Uttar Pradesh Technical University, Lucknow

Syllabus

3rd Year

[Effective from Session 2015-16]

1. B.Tech. Electronics Engineering
2. B.Tech. Electronics & Communication Engineering
3. B.Tech. Electronics & Telecommunication Engineering

SEMESTER - V

No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECTS											
1	NEC 501	Integrated Circuits	3	1	0	30	20	50	100	150	4
2	NEC 502	Principles of Communication	3	1	0	30	20	50	100	150	4
3	NEC 503	Microprocessors	3	1	0	30	20	50	100	150	4
4	NIC 501	Control System – I	3	1	0	30	20	50	100	150	4
5	NEC 504	Antenna and Wave Propagation	2	1	0	15	10	25	50	75	3
6	NHU 501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/ DESIGN/ DRAWING											
7	NEC 551	Integrated Circuits Lab	0	0	2	10	10	20	30	50	1
8	NIC 551	Control System Lab	0	0	2	10	10	20	30	50	1
9	NEC 552	Communication Lab – 1	0	0	2	10	10	20	30	50	1
10	NEC 553	Microprocessors Lab	0	0	2	10	10	20	30	50	1
11	NGP 501	GP						50		50	
		TOTAL	16	5	8					1000	25

SEMESTER - VI

No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECTS											
1	NEC 601	Microwave Engineering	3	1	0	30	20	50	100	150	4
2	NEC 602	Digital Communication	3	1	0	30	20	50	100	150	4
3	NEC 603	Integrated Circuit Technology	3	1	0	30	20	50	100	150	4
4	NEC 0__	Departmental Elective – I	3	1	0	30	20	50	100	150	4
5	NEC 0__	Departmental Elective – II	2	1	0	15	10	25	50	75	3
6	NHU 601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/ DESIGN/ DRAWING											
7	NEC 651	Antenna and Microwave Lab	0	0	2	10	10	20	30	50	1
8	NEC 652	Communication Lab – II	0	0	2	10	10	20	30	50	1
9	NEC 653	CAD of Electronics Lab	0	0	2	10	10	20	30	50	1
10	NEC 654	Seminar	0	0	2	10	10	20	30	50	1
11	NGP 601	GP						50		50	
		TOTAL	16	5	8					1000	25

Departmental Elective – I

1. NEC 011 Digital Signal Processing
2. NEC 012 Computer Architecture and Organization
3. NEC 013 Artificial Neural Network
4. NEC 014 Advance Semiconductor Devices

Departmental Elective – II

1. NEC 021 Industrial Electronics
2. NEC 022 Microcontroller and its Applications
3. NEC 023 Analog Signal Processing
4. NEC 024 Advance Digital Design and Verilog

NEC 501 Integrated Circuits		
Unit	Topic	Proposed number of Lectures
I	**Analog Integrated circuit Design: an overview:** Current Mirrors using BJT and MOSFETs, Simple current Mirror, Base current compensated current Mirror, Wilson and Improved Wilson Current Mirrors, Widlar Current source and Cascode current Mirror **The 741 IC Op-Amp:** Bias circuit, short circuit protection circuitry, the input stage, the second stage, the output stage, and device parameters; D**C** Analysis of 741: Small Signal Analysis of input stage, the second stage, the output stage; Gain, Frequency Response of 741; a Simplified Model, Slew Rate, Relationship Between f_t and SR	10
II	**Linear Applications of IC op-amps:** An Overview of Op-Amp (ideal and non-ideal) based Circuits V-I and I-V converters, generalized Impedance converter, simulation of inductors **Filters:** First and second order LP, HP, BP BS and All pass active filters, KHN.	8
III	**Digital Integrated Circuit Design-An Overview**: CMOS Logic Gate Circuits**:** Basic Structure CMOS realization of Inverters, AND, OR, NAND and NOR Gates **Latches and Flip flops:**The Latch, The SR Flip-flop, CMOS Implementation of SR Flip-flops, A Simpler CMOS Implementation of the Clocked SR Flip-flop, D Flip-flop Circuits.	8
IV	**Non-Linear applications of IC Op-amps:** Log–Anti Log Amplifiers, Precision Rectifiers, Peak Detectors, Simple and Hold Circuits, Analog Multipliers and their applications. Op-amp as a comparator, Zero crossing detector, Schmitt Trigger, Astablemultivibrator, Monostablemultivibrator, Generation of Triangular Waveforms	7
V	**D/A and A/D converters** **Integrated Circuit Timer:** The 555 Circuit, Implementing a MonostableMultivibrator Using the 555 IC, AstableMultivibrator Using the 555 IC. **Phase locked loops (PLL):** Ex-OR Gates and multipliers as phase detectors**,** Block Diagram of IC PLL, Working of PLL and Applications of PLL.	7

Text Books:

1. Sedra and Smith, “Microelectronic Circuits”, 6thEdition, Oxford University Press.
2. Michael Jacob, “Applications and Design with Analog Integrated Circuits”, PHI, 2ndEdition.

Reference Books:

1. Jacob Millman and Arvin Grabel, “Microelectronics”, 2ndEdition, Tata McGraw Hill.
2. BehzadRazavi, “Fundamentals of Microelectronics”, 2ndEdition, Wiley.
3. Mark N. Horenstein, “Microelectronic Circuits and Devices”, PHI.
4. Paul R. Gray, Paul J. Hurst, Stephen H. Lewis and Robert G. Meyer, “Analysis and Design of Analog Integrated Circuits”, Wiley.

NEC 502 Principles of Communication		
Unit	Topic	Proposed number of Lectures
I	Introduction:OverviewofCommunicationsystem,Communicationchannels,Needformodulation,BasebandandPass bandsignals,AmplitudeModulation: Doubleside bandwithCarrier(DSB-C),Doubleside bandwithoutCarrier, SingleSide BandModulation, DSB-SC,DSB-C,SSB Modulators and Demodulators,VestigialSideBand(VSB),Quadrature AmplitudeModulator, Radio Transmitterand Receiver.	10
II	Angle Modulation, Tone Modulated FM Signal, Arbitrary Modulated FM Signal, FM Modulators and Demodulators, Approximately Compatible SSB Systems,StereophonicFM Broadcasting, ExamplesBased onMat Lab.	8
III	PulseModulation,DigitalTransmissionofAnalogSignals:SamplingTheorem anditsapplications, Pulse AmplitudeModulation (PAM),Pulse Width Modulation, Pulse PositionModulation. Their generationandDemodulation, DigitalRepresentation ofAnalogSignals,PulseCodeModulation(PCM),PCM System,Issuesindigitaltransmission:Frequency DivisionMultiplexing,Time DivisionMultiplexing,LineCoding andtheir Power Spectral density, T1 Digital System, TDMHierarchy.	8
IV	Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation,VoiceCoders,SourcesofNoises,Frequency domainrepresentation ofNoise, Super position ofNoises, Linearfilteringof Noises,Mathematical Representation of Noise.	7
V	NoiseinAmplitudeModulation:Analysis,SignaltoNoiseRatio,Figureof Merit.NoiseinFrequencyModulation:Preemphasis,DeEmphasisandSNR Improvement, PhaseLocked LoopsAnalog and Digital.	7

Text Book:

1. Herbert Taub and Donald L. Schilling, “Principles of Communication Systems”, Tata McGraw Hill.

Reference Books:

1. B.P.Lathi,“ModernDigitalandAnalogcommunicationSystems”,3rd Edition,OxfordUniversityPress.
2. SimonHaykin,“Communication Systems”,4thEdition,Wiley India.
3. H.P.Hsu&D.Mitra,“AnalogandDigitalCommunications”,2nd Edition,TataMcGraw-Hill.

NEC 503 MICROPROCESSORS		
Unit	**Topic**	**No. of Lectures**
1.	Evolution of microprocessors, Microprocessor architecture and its operations, 8085 pins description, programming model, basic interfacing concepts, input and output devices, logic devices and memory interfacing, addressing modes, Concept of instruction cycle, machine cycle and T-states, Concept of interrupts, Classification of 8085 instructions.	8
2.	8086 architecture-functional diagram, register organization, memory segmentation, programming model, memory address, physical memory organization, pins description, clock generator 8284A, maximum mode and minimum mode signal descriptions, timing diagrams, introduction to DOS and BIOS interrupts.	8
3.	Instruction formats, addressing modes, classification of instruction set, assembler directives (debug, TASM & MASM), macros, Programs techniques and assembly language programs: simple programs involves data transfer operation, arithmetic operation, logical operation, branch operation, machine control operation, string manipulations, stack and subroutine operations.	8
4.	8255 Programmable peripheral interfacing various mode of operation to 8086, interfacing keyboard and seven segment display, stepper motor interfacing, D/A and A/D converter, 8254 (8253) programmable interval timer, Direct Memory Access and 8237 DMA controller.	8
5.	Memory interfacing to 8086. Interrupt structure of 8086, interrupt handling, vector interrupt table and interrupt Service routine. Interfacing interrupt controller 8259 and DMA Controller 8257 to 8086. Serial communication standards, Serial data transfer schemes.	8

Text Book:

1. Ramesh Gaonkar, "Microprocessor architecture, programming and applications with the 8085", 5th Edition, Penram International Publication (India) Pvt. Ltd.
2. Douglas V. Hall, "Microprocessors and Interfacing", 2nd Edition, Tata McGraw Hill.

Reference Books:

1. Sivarama P. Dandamudi, "Introduction to Assembly Language Programing From 8086 to Pentium Processors", Springer.
2. Walter A. Triebel and Avtar Singh, "The 8088 and 8086 Microprocessors: Programming, Interfacing Software, Hardware and Applications", Pearson.
3. A. K. Ray and K. M. Bhurchandi, "Advance microprocessors and Peripherals" Tata McGraw Hill.
4. Lyla B. Das, "The X86 Microprocessors, Architecture, Programming and Interfacing (8086 to Pentium)", Pearson.

NIC 501 Control System – I		
Unit	Topic	Proposed number of Lectures
I	Basic Components of a control system, Feedback and its effect, types of feedback control systems. Block diagrams Reduction and signal flow graphs, Modeling of Physical systems: electrical networks, mechanical systems elements, equations of mechanical systems, sensors and encoders in control systems, DC motors in control systems.	8
II	State-Variable Analysis: Vector matrix representation of state equation, state transition matrix, state-transition equation, relationship between state equations and high-order differential equations, relationship between state equations and transfer functions. Similarity Transformation, Decomposition of transfer functions, Controllability and observability.	8
III	Time domain Analysis of Control Systems: Time response of continuous data systems, typical test signals for the time response of control systems, the unit step response and time-domain specifications, Steady-State error, time response of a first order system, transient response of a prototype second order system.	8
IV	Stability of Linear Control Systems: Bounded-input bounded-output stability continuous data systems, zero-input and asymptotic stability of continuous data systems, methods of determining stability, Routh Hurwitz criterion. Root-Locus Technique: Introduction, Properties of the Root Loci, Design aspects of the Root Loci	8
V	Frequency Domain Analysis: M_r (resonant peak) and ω_r (resonant frequency) and bandwidth of the prototype Second order system, effects of adding a zero to the forward path, effects of adding a pole to the forward path, Nyquist stability criterion, relative stability: gain margin and phase margin, stability analysis with The Bode plot.	8

Text Book:

1. B.C. Kuo&FaridGolnaraghi, “Automatic Control Systems”, 8th Edition, John Wiley India.

Reference Books:

1. William A. Wolovich, “Automatic Control Systems”, Oxford University Press.
2. Joseph J. Distefano III, Allen R. Stubberud, Ivan J. Williams, “Feedback and Control Systems” Schaums Outlines Series, 3rd Edition, Tata McGraw Hill.
3. I. J. Nagrath& M. Gopal, “Control System Engineering”, New Age International Publishers.

NEC 504 Antenna and Wave Propagation		
Unit	Topic	Proposed number of Lectures
I	**Antennas Basics:** Introduction, Basic Antenna Parameters, Patterns, Beam Area (or Beam Solid Angle) ΩA, Radiation Intensity, Beam Efficiency, Directivity D and Gain G, Directivity and Resolution, Antenna Apertures, Effective Height, The radio Communication link, Fields from Oscillating Dipole, Single-to-Noise Ratio(SNR), Antenna Temperature, Antenna Impedance.	8
II	**Point Sources and Their Arrays:** Introduction, Point Source ,Power Theorem and its Application to an Isotropic Source, Radiation Intensity, Arrays of Two Isotropic Point Sources, Non-isotropic but Similar Point Sources and the Principle of Pattern Multiplication, Pattern Synthesis by Pattern Multiplication, Linear Arrays of n Isotropic Point Sources of Equal Amplitude and Spacing, Linear Broadside Arrays with Non- uniform Amplitude Distributions. General Considerations. **Electric Dipoles, Thin Liner Antennas and Arrays of Dipoles and Apertures**: The Short Electric Dipole, The Fields of a Short Dipole, Radiation Resistance of Short Electric Dipole, Thin Linear Antenna, Radiation Resistance of λ/2 Antenna, Array of Two Driven λ/2 Elements: Broadside Case and End-Fire Case, Horizontal Antennas Above a Plane Ground, Vertical Antennas Above a Plane Ground, Yagi-Uda Antenna Design, Long-Wire Antennas, folded Dipole Antennas.	8
III	**The Loop Antenna:** Design and its Characteristic Properties, Application of Loop Antennas, Far Field Patterns of Circular Loop Antennas with Uniform Current, Slot Antennas, Horn Antennas, Helical Antennas, The Log-Periodic Antenna, Micro strip Antennas. **Reflector Antennas:**Flat Sheet Reflectors, Corner Reflectors, The Parabola-General Properties, A Comparison Between Parabolic and Corner Reflectors, The Paraboloidal Reflector, Patterns of Large Circular Apertures with Uniform Illumination, Reflector Types (summarized), Feed Methods for Parabolic Reflectors.	8
IV	**Ground Wave Propagation:**Plane Earth Reflection, Space Wave and Surface Wave. **Space Wave Propagation:**Introduction, Field Strength Relation, Effects of Imperfect Earth, Effects of Curvature of Earth. **Sky wave Propagation:**Introduction structural Details of the ionosphere, Wave Propagation Mechanism, Refraction and Reflection of Sky Waves by ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation Between MUF and the Skip Distance, Multi-Hop Propagation, Wave Characteristics	8

Text Book:

1. John D Krauss, Ronald J Marhefka and Ahmad S. Khan, “Antennas and Wave Propagation”, Fourth Edition, Tata McGraw Hill.

Reference Books:

1. A. R. Harish, M. Sachidananda, “Antennas and Wave Propogation”, Oxford University Press.
2. Edward Conrad Jordan and Keith George Balmain, “Electromagnetic Waves and Radiating Systems”, PHI.
3. A. Das, Sisir K. Das, “Microwave Engineering”, Tata McGraw Hill.

LABOROTARY

NEC 551: Integrated Circuit Lab

Objective: - To design and implement the circuits to gain knowledge on performance of the circuit and its application. These circuits should also be simulated on Pspice.

1. Log and antilog amplifiers.
2. Voltage comparator and zero crossing detectors.
3. Second order filters using operational amplifier for–
    a. Low pass filter of cutoff frequency 1 KHz.
    b. High pass filter of frequency 12 KHz.
    c. Band pass filter with unit gain of pass band from 1 KHz to 12 KHz.
4. Wien bridge oscillator using operational amplifier.
5. Determine capture range; lock in range and free running frequency of PLL.
6. Voltage regulator using operational amplifier to produce output of 12V with maximum load current of 50mA.
7. A/D and D/A convertor.
8. Voltage to current and current to voltage convertors.
9. Function generator using operational amplifier (sine, triangular & square wave)
10. Astable and monostablemultivibrator using IC 555.

NIC 551: Control System Lab

1. DifferentToolboxesinMATLAB,IntroductiontoControlSystemsToolbox.
2. Determinetranspose,inversevaluesofgivenmatrix.
3. Plotthepole-zeroconfigurationins-planeforthegiventransferfunction.
4. Determinethetransferfunctionforgivenclosedloopsysteminblockdiagramrepresentation.
5. Plotunitstepresponseofgiventransferfunctionandfindpeakovershoot,peaktime.
6. Plotunitstepresponseandtofindrisetimeanddelaytime.
7. Plotlocusofgiventransferfunction,locateclosedlooppolesfordifferentvaluesofk.
8. Plot root locusofgiventransferfunction and tofind outS,Wd,Wnatgivenroot &todiscuss stability.
9. Plotbodeplotofgiventransferfunction.
10. Plotbodeplotofgiventransferfunctionandfindgainandphasemargins
11. PlotNyquistplotforgiventransferfunctionandtocomparetheirrelativestability
12. PlottheNyquistplotforgiventransferfunctionandtodiscussclosedloopstability,gainand phasemargin.

Note:-Inaddition,Institutesmayincludemoreexperimentsbasedontheexpertise.

NEC 552: Communication Lab – 1

1. To study DSB/ SSB amplitude modulation & determine its modulation factor & power in side bands.
2. To study amplitude demodulation by linear diode detector
3. To study frequency modulation and determine its modulation factor
4. To study PLL 565 as frequency demodulator.
5. To study sampling and reconstruction of Pulse Amplitude modulation system.
6. To study the Sensitivity, Selectivity, and Fidelity characteristics of super heterodyne receiver.

7. To study Pulse Amplitude Modulation
    a. using switching method
    b. by sample and hold circuit
8. To demodulate the obtained PAM signal by 2nd order LPF.
9. To study Pulse Width Modulation and Pulse Position Modulation.
10. To plot the radiation pattern of a Dipole, Yagi-uda and calculate its beam width.
11. To plot the radiation pattern of Horn, Parabolic & helical antenna. Also calculate beam width & element current.
12. Design and implement an FM radio receiver in 88-108 MHz.

NEC 553: Microprocessors Lab

1. Write a program using 8085/ 8086 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
2. Write a program using 8085/ 8086 Microprocessor for addition and subtraction of two BCD numbers.
3. To perform multiplication and division of two 8 bit numbers using 8085/ 8086.
4. To find the largest and smallest number in an array of data using 8085/8086 instruction set.
5. To write a program to arrange an array of data in ascending and descending order using 8085/ 8086.
6. To convert given Hexadecimal number into its equivalent ASCII number and vice versa using 8085/ 8086 instruction set.
7. To write a program to initiate 8251 and to check the transmission and reception of character.
8. To interface 8253 programmable interval timer to 8085/ 8086 and verify the operation of 8253 in six different modes.
9. To interface DAC with 8085/ 8086 to demonstrate the generation of square, saw tooth and triangular wave.
10. Serial communication between two 8085/8086 through RS-232 C port.

Note:-In addition, Institutes may include two more experiments based on the expertise.

NEC 601 Microwave Engineering		
Unit	Topic	Proposed number of Lectures
I	RectangularWaveGuide:FieldComponents,TE,TMModes,Dominant TE_{10} mode, FieldDistribution,Power, Attenuation.Circular Waveguides: TE,TMmodes. Wave Velocities,MicrostripTransmissionline(TL), CoupledTL, StripTL,CoupledStripLine,CoplanarTL,Microwave Cavities,	8
II	Scattering Matrix, Passivemicrowave devices: MicrowaveHybrid Circuits, Terminations, Attenuators, Phase Shifters, Directional Couplers: TwoHole directional couplers,SMatrix ofa Directional coupler,HybridCouplers, MicrowavePropagationinferrites,Faraday Rotation,Isolators,Circulators.Sparameteranalysis ofallcomponents.	8
III	Microwave Tubes: Limitation of Conventional Active Devices at Microwave frequency, Two Cavity Klystron, Reflex Klystron, Magnetron, Traveling Wave Tube,BackwardWave Oscillators:Their Schematic,Principle ofOperation, PerformanceCharacteristicandtheir applications.	8
IV	Solid state amplifiers and oscillators: Microwave Bipolar Transistor, Microwavetunnel diode,MicrowaveField-effectTransistor,Transferred electron devices,Avalanche Transit – time devices:IMPATT Diode, TRAPPATDiode,	8
V	MicrowaveMeasurements:Generalsetupofamicrowavetestbench, Slottedlinecarriage, VSWRMeter,microwave powermeasurements techniques,CrystalDetector,frequency measurement,wavelength measurements,Impedance andRefection coefficient, VSWR,Insertion andattenuationlossmeasurements, measurementofantenna characteristics, microwave linkdesign.	8

Text Book:

1. Samuel Y. Liao, "MicrowaveDevices and Circuits", 3rdEdition,PearsonEducation.

Reference Books:

1. R.E Collin, "Foundation forMicrowaveEngineering", 2ndEdition, JohnWiley India.
2. A. DasandS.K.Das,"MicrowaveEngineering",Tata McGraw Hill.

NEC 602 Digital Communication		
Unit	Topic	Proposed number of Lectures
I	DigitalDatatransmission, Linecoding review,Pulseshaping,Scrambling, Digitalreceivers,Eyediagram,Digitalcarriersystem,Methodofgeneration and detection of coherent &non-coherent binary ASK, FSK &PSK, Differentialphaseshiftkeying,quadraturemodulationtechniques.(QPSKand MSK),M-aryDigital carrierModulation.	8
II	Concept of Probability, Random variable, Statistical averages, Correlation, Sum ofRandom Variables,CentralLimitTheorem,Random Process, ClassificationofRandom Processes,Powerspectral density,Multiplerandom processes,	8
III	Performance Analysis of Digital communication system: Optimum linear Detector for Binary polar signaling, General Binary Signaling,Coherent Receivers for DigitalCarrierModulations, Signal Space Analysisof Optimum Detection, VectorDecompositionof WhiteNoiseRandom processes,General Expression forError Probability ofoptimumreceivers,	8
IV	Spread spectrum Communications: Frequency Hopping Spread Spectrum (FHSS)systems,DirectSequenceSpreadSpectrum,CodeDivision Multiple Access ofDSSS, Multiuser Detection,OFDM Communications	8
V	MeasureofInformation,SourceEncoding,ErrorFreeCommunicationovera NoisyChannelcapacity ofa discreteandContinuous Memorylesschannel ErrorCorrectingcodes:Hammingsphere,hamming distanceandHamming bound,relationbetweenminimum distanceanderror detectingandcorrecting capability,Linear blockcodes,encoding& syndrome decoding; Cycliccodes, encoderanddecodersforsystematiccyclecodes;convolutioncodes,codetree &Trellisdiagram, Viterbiandsequentialdecoding,bursterrorcorrection, Turbocodes.	8

Text Book:

1. B.P.Lathi,"ModernDigitalandAnalogcommunicationSystems",4th Edition,OxfordUniversityPress.

Reference Books:

1. H.Taub,D.L.Schilling,G.Saha,"PrinciplesofCommunication",3rd Edition,TataMcGraw-Hill.
2. John G.Proakis,"Digital Communications",4th Edition,McGraw-Hill International.
3. SimonHaykin,"Communication Systems",4th Edition,Wiley India.
4. H.P.HSUandD.Mitra,"AnalogandDigitalCommunications",2nd Edition,TataMcGraw-Hill.

NEC 603 Integrated Circuit Technology		
Unit	Topic	Proposed number of Lectures
I	Introduction To IC Technology: SSI, MSI, LSI, VLSI Integrated CircuitsCrystal Growth and Wafer Preparation: Electronic Grade Silicon, Czochralski Crystal Growth, Silicon Shaping, Processing Considerations. Epitaxy: Vapor –Phase Epitaxy, Molecular Beam Epitaxy, Silicon on Insulators, Epitaxial Evaluation.	8
II	Oxidation: Growth Kinetics, Thin Oxides, Oxidation Techniques andSystems, Oxides Properties. Lithography: Optical Lithography. Photo masks, Wet Chemical Etching. Dielectric and Polysilicon Film Deposition:Deposition Processes, Polysilicon, Silicon Dioxide, Silicon Nitride.	8
III	Diffusion: Diffusion of Impurities in Silicon and Silicon Dioxide, DiffusionEquations, Diffusion Profiles, Diffusion Furnace, Solid, Liquid andGaseous Sources, Sheet Resistance and its Measurement. Ion-Implantation: Ion-Implantation Technique, Range Theory, ImplantationEquipment.	8
IV	Metallization: Metallization Application, Metallization Choices, PhysicalVapor Deposition, Vacuum Deposition, Sputtering Apparatus. Packaging of VLSI devices: Package Types, Packaging DesignConsideration, VLSI Assembly Technologies, Package FabricationTechnologies.	8
V	VLSI Process Integration: Fundamental Considerations For IC Processing,NMOS IC Technology, CMOS IC Technology, Bipolar IC Technology,Monolithic and Hybrid Integrated Circuits, IC Fabrication	8

Text Books:

1. S. M. Sze, “VLSI Technology”, 2nd Edition, McGraw –Hill Publication.
2. S.K. Ghandhi, “VLSI Fabrication Principles”, 2nd Edition, Willy-India Pvt. Ltd.

Reference Books:

1. J. D. Plummer, M. D. Deal and Peter B. Griffin, “Silicon VLSI Technology: Fundamentals, practice and modelling”, Pearson Education.
2. Stephen A. Campbell, “Fabrication Engineering at the micro and nano scale”, Oxford University Press.

Laboratory

NEC 651 Antenna and Microwave Lab

1. Study of Reflex Klystron Characteristics.
2. Measurement of guide wavelength and frequency of the signal in a rectangular Waveguide using slotted line carriage in a Micro wave Bench.
3. Measurement of impedance of an unknown load connected at the output end of the slotted line carriage in a Micro wave Bench.
4. Determine the S-parameter of any Three port Tee.
5. Determine the S-parameter of a Magic Tee.
6. Study various parameters of Isolator .
7. Measurement of attenuation of a attenuator and isolation, insertion loss, cross coupling of a circulator.
8. Determine coupling coefficient, Insertion loss, Directivity and Isolation coefficient of anty Multi-Hole directional coupler.
9. To study working of MIC Components like Micro strip Line, Filter, Directional Coupler,Wilkinson Power Divider, Ring resonator & coupler, antennas & amplifies.
10. Study of waveguide horn and its radiation pattern and determination of the beam width.
11. Study radiation pattern of any two types of linear antenna.

NEC 652 COMMUNICATION LAB – II

1. To construct a triangular wave with the help of Fundamental Frequency and its Harmonic component.
2. To construct a Square wave with the help of Fundamental Frequency and its Harmonic component.
3. Study of Pulse code modulation (PCM) and its demodulation using Bread Board.
4. Study of delta modulation and demodulation and observe effect of slope overload.
5. Study of pulse data coding techniques for NRZ formats.
6. Study of Data decoding techniques for NRZ formats.
7. Study of Manchester coding and Decoding.
8. Study of Amplitude shift keying modulator and demodulator.
9. Study of Frequency shift keying modulator and demodulator.
10. Study of Phase shift keying modulator and demodulator
11. Study of single bit error detection and correction using Hamming code.
12. Measuring the input impedance and Attenuation of a given Transmission Line

NEC-653 CAD OF ELECTRONICS LAB

PSPICE Experiments

1. (a)Transient Analysis of BJT inverter using step input.
   (b)DC Analysis (VTC) of BJT inverter with and without parameters.
2. (a)Transient Analysis of NMOS inverter using step input.
   (b)Transient Analysis of NMOS inverter using pulse input.
   (c)DC Analysis (VTC) of NMOS inverter with and without parameters.
3. (a)Analysis of CMOS inverter using step input.
   (b)Transient Analysis of CMOS inverter using step input with parameters.
   (c)Transient Analysis of CMOS inverter using pulse input.
   (d)Transient Analysis of CMOS inverter using pulse input with parameters.
   (e)DC Analysis (VTC) of CMOS inverter with and without parameters.

4. Transient &DC Analysis of NOR Gate inverter.
5. Transient & DC Analysis of NAND Gate.
6. VHDL Experiments
    a. Synthesis and simulation of Full Adder.
    b. Synthesis and Simulation of Full Subtractor.
    c. Synthesis and Simulation of 3 X 8 Decoder.
    d. Synthesis and Simulation of 8 X 1 Multiplexer.
    e. Synthesis and Simulation of 9 bit odd parity generator.
    f. Synthesis and Simulation of Flip Flop (D, and T).

Electives

NEC 011 Digital Signal Processing		
Unit	Topic	Proposed number of Lectures
I	**Realization of Digital Systems:** Introduction, direct form realization of IIR systems, cascade realization of an IIR systems, parallel form realization of an IIR systems, Ladder structures: continued fraction expansion of H (z), example of continued fraction, realization of a ladder structure, example of a ladder realization.	8
II	**Design of Infinite Impulse Response Digital Filters**: Introduction to Filters, Impulse Invariant Transformation, Bi-Linear Transformation, All- Pole Analog Filters: Butterworth and Chebyshev, Design of Digital Butterworth and Chebyshev Filters.	8
III	**Finite Impulse Response Filter Design:** Windowing and the Rectangular Window, Other Commonly Used Windows, Examples of Filter Designs Using Windows, The Kaiser Window.	8
IV	**Discrete Fourier Transforms:** Definitions, Properties of the DFT, Circular Convolution, Linear Convolution.	8
V	**Fast Fourier Transform Algorithms:** Introduction, Decimation –In Time(DIT) Algorithm, Computational Efficiency, Decimation in Frequency (DIF) Algorithm.	8

Text Book:

1. Johnny R. Johnson, “Digital Signal Processing”, PHI.

Reference Books:

1. John G Prokias, Dimitris G Manolakis, “Digital Signal Processing”, Pearson Education.
2. Oppenheim & Schafer, “Digital Signal Processing” PHI.
3. Sanjit K. Mitra, “Digital Signal Processing: A Computer-Based Approach”, 4th Edition, McGraw Hill.
4. Monson Hayes, “Digital Signal Processing”,2nd Edition, McGraw Hill Education

NEC 012 Computer Architecture and Organization		
Unit	Topic	Proposed number of Lectures
I	Introduction to Design Methodology: System Design – System representation, Design Process, the gate level (revision), the register level components and PLD (revision), register level design The Processor Level: Processor level components, Processor level design.	8
II	Processor basics: CPU organization- Fundamentals, Additional features Data Representation – Basic formats, Fixed point numbers, Floating point numbers. Instruction sets – Formats, Types, Programming considerations.	8
III	Datapath Design: Fixed point arithmetic – Addition and subtraction, Multiplication and Division, Floating point arithmetic, pipelining.	8
IV	Control Design: basic concepts – introduction, hardwired control, Micro programmed control –introduction, multiplier control unit, CPU control unit, Pipeline control- instruction pipelines, pipeline performance.	8
V	Memory organization: Multi level memories, Address translation, Memory allocation, Caches – Main features, Address mapping, structure vs performance, System Organisation: Communication methods- basic concepts, bus control. Introduction to VHDL.	8

TextBooks:

1. John P Hayes “Computer Architecture and Organisation”, 3rd Edition, McGraw Hill.

Reference Books:

1. M Morris Mano, “Computer System Architecture”,3rd Edition, Pearson.
2. Carl Hamacher, ZvonkoVranesic and SafwatZaky, “Computer Organization and Embedded Systems”, McGraw Hill.
3. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Elsevier.

NEC 013 Artificial Neural Network		
Unit	Topic	Proposed number of Lectures
I	**Introduction to ANN** Features , structure and working of Biological Neural Network Trends in Computing Comparison of BNN and ANN. **Basics of Artificial Neural Networks** - History of neural network research, characteristics of neural networks terminology, models of neuron McCulloch – Pitts model, Perceptron, Adaline model, Basic learning laws, Topology of neural network architecture.	8
II	**Backpropagation networks** : (BPN) Architecture of feed forward network, single layer ANN, multilayer perceptron, back propagation learning, input - hidden and output layer computation, backpropagation algorithm, applications, selection of tuning parameters in BPN, Numbers of hidden nodes, learning.	8
III	**Activation & Synaptic Dynamics** : Introduction, Activation Dynamics models, synaptic Dynamics models, stability and convergence, recall in neural networks. **Basic functional units of ANN for pattern recognition tasks**: Basic feed forward, Basic feedback and basic competitive learning neural network. Pattern association, pattern classification and pattern mapping tasks.	8
IV	**a)Feedforward neural networks** – - Linear responsibility X-OR problem and solution. - Analysis of pattern mapping networks summary of basic gradient search methods. **b)Feedback neural networks** Pattern storage networks, stochastic networks and simulated annealing, Boltzmann machine and Boltzmann learning.	8
V	**Competitive learning neural networks :** Components of CL network pattern clustering and feature. Mapping network, ART networks, Features of ART models, character recognition using ART network**.** **Applications of ANN :** Pattern classification – Recognition of Olympic games symbols, Recognition of printed Characters. Neocognitron – Recognition of handwritten characters. NET Talk: to convert English text to speech. Recognition of consonant vowel (CV) segments, texture classification and segmentation.	8

Text Book:

1. B. Yegnanarayana, “Artificial neural Networks”, PHI.

Reference Books:

1. S. Raj Sekaran ,VijayalakshmiPari,” Neural networks, Fuzzy logic and Genetic Algorithms”, PHI.
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, TMH.

NEC 014 Advance Semiconductor Devices		
Unit	Topic	Proposed number of Lectures
I	**Physics and Properties of Semiconductors:** Introduction, Crystal Structure, Energy Bands and Energy Gap, Carrier Concentration at Thermal Equilibrium, Carrier-Transport Phenomena. Phonon, Optical, and Thermal Properties, Heterojunctions and Nanostructures, Basic Equations and Examples. *p-n* Junctions, Introduction, Depletion Region, Current-Voltage Characteristics, Junction Breakdown, Transient Behavior and Noise, Terminal Functions, Heterojunctions. Metal-Semiconductor Contacts, Metal-Insulator-Semiconductor Capacitors.	8
II	**Bipolar Transistors:** Static Characteristics, Microwave Characteristics, Related Device Structures, Heterojunction Bipolar Transistor. **MOSFETs:** Basic Device Characteristics, Nonuniform Doping and Buried-Channel Device, Device Scaling and Short-Channel Effects, MOSFET Structures, Circuit Applications, Nonvolatile Memory Devices, Single-Electron Transistor. JFETs, MESFETs, and MODFETs	8
III	**Tunnel Devices:** Tunnel Diode, Related Tunnel Devices, Resonant-Tunneling Diode. **IMPATT Diodes:** Static Characteristics, Dynamic Characteristics, Power and Efficiency, Noise Behavior, Device Design and Performance, BARITT Diode, TUNNETT Diode.	8
IV	Transferred-Electron and Real-Space-Transfer DevicesThyristors and Power Devices **Photonic Devices and Sensors:** Radiative Transitions, Light-Emitting Diode (LED), Laser Physics, Laser Operating Characteristics, Specialty Lasers.	8
V	**Photodetectors and Solar Cells:** Photoconductor, Photodiodes, Avalanche Photodiode, Phototransistor, Charge-Coupled Device (CCD), Metal-Semiconductor-Metal Photodetector, Quantum-Well Infrared Photodetector, Solar Cell. **Sensors:**Thermal Sensors, Mechanical Sensors, Magnetic Sensors, Chemical Sensors.	8

Text Book:

1. S. M. Sze, Kwok K. NG, “Physics of Semiconductor Devices”, 3rd Edition, Wiley Publication.

Reference Books:

1. J. P. Colinge and C. A. Colinge, "Physics Of Semiconductor Devices", Kluwer Academic Publishers

NEC 021 Industrial Electronics		
Unit	Topic	Proposed number of Lectures
I	**Power Semiconductor Devices:** Power semiconductor devices their symbols and static characteristics and specifications of switches, types of power electronic circuits Operation, steady state & switch characteristics & switching limits of Power Transistor Operation and steady state characteristics of Power MOSFET and IGBT Thyristor – Operation V- I characteristics, two transistor model, methods of turn-on Operation of GTO, MCT and TRIAC.	8
II	**Phase Controlled Rectifiers:** Phase Angle Control, Single-phase Half-wave Controlled Rectifier (One quadrant), Single-phase Full-wave Controlled Rectifier (Two quadrant Converters),Performance Factors of Line-commutated Converters, The Performance Measures of Two-pulse Converters, Three phase Controlled Converters **Inverters:** Introduction Thyristor Inverter Classification, Series Inverters, Parallel Inverter, Three-phase Bridge Inverters, Three-phase Bridge Inverter with Input-circuit Commutation.	8
III	**Choppers:** Introduction, Principle of Chopper Operation, Control Strategies, step-up/Down Chopper, Jones Chopper. Introduction to basic Cycloconverters. **Control of D.C. Drives:** Introduction, Basic Machine Equations, Breaking Modes, Schemes for D.C. Motor Speed Control, Single-phase Separately Excited Drives, Braking Operation of Rectifier Controlled Separately excited Motor, Single-phase Separately Excited Drives, Power Factor Improvement, Three-phase Separately Excited Drives, D.C. Chopper Drives	8
IV	**Control of A.C. Drives:** Introduction, basic Principle of Operation, Squirrel-cage Rotor Design, Speed Control of Induction Motors, stator Voltage Control, Variable Frequency control, Rotor Resistance Control, Slip Power Recovery Scheme, Synchronous Motor Drives	8

Text Books:

1. M. H. Rashid, “Power Electronics”, 3rd Edition, Pearson Education.

Reference Books:

1. M. D. Singh & K. Khanchandani, “Power Electronics”, Tata McGraw Hill.
2. V.R. Moorthy, “Power Electronics: Devices, Circuits and Industrial Applications”, Oxford University Press,2007.
3. M.S. JamilAsghar, “Power Electronics”,PHI.
4. Ned Mohan, T.M.Undeland and W.P.Robbins, “Power Electronics:Converters, Applications and Design”, Wiley India.

NEC 022 Microcontroller and it Applications		
Unit	Topic	Proposed number of Lectures
I	Introduction to microcontrollers and embedded systems, Von Neumann (Princetone) and Harvard architecture, RISC and CISC machine, overview of the 8051 family, general architecture (pins and signals, internal architecture, program memory and data memory organization, system clock, reset, programming technique), input/ output ports and special function registers, addressing mode.	8
II	Instruction groups of MCS-51: data transfer operation, arithmetic operations, branch operation, logical operation, Boolean variable manipulation, subroutine & stack operation and advance instructions. Assembler data type and directives, introduction to assembly programming and programming in C.	8
III	External interrupts and software interrupt, timer/ counter interrupt, interrupt service routine, programming 8051 timer, counter programming, Basic of serial communication, mode of serial communication, RS232, serial communication issue, serial port programming,	8
IV	Interfacing with 8051: external memory, 8255, keyboards, display devices, DAC/ADC, DC Motor, Stepper Motor, Servomotor, power management, Sensor interfacing and signal conditioning.	8

Text Book:

1. Mazidi Ali Muhammad, MazidiGillispie Janice, and McKinlayRolin D., "The 8051 Microcontroller and Embedded Systems using Assembly and C", Pearson, 2nd Edition.
2. ChhabraBhupendra Singh, "Microcontrollers & its Applications" DhanpatRai Publishing Company, New Delhi

Reference Book:

1. Shah Satish, "8051 Microcontrollers MCS 51 Family and its variants", Oxford
2. SubrataGhoshal, "8051 Microcontroller Internals, Instructions, Programming and Interfacing" Pearson
3. V. Udayashankara, M.S. Mallikajunaswamy, "8051 Microcontroller Hardware, Software and Applications", McGraw-Hill.
4. DoganBrahim, "Microcontroller Projects in C for the 8051", Newnes
5. SubrataGhoshal,"Embedded System & Robots Projects using the 8051 Microcontroller", CengageLerning

NEC 023 Analog Signal Processing		
Unit	Topic	Proposed number of Lectures
I	Introduction to domains and the analogue/digital trade off, Introduction to basic building blocks: nullor, voltage feedback amplifier, operation transconductance amplifier, current conveyor, current feedback amplifier. Analog signal filtering: introduction to bilinear transfer functions and active realizations. First-order and second-order filter realization, filter design parameters (Q and ω_0), frequency response,effect of finite gain of op-amp, realization of Single-Amplifier Biquad and General Impedance Convertor circuit.	8
II	Ideal low-pass filter, Buttreworth and Chebyshev magnitude response, pole locations, low-pass filter specifications.	8
III	Delay equalization: equalization procedures, equalization with first-order and second-order modules, strategies for equalization design. Definition of Bode sensitivity.	8
IV	Properties of Lossless ladders, the general impedance convertor (GIC), optimal design of the GIC, realization of simple ladders, Gorski-Popiel's Embedding Technique, Bruton's FDNR technique, creating negative components.	8

Text Books:

1. R.Schaumann and M.E.Valkenberg,"Designof AnalogCircuits", Oxford University Press.

NEC 024 Advanced Digital Design and Verilog		
Unit	Topic	Proposed number of Lectures
I	Introduction to Mixed Logic, Logic Representation and Minimization with cost, Multiple output minimization, Entered Variable K- Map including don't care handling, XOR-Pattern Handling.	8
II	Combinational Circuit Design, Multiplexers, Decoders, Encoders, Code Comparators, Adders, Subtractors, Multipliers, Timing Analysis, Hazard Detection and Elimination.	8
III	Synchronous Sequential Circuits Design, Mapping Algorithm, Synchronous State Machines, ASM Charts, Asynchronous Sequential Circuit Design, Races, Multi level minimization and optimization.	8
IV	Factoring, Decomposition, BDD, Ordered BDD, LPDD, Fault Detection and Analysis in combinational and sequential systems, Path Sensitization method, Boolean Difference Method, Initial State Method.	8
V	Study of programmable logic families, PLD, CPLD, FPGA, ASIC, PLA, Architectures, Design of Combinational and sequential circuits using CPLD and FPGA, Design Examples.	8

Text Books:

1. Richard F. Tinder, "Engineering Digital Design", Academic Press.
2. Parag K. Lala, "Digital system Design Using PLDs", PHI India Ltd.

Reference Books:

1. John Williams, "Digital VLSI Design with Verilog", Springer Publication.
2. Eugene Fabricius, "Modern Digital Design and Switching Theory", CRC Press.
3. Samuel C. Lee, "Digital Circuit and Logic Design", PHI India Ltd.
4. Alexander Miczo, "Digital Logic Testing and Simulation",Wiley Interscience.
5. Stephen Brown and ZvonkoVranesiv, "Fundamental of Digital Logic with Verilog Design", Tata McGraw Hill.