memory using various addressing mode, Arithmetic instructions and programs: unsigned addition and subtraction, unsigned, multiplication and division, signed members concepts and arithmetic operations, Logic Instruction and programs: Logic and compare instructions rotate and swap instructions. Jump, Loop and call instructions; Loop and jump instructions, call Instructions, time delay, generation and calculation. Single bit instructions and programming: single bit instruction programming, single bit operation with carry reading input pins versus port latch. I/O port programming: I/O programming, bit manipulation.

UNIT – III: 8051 Timer/Counter, Serial Communication and Interrupt Programming (10 Lectures)

Timer/Counter programming: programming 8051 timers, counter programming, pulse frequency and pulse width measurements. Serial communication programming, : Basics of serial communication, 8051 connection toRS232, 8051 serial communication programming. Interrupts programming: Interrupts of 8051; programming timer interrupts, programming external hardware interrupts, and programming serial communication interrupts.

UNIT – IV: Application of 8051 Microcontroller (10 Lectures)

Programmable peripheral interface (PPI)-8255, programming 8255, 8255 interfacing with 8051. Interfacing Key board. Interfacing LED/ LCD, Interfacing A/D & D/A converters, Interfacing stepper motor.

Text Books:

1. 8051 Micro-controller & Embedded system by J.G.Maziddi, Pearson Pub
2. 8051 Micro-controller & ap[pilication by J.K.Ayala, Tata MGraw Hill
3. 8051 Micro-controller & ap[pilication by R.Kamal, Pearson Pub

ELE-305(E2) Marks: 80

Soft Computing

Unit I: Overview of Crisp Sets, Fuzzy Sets and Relations (10 Lectures)

Basic Concepts of Crisp Sets and Fuzzy Sets, Basic Types of Fuzzy Sets, Sets, Representation of Fuzzy Sets, Fuzzy Relations, Operation on Fuzzy relations, Composition of Relations, Extension Principle for Fuzzy Sets, Concept and mdels of Fuzzy logic Circuits-viz. AND, OR and NOT.

Unit II: Fuzzy Logic and Rule based Systems (10 Lectures)

Overview of classical logic, Multi-valued logic, Fuzzy sets and probability theory, Probability vs. possibilities, Approximate reasoning, Fuzzy rule based Systems: Structure of Fuzzy rules, decomposition of compound rules, aggregation of fuzzy rules, Graphical techniques of inferences, Types of fuzzy rule based models.

Unit III: Introduction to Neural Networks (10 Lectures)

Biological and Artificial Neurones, Neuron Models: Classification and Linear Separability, X-OR Problem, Hopfield Networks, Overview of Neural Networks Architectures: Mulyilayered Feed forward and Recurrent Networks, Learning: Supervised, Unsupervised and Reinforcement, Learning Laws

Unit IV: Multi-layered Networks (10 Lectures)

Back-propagation (BP) Networks, Generalized delta rule, BP Training Algorithm and Derivation for Adaptation of Weights, Variations in BP, Radical Basis Function (RBF) Networks, Applications of BP and RBF Networks.

Text Books:

1. Fuzzy Sets and Fuzzy Logic: Theory and Applications, G. Klir abd B. Yuan, Printice Hall of India
2. Neural Networks and Fuzzy systems,: A Dynamical System Approach to Machine Intelligence, Printice Hall of India
3. Neura;l Networks in Computer Intellligence, Limin Fu, Mcgraw Hill International
4. Adaptive Recognition and Neural Networks, Yoh-Han Pao, Addison Weseley
5. Introduction to the Theory of Neural Computations, John Hertz, Anders Krogh and Richard G. Palmer, Addison Wesley.

ELE-305(E3) Marks: 80

Advanced Communication Systems and Antennas

Unit–I: Lasers and Optical Fiber Communication Systems

Principles of Lasers, Einstein's Coefficients, Laser Pumping, Laser Oscillator, Q- switching, Mode locking, Three level and Four level Laser Schemes, Types of Lasers: Solid state lasers, Semiconductor lasers, Applications of Lasers, Introduction to Optical Communication Systems; Optical fibers, sources and detectors; Analog and Digital systems; Modulation and Multiplexing; Power budget analysis; Synchronous optical networks (SONET/SDH); Fiber distributed data interface (FDDI).

Unit-II: Cellular Mobile Communication Systems

Concept of Cellular Communications, Cell fundamentals, Frequency Reuse Concept, Concept of Cell Cluster, Geometry of Hexagonal Cells, Frequency reuse Ratio, co- channel and adjacent channel interferance, Call blocking and delay at the cell site, Various mechanisms for capacity increase, Channel Assignment Strategies, Roaming and Handoffs, Global Service for Mobile Communications (GSM): GSM services, Referance Architecture, Communications in the infrastructure, CDMA Digital cellular Standarad (IS-95): IS-95 CDMA forward and Reverse Channel, Packet and Frame Formats in IS-95, Mobility and Radio Resource in IS- 95

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Unit-III: Satellite Communications

Introduction to Satellite Systems; Orbiting satellites, satellite frequency bands, communication satellite systems, satellite modulation and multiple access formats; Satellite systems in India; Satellite receiving systems, G/T ratio; Satellite uplink and downlink analyses in C, Ku and Ka bands; Spot beam, multiple beam, frequency reuse; Satellite transponder; Satellite front end. Multiplexing Techniques, Global Positioning Systems (GPS), Multiplexing Techniques, VSAT and MSAT Systems, Satellite Radio

Unit-IV: Microwave Antennas

Basic Antenna Theory, Half- Wave Dipole Antenna, Antenna for low, medium and high frequencies, Effects of Antenna Height, Directional Characteristics of Antennas, Directive of Antenna Arrays, Arrays with parasitic elements, Yagi- Udda Antenna, Turnstile Antenna, Driven Collinear Antenna, Broadside Array, Vertical Array, reflectors, Anteena feed lines, Broadband Antennas: Horns, Sectoral Horns, Pyramidal Horns, Patch or Microstrip Antennas, Helical Antennas, Parabolic reflectors, Slot Antenna, Smart Antennas,

Test Books and References:

1. Microwave Principles by Herbert J. Reich, East- West Press.
2. Antenna and Wave Propagation by A.K. Gautam.
3. Modern Electronic Communications by Jeffrey S. Beasley, PHI.
4. Lasers and Optical Fibre Communications by P. Sarah International Publishing House.

Course No. ELE-306 Marks: 80

Laboratory–V

Section I. (Experiments on Digital Signal Processing)

1. Testing of various Test signals using Matlab.
2. Study of Linear Convolution using Matlab/ Simulink.
3. Study of Correlation of signals using Matlab.
4. Implementation of general difference equations using Matlab/C.
5. Generation of Samples of some standarad signls using Matlab/C.
6. Generation of Samples of Sine and Exponential Signals using Matlab/C.
7. Computation of DFT using Radix- 2 DIT FFT by Matlab/C.
8. Computation of IDFT using C/Matlab.
9. Computation of Circular Convolution using Matlab/C
10. Computation of Magnitude and Phase Transfer Function using Matlab/C.
11. Implementation of FIR Filter using Matlab/C.
12. Some Working examples on Speech and Image Processing.

Section II. (Experiments on Control system Engineering)

1. Design & realize a proportional controller using Op-amps.
2. Design & realize an Integral controller using Op-amps.
3. Design & realize a PD controller using Op-amps.
4. Design & realize a PI controller using Op-amps.
5. Design & realize a PlD controller using Op-amps.
6. Design & realize a Lead-lag compensation N/W using Op-amps.
7. Write a Matlab program to find Pole, zero, residue & constant terms of a transfer function.
8. Write a Matlab program to find the transformation of transfer function to state space representation.
9. Write a Matlab program to transfer a system representation in state space to transfer function representation.
10. Write a Matlab program to find
    a. Step response of a first order system
    b. Impulse response of first order system
11. Write a Matlab program to obtain impulse, step & ramp response of a second order system.
12. Write a Matlab program to find rise time, peak time, maximum overshoot & settling time of second order systems.
13. Write a Matlab program to find unit step response of second &higher order systems. Also express the transfer function in term of partial fractions.
14. Write a Matlab program to plot root locus of second & higher order system & hence comment on stability.
15. Write a Matlab program to plot root locus of a system defined in state space.
16. Write a Matlab program to demonstrate effect of addition of poles & zeros to a transfer function.
17. Write a Matlab program to obtain Bode plot of transfer function. Find gain margin & hence comment on stability.
18. Write a Matlab program to obtain Bode plot of a system represented in state space form.
19. Write a Matlab program to determine Polar plot of a given transfer function.
20. Write a Matlab program to draw Nyquist plot of a second & higher order system.
21. Write a Matlab program to find Nyquist plot of a system represented in state space.

Course No. ELE-307 Marks: 80

Laboratory – VI

Section I. (Experiments on HDL (Hardware Description Language) and Digital System Design)

1. Use CPLD XC9572 kit to simulate, synthesize & implement following gates
   a. OR
   b. AND
   c. NOT
   d. NOR
   e. NAND
   f. XOR
   g. XNOR
2. Implement all the basic gates using universal gates on CPLD XC9572 kit.
3. Implement 8×3 encoder & 3×8 decoder on CPLD XC9572.
4. Use CPLD XC9572 kit to simulate, synthesize & implement
   a. 2×1, 4×1, 8×1 MUX
   b. 1×2, 1×4, 1×8 DE-MUX
5. Use CPLD CX9572 kit to implement
   a. Half Adder
   b. Full Adder
   c. Half subtractor
   d. Full substractor
6. Use CPLD CX9572 kit to implement
   a. 4 bit parallel binary adder
   b. BCD adder
7. Write a VHDL programe to synthesize & simulate following Flip-Flops
   a. RS
   b. D
   c. JK
   d. T
8. Write a VHDL programe to synthesize & simulate mod N
   a. asynchoronous counter
   b. synchoronous counter
9. Write a VHDL programe to synthesize & simulate
   a. Ring counter
   b. Jonson counter
10. Write a VHDL programe to synthesize & simulate
    a. n-bit shift left register
    b. n-bit shift right register
11. Write a VHDL programe to synthesize & simulate
    a. parity generator
    b. parity checker
12. Write a VHDL programe to synthesize, simulate & implement
    a. Binary to gray code converter
    b. Binary to excess-3 code
    c. Gray to binary
13. Write a VHDL programe to synthesize, simulate & implement an 8-bit ALU.
14. Write a VHDL programe to synthesize, simulate & implement a Barrel shifter.

15. Write a VHDL programe to implement RAM.
16. Write a VHDL programe to synthesize & simulate aBCD counter
17. Write a VHDL programe to implement parallel to serial converter.
18. Write a VHDL programe to implement signal generator.
19. Write a VHDL programe to synthesize & simulate PN code generator.

Section II. (Experiments on Microcontroller and Embedded System)

1. 8051 based minimum system.
2. Write an 8051 ALP to generate 10 KHz square wave on any pin of port 0.
3. Write an 8051 ALP to generate 10 KHz square wave on any pin of port 0 using interrupts.
4. 8051C I/O programming examples.
5. Interfacing of MAX 232 and RS 232 with 8051 microcontroller.
6. Working examples on counter and timer programming.
7. Baud rate programming using 8051 microcontroller.
8. Study of SBUF and SCON registers of 8051 microcontroller.
9. Study of TMOD and TCON registers of 8051 microcontroller.
10. Write an ALP in 8051C to transfer data serially in full duplex mode.
11. Interfacing of LCD with 8051 microcontroller.
12. Interfacing of Keyboard with 8051 microcontroller.
13. Interfacing of 8255 with 8051 microcontroller.
14. Stepper motor control using 8051 microcontroller.
15. Interfacing of opt-coupler with 8051 microcontroller.
16. Use of assemblers and simulators.
17. Use of Keil simulation software.
18. Use of development boards of 8051 microcontroller.

Section III. (Experiments on Advanced Communication Laboratory)

1. Simulation of PCM System
2. Simulation of DPCM system
3. Simulation of DM System
4. Simulation of Transponder of Satellite System
5. Study of Uplink and Down Link System
6. Simulation of Optical Fibre Communication system
7. Study of Optical Fibre Communication system using Training kit
8. Study of lasers
9. Simulation of cellular Mobile Communication system model
10. Simulation of GSM System
11. Simulation of IS- 2000 CDMA System
12. Implementation of Spreading codes
13. Study of Digital Modulation techniques
14. Study of Antennas using available Module
15. Field visit to any Cellular Communication service provider company and main exchange

Section IV. (Experiments on Soft Computing)

1. Write a program to implement and function using Adaline with bipolar inputs and outputs.
2. Write a program to implement and function using Madaline with bipolar inputs and outputs.
3. Write a Matlab program to implement discrete Hopfield network and test for input pattern.
4. Write a Matlab program to implement back propagation network for a given input pattern.
5. Write a Matlab program to implement full counter propagation network for a given input pattern.
6. Write a program to implement art 1 network for clustering input vectors with vigilance parameter.
7. Write a Matlab program to implement fuzzy set operation and properties.
8. Write a program to implement composition of fuzzy and crisp relations.
9. Write a program to perform max-min composition of two matrices obtained from Cartesian product.
10. Write a program to verify the various laws associated with fuzzy set.

Course No. ELE-401 Marks: 80

Digital Communication and Information Theory

Unit I: Information Theory (10 Lectures)

Introduction to Information Theory, Measure of information, Information content of Messages, Information sources, Markoff Model for Information sources, Information Content of a Discreate Memoryless Channel ,Entropy and Information rate of Markoff sources, Joint Entropy and Conditional Entropy,Mutual Information, Discrete Communication Channels, Channel representation and Channel Matrix, Mutual information for each channel, Channel Capacity, Shannon's Theorem, Shannon- Hartley Theorem, Bandwidth S/N Trade–off, Source Encoding, Coding Efficiency, Shannon- Fano Coding, Huffman Coding,.

Unit II: Pulse Code Modulation and Equalization Techniques (10 Lectures)

Sampling Theorem, Signal Reconstruction: The Interpolation Formula, Elements of Pulse Code Modulation (PCM), Quantization: Uniform and Non-uniform Quantization, Statistics of Speech Amplitudes, Compading Characteristics, Encoding, Bandwidth and Noise in PCM Systems, Speech Coding, Differential PCM, Delta modulation and Adaptive DM, S-ary System, Inter-symbol Interference(ISI), Pulse Shaping and Raised- Cosine Filter Equalization techniques, Linear equalizers.

Unit III: Band Pass Digital Carrier Modulation and Channel Coding (10 Lectures)

Digital modulation techniques: Generation and Detection of Amplitude Shift Keying (ASK), frequency Shift keying (FSK), Phase Shift Keying, and Differential Phase Shift Keying (PSK and DPSK), Quadrature Phase Shift Keying (QPSK), Minimum Phase Shift Keying (MSK), Gaussian Minimum Shift Keying (GMSK) , Optimum Filter, Correlator, Probability of Error in each Scheme, Comparison of Digital Modulation Techniques. Error Control Coding: Linear Block codes, (7, 4) Linear Block Coding, Cyclic Codes, Convolutional Codes, Convolutional Encoder Representation: State representation and State Diagram, Trellis Diagram, Convolutional Decoding Representation: The Viterbi Convolutional Decoding (Brief description).

Unit IV: Wide Band Digital Communications (10 Lectures)

Basics of Wide band Systems, Generation of Spreading Codes (PN Codes, Gold Codes), Properties of PN codes, Theory of Spread Spectrum Modulation, Model of Spread Spectrum Digital Communication System, Direct-Sequence Spread Spectrum (DSSS): Processing Gain, Performance and Generation and Detection, Frequency Hopping Spread-Spectrum (FHSS): Generation and Detection, Types, Performance of FH spread Spectrum Signals in AWGN Channel, Introduction to Digital Cellular Communication Systems: Introduction to Multicarrier Communications (OFDM), Simulation of Spread Spectrum System using Matlab/Simulink.

Text Books and References:

1. Digital Communication By Simin Hykin,
2. Digital and Analog Communication by K. Shan Mugam.
3. Digital and Analog Communication by Tomasi,
4. Digital and Analog Communication Systems by Leon W. Couch, II.Pearsons Education
5. Digital Communications By Bernard Sklar, Pearsons Education
6. Digital Communications By John G. Proakis McGraw- Hill International Editions
7. Wideband Wireless Digital Communications by Andreas F. Molisch, Pearsons Education.
8. Information Theory Coding and Cryptography by Ranjan Bose, TMH.

Course No ELE-402 Marks: 80

VLSI Technology

Unit I: Crystal Growth, and Epitaxy (10 Lectures)

Crystal Growth and Wafer Preparation, Electronic grade Germanium and Silicon, Zone melting process of purification, Simple purification process, Czhrolaski method. Epitaxy, Vapor phase epitaxy, Transport process and Reaction kinetics, Doping in epitaxial layers, Epitaxy equipment details, Molecular beam Epitaxy process *(in brief).*

Unit II: Diffusion and Oxidation (10 Lectures)

Fick's one dimensional diffusion equation, Diffused layers, Pre deposition step, Drive- in diffusion with expression, Field aided diffusion, Diffusion system, C-V technique for profile measurement, Junction depth and sheet resistance measurement.
Oxidation Techniques, Growth mechanism and Kinetics of Oxidation layers, Oxidation techniques and Systems.

Unit III: Lithography Etching (10 Lectures)

Lithography, Lithography process and Types of Lithography, Optical Lithography, Contact proximity and projection Lithography techniques, Resists, Electron beam Lithography, Electron Resists, X- ray Lithography, X- ray resist.
Etching, Subtractive and Additive method of pattern transfer, Resolution and edge profiles in Subtractive pattern transfer, Selectivity and feature size control of an etching process, Plasma and chemical etching of Silicon dioxide and Various metals used for metallization.

Unit IV: Metallization and IC Technology (10 Lectures)

Contacts *(Ohmic and rectifying)*, Physical vapor deposition, Methods of physical vapor deposition, Resistance heated evaporation, Electron beam evaporation, Inductive heated evaporation, Sputter deposition, Process and System details of PVD, Thickness measurement and monitoring.
Technology, Basic consideration for IC processing, Bipolar IC technology, NMOS IC technology, CMOS IC technology, Miniaturizing VLSI circuits, Modern IC fabrication.

Text Books and References:

1. Physics of Semiconductor Devices, S. M. Sze, , Wiley eastern Ltd.
2. Electronic Processes in Semiconductors, Azeroff and Brophy, , McGraw Hill Publishing company.
3. Physics and Technology of Semiconductor Devices A. S. Grove, , John Wiley and Sons, New York.
4. Solid State Electronic Devices Ben G. Streetman, , Prentice Hall of India Ltd, N. Delhi.
5. S. M. Sze, VLSI Technology, Mcgraw Hill Publishing Company.

Course No. ELE-403 Marks: 80

CMOS Circuit Design: Analog and Mixed

Unit I: PSPICE ORCAD and MOSFET Operation (10 Lectures)

An Introduction to PSPICE Orcad, Generating a Netlist File, PSPICE Schematics, Circuit description, DC circuit analysis, Transient analysis, AC circuit analysis, Overview of MOSFETs: Regions of operation, Threshold Voltage and Body Effect, Floating Gate and Bulk MOSFETs, I-V Characteristics of MOSFETs, Long-Channel and Short Channel Modeling of MOSFETs, Some PSPICE Simulation Examples on MOSFET effects and Characteristics, A brief introduction to Design layout.

Unit II: Analog CMOS Sub-circuits (10Lectures)

MOS Switch; MOS Diode/Active Resistor; Current Sinks and Sources; Current Mirrors; Current and Voltage References; Amplifier, Differential Amplifier; Comparator; Translinear Circuits: Ideal Translinear Element, Translinear Signal representations, Translinear Principle, Translinear-loop-circuit synthesis, Various Translinear circuits, Squarer/divider, Squarer rooting; Some PSPICE Simulation Examples.

Unit III: Data Converters (10 Lectures)

Analog Versus Discrete Time Signals; Converting Analog Signals to Digital Signals; Sample-and-Hold (S/H) Characteristics; Aperture; Digital-to-Analog Converter (DAC) and Analog-to-Digital Converter (ADC) Specifications; DAC Architectures: R-2R Ladder Network DAC, Cyclic DAC; Pipeline DAC; ADC Architectures: Flash ADC; Two-Step Flash ADC, Pipeline ADC, Integrating ADC, The Successive Approximation ADC; Oversampled converters; First-Order ΣΔ Modulator; Higher Order ΣΔ Modulators; Some PSPICE Simulation Examples.

Unit IV: Analog Multipliers and Mixers (10 Lectures)

The Gilbert Cell; MOS Analog Multipliers: Multiplier Design Using Squaring Circuits, The Multiplying Quad, Simulating the Operation of the Multiplier; Mixing, Modulation and Frequency Translation: Single-Device Mixers, MOSFET Mixers, Fully Balanced (Quad) Mixer; Demodulation using multiplixer, Some PSPICE Simulation Examples.

Text Books and References:

1. Analysis and Design of Analog integrated circuits, P. R. Gray, P. J. Hurst, S. H. Lewis and R. J. Meyer, John Wiley and Sons, 2001.
2. CMOS, Circuit Design, Layout, and Simulation, R. Jacob Baker, JOHN WILEY & SONS, 2010.
3. CMOS Analog circuit design, P. E. Allen and D. R. Holberg, Oxford University Press, 2002.
4. Analog VLSI: Circuits and Principles, Shih-Chii Liu et al, The MIT Press, 2002.

Course No. ELE-404(E1) Marks: 80

Computer Networks & Data Security

Unit-I: OSI Reference Model and Network Architecture: **(10 Lectures)**

Introduction to Computer Networks, Network Topologies: Bus, Star, Ring, Hybrid, Tree, Complete, Irregular–Topology; Types of Networks: Local Area Networks, Metropolitan Area Networks, Wide Area Networks; Layering architecture of networks, OSI model, Functions of each layer, Services and Protocols of each layer**.** Introduction to LANs, Features of LANs, Components of LANs, Usage of LANs, LAN Standards, IEEE 802 standards, Channel Access Methods, Aloha, CSMA, CSMA/CD, Token Passing, Ethernet, Layer 2 & 3 switching, Fast Ethernet and Gigabit Ethernet, Token Ring, LAN interconnecting devices: Hubs, Switches, Bridges, Routers, Gateways.

Unit–II: TCP/IP: **(10 Lectures)**

Introduction, History of TCP/IP, Layers of TCP/IP, Protocols, Internet Protocol, Transmission Control Protocol, User Datagram Protocol, IP Addressing, IP address classes, Subnet Addressing, Congestion and congestion control mechanism.

UNIT-III: Network layer **(10 Lectures)**

Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing: Internet address, sub-netting; Routing techniques, static &. Dynamic routing, Routing table. Routing algorithms: shortest path algorithm, flooding, distance vector routing, link state routing; Protocols: ARP, RARP, IP, ICMP, IPV6 Unicast and multicast routing protocols.

UNIT-IV: Cryptography & Network Security **(10 Lectures)**

Introduction to security attacks, services and mechanism, introduction to cryptography. Encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers, data encryption standard (DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, Principals of public key crypto systems, RSA algorithm, Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature, Web Security, Secure socket layer and transport layer security, secure electronic transaction (SET), System Security, Intruders, firewall design principals, trusted systems. Implementation of cryptographic and network security algorithms using JAVA.

Text Books and References:

1. Data Communications, Computer Networks and Open Systems (4th edition), Halsall Fred, 2000, Addison Wesley, Low Price Edition.
2. Business Data Communications, Fitzgerald Jerry,
3. Computer Networks – A System Approach, Larry L. Peterson & Bruce S. Davie, 2nd Edition
4. Computer Networking – ED Tittel , 2002, T.M.H.
5. Java 2.0 Patric Norton. T.M.H

Course No. ELE-404(E2) Marks: 80

Windows Programming

Unit I: (10 Lectures)

DOT NET framework, MSIL, CLR, CLS, Name spaces, Assemblies Common Language Implementation Assemblies Metadata and Intermediate Language. Garbage Collection Versioning and Side-by-Side Execution. Integration Development Environment of VB, User Interface, Designing, Basics of Event driven programming. From- Designing, Showing & Hiding.

Unit II: (10 Lectures)

VB language- Data types, Variables & Constant, Arrays, Arrays as Function, Collections, Procedures, Arguments passing, Functions, and Returning Values. Control Flow statements: if- then, if-then-else, select case, looping statement: Do-loop, For-next, While-Wend, Nested Control Structure, Exit statement.

Unit III (10 Lectures)

Basic Active X Control, Properties & Methods – Text box, List box, combo box, Scrollbar, slider Controls. Advance Active X Control – Common Dialog controls, Color, Font, File open, file save using Rich Textbox Controls. String Manipulations on Textboxes. Graphics controls – Picture Box, Coordinate system, Graphics Methods- Text drawing, Lines & Shape, Filling Shapes.

Unit IV (10 Lectures)

Grid methods Menu editor: Pull-down, Pop-up Menus. Multiple Document Interface- Parent & Child Forms & Methods. OLE – Basics, OLE control Properties & Methods, Error handling in VB- Types of Errors, Error handling methods and functions.

Database Programming with VB database Models, Visual Data manager, DATA Control-Methods, Properties, Connectivity with database, DATA bound controls, ADO Database Controls, Creating & using Database with object model, Attaching Queries with database. Filtering Data. DATA Report Designer.

Text Books and References

1. Mastering VB .NET by Evangelos Peteroutsos, WROX Publications
2. Dietel and Dietel, “Visual Basic, How To Program”, Pearson Education.
3. Peter Norton’s Guide To Visual Basic 6 By Peter Norton
4. Beginning Visual Basic 6 By Peter Wright, Shroff Publishers
5. Programming In Visual Basic 6.0 By Mohammed Azam, Vikas Publishing House

Course No. ELE-404(E3) Marks: 80

RF Circuit Design

Unit I: RF Fundamentals (10 Lectures)

Components and Systems: Wire, Resistors, Capacitors, Inductors, Toroids, Toroidal Inductor Design, Practical Winding Hints; Resonant Circuits: Some Definitions, Resonance (Lossless Components), Loaded *Q*, Insertion Loss, Impedance Transformation, Coupling of Resonant Circuits; Impedance Matching: Network, Dealing With Complex Loads, Three-Element Matching, Low-*Q* or Wideband Matching Networks, Smith Chart, Impedance Matching on the Smith Chart, Software Design Tools

Unit II: RF Amplifier Design (10 Lectures)

Transistor Models at Low and High Frequencies; *S* Parameter Equations; RF MOSFETs; Diode Detectors; Amplifier Design Using Admittance Parameters; Tapped *LC* Matching Circuits; Dual Gate MOSFET Amplifiers; Amplifier Design Using *S* Parameters and the Smith Chart; Power Amplifiers: Load Pull Techniques; Design Examples: Switching Amplifiers; Class E Amplifiers

Unit III: RF Oscillators and Mixers (10 Lectures)

Low Noise Oscillators; Oscillator Noise Theories; Equivalent Circuit Model; Effect of Load; Optimization for Minimum Phase Noise; Oscillator Designs: Inductor Capacitor Oscillators, SAW Oscillators, Transmission Line Oscillators, Tuning, Flicker Noise; Mixers: Single Balanced Mixer (SBM), Double Balanced Mixer (DBM), Important Mixer Parameters.

Unit IV: IF amplifiers and filters (10 Lectures)

IF filters: LC IF filters, Crystal filters, Crystal ladder filters, Monolithic ceramic crystal filters, Mechanical filters, SAW filters, Filter switching in IF amplifiers, Amplifier circuits Cascade pair amplifier, Universal IF amplifier, Coupling to block filters, , FM IF amplifier, Successive detection logarithmic amplifiers

Text Books:

1. Fundamentals of RF circuit design with Low Noise Oscillators, Jeremy Everard, John Wiley & Sons, 2001.
2. RF Circuit Design, Christopher Bowick, John Blyler and Cheryl Ajluni, Newnes, Elsevier, 2008.
3. RF Components and Circuits, Joseph J. Carr, Newnes, Elsevier, 2002.
4. RF Circuit Design, Richard Chi-Hsi Li, John Wiley & Sons, 2009.

Course No. ELE-405 Marks: 50 (Internal)

Seminar

Each student shall individually present a seminar in the 4^{h} semester on a topic relevant to the field of Electronics for about 30 minutes. The topic should not be a replica of what is contained in the syllabus. The topic shall be approved by the Seminar Evaluation Committee of the Department. The committee shall evaluate the presentation of students. Seminar report in the prescribed format shall be submitted to the department after the approval from the committee.

Course No. ELE-406 Marks: 150

Project Work

Each student group should complete the project work in 4th semester. Each student is expected to prepare a report and a technical paper in the prescribed format, based on the project work. The paper may be prepared as per IEEE standard and can have a maximum of eight pages. Members of the group will present the relevance, design, implementation, and results of the project before an evaluation committee consisting of the guide, and three/four faculty members of the department. The evaluation committee may also carry out continuous assessment of the project through progress seminars conducted during the semester.

Course No. ELE-407 Marks: 30

Industrial Training

The students are required to undergo training at some center of excellence outside the state to get additional exposure in the new and emerging trends in the discipline of. This component shall be evaluated by the host Institute through conduct of theory and practical examinations in collaboration with the teacher in-charge of the Department.