UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS

For

B. Tech

Electronic & Communication Engineering

3rd Year

[Effective from Session 2015-16]

SEMESTER - V

S. 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

S. 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

INSTITUTE

Vision:

To achieve excellence in technical education and create competent professionals for Industry &Socio-economic development to meet National and International needs.

Mission:

- To achieve academic excellence in technical education through innovative teaching-learning process
- To provide strong fundamental & conceptual knowledge with essential skills to meet current and future needs
- To build strong industry academia connect through industrial & socially relevant projects
- To inculcate right human values and professional ethics

DEPARTMENT OF ECE

Vision:

To become a leading center of excellence in the technical education of Electronics & Communication Engineering and create competent professionals in thrust areas for the development of society and nation

Mission:

- To educate the students with the state of the art technologies through innovative teaching-learning process.
- To enable the graduates to develop the skills required to solve complex real time problems using tools and techniques of Electronics & Communication Engineering practice.
- To develop the spirit of innovation and creativity by collaborating with industries and research establishments to fulfill the needs of society.
- To practice high standards of human values, professional ethics and accountability.

PROGRAMME EDUCATIONAL OBJECTIVES

There are following Program Educational Objectives:

I. Acquire fundamental knowledge of Electronics & Communication Engineering to become employable and capable of pursuing higher studies.
II. Have sound foundation required to develop hardware & software solutions necessary for analysis, design and implementation of modern Electronics & Communication Engineering systems
III. Develop effective communication skills and interpersonal behavior to become a cooperative team member and able leader.
IV. Provide quality and worthy service towards their profession with societal and ethical values.
V. Inculcate the habit of life -long learning needed for higher studies and research and continue to develop new methodologies and technologies

NEC- 501 Integrated Circuits

Preamble

- To deliver the core concepts to understand the design and analysis of basic analog amplifier and various types of filter. Also to motivate students the concept of op-amp and CMOS to apply for real applications.

Course Objective

- To understand the knowledge of basic analog amplifiers and circuits.
- To understand the methods and techniques of simulation tool to design and analysis of IC based circuits.
- To understand the designing of basic logic gates, latches, flip-flops based on the concept of CMOS logic.

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Course Outcomes

Students will be able to:

1. Apply knowledge of basic analog amplifiers and circuits to analyze Op-Amp, integrated circuits.
2. Identify and formulate equation of basic filters in the field of analog filter design.
3. Use the techniques of circuit simulation tool to design and analysis of IC based circuits.
4. Use concept of CMOS logic for designing of basic logic gates, latches, flip-flops and analyze structural domain of Y chart.
5. Use the fundamentals of integrated circuits in the field of communication system, sampling, mathematical operation, digital logic circuits.

Pre-Requisite

- Knowledge on Electronic Circuits

Links to Other Courses

- VLSI Design

Course Content

Unit 1:

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 ft and SR

Unit 2:

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.

Unit 3:

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.

Unit 4:

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

Unit 5:

D/A and A/D converters, Integrated Circuit Timer: The 555 Circuit, Implementing a Monostable Multivibrator Using the 555 IC, Astable Multivibrator 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.

Text Book:

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

Preamble

- This course is used to provide the knowledge of communication system and for student to motivate and understand the concept of probability theory in analog communication system.

Course Objective

- To understand the basic concept of analog communication systems
- To understand the bandwidth and signal-to-noise ratio of a signal at the output of a linear time-invariant system
- To Understand the techniques involved in the transfer of information in the field of communication

Course Outcomes

Student will be able to:

1. Learn comprehensive, theory based understanding of the analog communication systems and fundamentals of digital communication systems applicable to the engineering discipline.
2. Apply knowledge of mathematics to obtain Fourier series for periodic signals; sketch the magnitude and phase spectra for periodic signals and identify the discrete frequency components.
3. Design system-level block diagrams within realistic constraints to recover message signals from different analog modulation formats.
4. Calculate the bandwidth and signal-to-noise ratio of a signal at the output of a linear time-invariant system given the signal and the power spectral density of the noise at the input of the system.
5. Understand the techniques involved in the transfer of information in the field of radio communication

Pre-Requisite

- Knowledge of mathematics and signal systems

Links to Other Courses

- Related with all communication systems

Course Content

Unit 1:

Introduction: Overview of Communication system, Communication channels, Need for modulation, Base band and Pass band signals, Amplitude Modulation: Double side band with Carrier(DSB-S Double side band without Carrier, Single Side Band Modulation, DSB-

SC,DSB-C,SSB Modulators and Demodulators, Vestigial Side Band (VSB), Quadrature Amplitude Modulator, Radio Transmitter and Receiver.

Unit 2:

Angle Modulation, Tone Modulated FM Signal, Arbitrary Modulated FM Signal, FM Modulators and Demodulators, Approximately Compatible SSB Systems, Stereophonic FM Broadcasting, Examples Based on MATLAB.

Unit 3:

Pulse Modulation, Digital Transmission of Analog Signals: Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation. Their generation and Demodulation, Digital Representation of Analog Signals, Pulse Code Modulation (PCM), PCM System, Issues in digital transmission: Frequency Division Multiplexing, Time Division Multiplexing, Line Coding and their Power Spectral density, T1 Digital System, TDM Hierarchy.

Unit 4:

Differential Pulse Code Modulation, Delta Modulation. adaptive delta modulation, Voice Coders, Sources of Noises, Frequency domain representation of noise, position of noises, Linear filtering of Noises, Mathematical Representation of Noise.

Unit 5:

Noise in Amplitude Modulation: Analysis Signal to Noise Ratio, Figure of Merit. Noise in Frequency Modulation: Pre emphasis, De Emphasis and SNR Improvement, Phase Locked Loops Analog and Digital.

Text Book:

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

Reference Books:

1. B.P.Lathi,“ModernDigitalandAnalogcommunicationSystems”,3 Edition, Oxford University Press.
2. SimonHaykin,“Communication Systems”,4th Edition,Wiley India.
3. H.P.Hsu&D.Mitra,“AnalogandDigitalCommunications”,2 Edition,TataMcGraw-Hill.

NEC- 503 MICROPROCESSORS

Preamble

- To deliver the knowledge of programmable system and to understand the architecture and programming language to perform the real time task

Course Objective

- To understand the basic terminology and describe the components, parts and operation of a microprocessor based system
- To understand the architecture of 8085 and 8086 microprocessor
- To understand the all instruction set and addressing mode of 8 and 16 – bit microprocessor
- To understand the programming of both processors and interfacing with many peripheral devices.

Course Outcomes

Students will be able to:

1. Describe the architecture of 8085 microprocessor and acquire programming proficiency using the various addressing modes and data transfer instructions of the microprocessor.
2. Apply knowledge of the microprocessor's internal registers and operations by use of a PC based microprocessor simulator.
3. Write assemble assembly language programs, assemble into machine a cross assembler utility and download and run their program on the training boards.
4. Design electrical & electronics circuitry using Microprocessors and I/O ports in order to interface the processor to external devices.
5. Write assembly language programs that will provide solutions to real-world control problems such as fluid level control, temperature control.

Pre-Requisite

- Knowledge of digital electronics, data structure

Links to Other Courses

- Related with microcontroller and Applications

Course Content

Unit 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.

Unit 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.

Unit 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.

Unit 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.

Unit 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.

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.

NEC- 501 Control System – I

Preamble

- To familiarize the students with control system - its working principles, methods of design and analysis, transform methods and application.

Course Objective

- To understand the basic components in control system.
- To understand the various method to design and analyze the physical systems.
- To understand the theory of Controllability and observability
- To understand the time domain and frequency domain analysis of control systems

Course Outcomes

Student will be able to:

1. Apply knowledge of basic components of control system to the analysis and design of physical systems such as electrical networks, sensors, mechanical systems, etc.
2. Identify state variables and analyze the response of various control systems in time domain to obtain their steady-state error.
3. Use routh-hurwitz criterion to determine the stability of linear control system to design practical stable physical systems necessary for engineering practice.
4. To design a practical control system in frequency domain with the help of nyquist stability criterion, relative stability, bode plot etc., to meet desired requirements in realistic environment.
5. To function on multi-disciplinary teams through various control system projects.

Pre-Requisite

- Signal and Systems

Links to Other Courses

- Digital Signal Processing

Course Content

Unit 1:

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.

Unit 2:

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.

Unit 3:

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.

Unit 4:

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

Unit 5:

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.

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

Preamble

- To deliver the knowledge of the principles governing waves, working, radiating systems, waveguides, transmission lines and antenna and the respective applications.

Course Objective

- To understand the fundamental parameters of antenna and their working.
- To understand the method to design and develop different types of antennas for given specifications to meet desired needs within realistic constraints.
- To understand the atmospheric effects on radio wave propagation.

Course Outcomes

Student will be able to:

1. Understand the antenna, working and fundamental parameters of antenna.
2. Identify, formulate and analyze an antenna array systems for given specifications.
3. Design and develop different types of antennas for given specifications to meet desired needs within realistic constraints such as economic, manufacturability, and sustainability.
4. Identify the antenna measurement techniques that is to be employed for the given antenna system and understand the effect of reflectors on antennas.
5. Understand the atmospheric effects on radio wave propagation so as to identify radio communication link which is more efficient and effective.

Pre-Requisite

- Knowledge from electromagnetic.

Links to Other Courses

- Optical Communication

Course Content

Unit 1:

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.

Unit 2:

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.

Unit 3:

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.

Unit 4:

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 skin Distance, Relation Between MUF and the Skip Distance, Multi-Hop Propagation, Wave Characteristics.

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 monostable multivibrator using IC 555.

NIC 551: Control System Lab

1. Different Tool boxes in MATLAB, Introduction to Control Systems Toolbox.
2. Determine transpose, inverse values of given matrix.
3. Plotthepole-zeroconfigurationins-planeforthegiventransferfunction.
4. Determinethetransferfunctionforgivenclosedloopsysteminblockdiagramrepresentation.
5. Plotunitstepresponseofgiventransferfunctionandfindpeakovershoot,peaktime.
6. Plot unit step response and to find rise time and delay time.
7. Plot locus of given transfer function, locate closed loop poles for different values of k.
8. Plot root locus of given transfer function and to find out S, Wd, Want given root & to discuss stability.
9. Plot bode plot of given transfer function.
10. Plot bode plot of given transfer function and find gain and phase margins
11. PlotNyquistplotforgiventransferfunctionandtocomparetheirrelativestability
12. PlottheNyquistplotforgiventransferfunctionandtodiscussclosedloopstability, gainand Phase margin.

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

Preamble:

- To provide the sound knowledge in basic concept of identification, formulation and finding solution in problems of high frequency transmission systems.

Course Objective

- To understand the concept of transmission lines to analyze and design a power distribution circuit
- To understand the solution for problems in the area of high frequency transmission systems using scattering parameters
- To understand the basic knowledge of microwave equipments and how to make measurement of various parameters of microwave systems
- To develop the skills to study the different passive microwave devices

Course Outcomes

Students will be able to:

1. Apply knowledge of transmission lines to analyze and design a power distribution circuit.
2. Identify, formulate, and solve engineering problems in the area of high frequency transmission systems using scattering parameters.
3. Use the techniques and skills to study different passive microwave devices.
4. Design commonly used systems such as radar and microwave transmission links.
5. Understand and identify the basic knowledge of microwave equipments and make measurement of various parameters of microwave systems.

Pre-Requisite

- Knowledge of mathematics and antenna & wave propagation

Links to Other Courses

- Optical communication

Course Content

Unit 1:

Rectangular Wave Guide: Field Components, TE, TM Modes, Dominant TE_{10} mode, Field Distribution, Power, Attenuation. Circular Waveguides: TE, TM modes Wave Velocities,

Microstrip Transmission line (TL), Strip TL, Coupled Strip Line, Coplanar TL, Microwave Cavities,

Unit 2:

Scattering Matrix, Passive microwave devices: Microwave Hybrid Circuits, Terminations Attenuators, Phase Shifters, Directional Couplers: Two Hole directional couplers, S Matrix ofa Directional coupler, Hybrid Couplers, Microwave Propagation in ferrites, Faraday Rotation Isolators, Circulators, S parameter analysis of all components.

Unit 3:

Microwave Tubes: Limitation of Conventional Active Devices at Microwave frequency, Two Cavity Klystron Reflex, Klystron, Magnetron, Traveling Wave Tube, Backward Wave Oscillators: Their Schematic, Principle of Operation, Performance Characteristic and their applications.

Unit 4:

Solid state amplifiers and oscillators: Microwave Bipolar Transistor, Micro wave tunnel diode, Microwave Field-effect Transistor, Transferred electron devices, Avalanche Transit – time devices: IMPATT Diode, TRAPPAT Diode,

Unit 5:

Micro wave Measurements: General setup of a micro wave test bench, Slotted line carriage, VSWR Meter, microwave power measurements techniques, Crystal Detector, frequency measurement ,wavelength measurements, Impedance and Refection coefficient, VSWR, Insertion and attenuation loss measurements, measurement of antenna characteristics, microwave link design.

Text Book:

1. Samuel Y. Liao, “Microwave Devices and Circuits”, 3rd Edition,PearsonEducation.

Reference Books:

1. R.E Collin, “Foundation forMicrowaveEngineering“, 2nd Edition, JohnWiley India.
2. A. DasandS.K.Das,“MicrowaveEngineering”,Tata McGraw Hill.

NEC- 602 Digital Communications

Preamble

- To provide the sound knowledge in concept of digital communication system

Course Objective

- To understand basic Concept of analog and digital modulation techniques, error control coding and spread spectrum.
- To understand the theoretical concepts like random process, error probability, bit error rate and error control coding techniques, spread spectrum techniques and various digital modulation techniques to efficiently utilize the modern engineering tools such as Lab-VIEW and MATLAB, necessary for engineering practice in the field of communication system
- To understand the function on multi-disciplinary teams through digital communication experiments and projects

Course Outcomes

Students will be able to

1. Apply knowledge of analog and digital modulation techniques, error control coding and spread spectrum techniques to the analysis and design of communication systems.
2. Identify, formulate, and solve engineering problems in the area of digital communication.
3. Apply the theoretical concepts like random process, error probability, bit error rate and error control coding techniques, spread spectrum techniques and various digital modulation techniques to efficiently utilize the modern engineering tools such as Lab-VIEW and MATLAB, necessary for engineering practice in the field of communication system.
4. Function on multi-disciplinary teams through digital communication experiments and projects.
5. Analyze and design a digital communication system using different error control techniques or modulation process to meet desired needs within realistic constraints.

Pre-Requisite

- Knowledge on signal and system, MATLAB

Links to Other Courses

- Data communication networks, wireless & mobile communication

Course Content

Unit 1:

Digital Data transmission, Line coding review, Pulse shaping, Scrambling, Digital receivers, Eye diagram, Digital carrier system, Method of generation and detection of coherent

& non-coherent binary ASK, FSK, & PSK, Differential phase shift keying, quadrature modulation techniques. (QPSK and MSK), M-ary Digital Carrier Modulation.

Unit 2:

Concept of Probability, Random variable, Statistical averages, Correlation, Sum of Random Variables, Central Limit Theorem, Random Process, Classification of Random Processes, Power spectral density, Multiple random processes,

Unit 3:

Performance Analysis of Digital communication system: Optimum linear Detector for Binary polar signaling, General Binary Signaling, Coherent Receivers for Digital Carrier Modulations, Single Space Analysis of Optimum Detection, Vector Decomposition of White Noise Random processes, General Expression for Error Probability of optimum receivers,

Unit 4:

Spread spectrum Communications: Frequency Hopping Spread Spectrum (FHSS) systems, Direct Sequence Spread Spectrum, Code Division Multiple Access of DSSS, Multiuser Detection, OFDM Communications.

Unit 5:

Measure of Information, Source Encoding, Error Free Communication over a Noisy Channel capacity ofa discrete and Continuous Memory less channel Error Correcting codes: Hamming sphere, hamming distance and Hamming bound, relation between minimum distance and error detecting and correcting capability, Linear block codes, encoding & syndrome decoding; Cyclic codes, encoder and decoders for systematic cycle codes; convolution codes, code tree & Trellis diagram, Viterbi and sequential decoding, burs terror correction,

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. Simon Haykin, "Communication Systems",4th Edition,Wiley India.
4. H.P.HSUandD.Mitra,"AnalogandDigitalCommunications",2nd Edition,TataMcGraw-Hill.

NEC- 603 Integrated Circuit Technology

Preamble:

- This course provide an introduction to fabrication process of integrated circuit technology

Course Objective

- To understand the knowledge of SSI, MSI, LSI, and VLSI integrated circuits.
- To understand the method of make oxide layer and film deposition process
- To understand the process of diffusion and metallization in fabrication process

Course Outcomes

Students will be able to

1. Apply knowledge of small scale integration, medium scale integration, large scale integration, and very large scale integration circuit.
2. Identify, formulate, and solve engineering problems in the area of integrated circuit technology
3. Use the techniques and skills to study different fabrication process.
4. Design commonly used method such as CVD, Ion-Implantation Technique etc.
5. Understand and identify the basic knowledge of Package Fabrication Technologies.

Pre-Requisite

- Engineering Chemistry

Links to Other Courses

- VLSI Design

Course Content

Unit 1:

Introduction To IC Technology: SSI, MSI, LSI, VLSI Integrated Circuits Crystal 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.

Unit 2:

Oxidation: Growth Kinetics, Thin Oxides, Oxidation Techniques and Systems, Oxides Properties. Lithography: Optical Lithography. Photo masks, Wet Chemical Etching.

Dielectric and Poly silicon Film Deposition: Deposition Processes, Poly silicon, Silicon Dioxide, Silicon Nitride.

Unit 3:

Diffusion: Diffusion of Impurities in Silicon and Silicon Dioxide, Diffusion Equations, Diffusion Profiles, Diffusion Furnace, Solid, Liquid and Gaseous Sources, Sheet Resistance and its Measurement. Ion-Implantation: Ion-Implantation Technique, Range Theory, Implantation Equipment.

Unit 4:

Metallization: Metallization Application, Metallization Choices, Physical Vapor Deposition, Vacuum Deposition, Sputtering Apparatus. Packaging of VLSI devices: Package Types, Packaging Design Consideration, VLSI Assembly Technologies, Package Fabrication Technologies.

Unit 5:

VLSI Process Integration: Fundamental Considerations For IC Processing, NMOS IC Technology, CMOS IC Technology, Bipolar IC Technology, Monolithic and Hybrid Integrated Circuits, IC Fabrication

Text Book:

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.

NEC- 011 Digital Signal Processing

Preamble

- To provide a comprehensive coverage of various transform to the analysis and design complex signal and systems. This course also provides the knowledge to design the FIR and IIR filters.

Course Objective

- To understand the knowledge of Fourier & Discrete Fourier Transform to the analysis and design of complex signals & systems
- To understand the concept of Identify, formulate, and solve engineering problems related to the FIR (Finite Impulse Response) & IIR (Infinite Impulse Response) Filters
- To understand the various types of digital filters like Butterworth and Chebyshev Filters
- To understand the concept of convolution.

Course Outcomes

Student will be able to:

1. Apply knowledge of Fourier & Discrete Fourier Transform to the analysis and design complex signals & systems.
2. Identify, formulate, and solve engineering problems related to the FIR (Finite Impulse Response) & IIR (Infinite Impulse Response) Filters.
3. Analyze the Analog Filters as Butterworth and Chebyshev, Design of Digital Butterworth and Chebyshev Filters required for Electronics Engineering practice.
4. Analyze the Fast Fourier Transform both in time & frequency domain necessary for solving the complex Discrete Fourier Transform in Electronics Engineering.
5. Analyze& Synthesize the Linear & Circular Convolution.

Pre-Requisite

- Signal and system

Links to Other Courses

- In many mathematical operation

Course Content

Unit 1:

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.

Unit 2:

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.

Unit 3:

Finite Impulse Response Filter Design: Windowing and the Rectangular Window, Other Commonly Used Windows, Examples of Filter Designs Using Windows, The Kaiser Window.

Unit 4:

Discrete Fourier Transforms: Definitions, Properties of the DFT, Circular Convolution, Linear Convolution.

Unit 5:

Fast Fourier Transform Algorithms: Introduction, Decimation –In Time(DIT) Algorithm, Computational Efficiency, Decimation in Frequency (DIF) Algorithm.

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- 022 Microcontroller and it Applications

Preamble

- This course provides the knowledge of microcontroller architecture and programming language to perform the projects.

Course Objective

- To understand the basic terminology and describe the components, parts and operation of a microcontroller based system
- To understand the architectures of 8051 family microcontroller.
- To understand the all instruction set and addressing mode of microcontroller
- To understand the programming of microcontroller and interfacing with many peripheral devices.

Course Outcomes

Students will be able to:

1. Explain basic terminology and describe the components, parts and operation of a microcontroller based system.
2. Describe the microcontroller architecture and usages of the instruction set of the representative microcontrollers
3. Explain and perform input/output and interrupt operations in a microcontroller system
4. Interpret and write simple programs for microcontroller applications
5. Explain the Interfacing with external memory, 8255, keyboards, display devices, DAC/ADC, DC Motor, Stepper Motor, Servomotor, power management, Sensor interfacing etc

Pre-Requisite

- Knowledge of digital electronics, microprocessor

Links to Other Courses

- Related with microcontroller and Applications

Course Content

Unit 1:

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.

Unit 2:

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.

Unit 3:

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,

Unit 4:

Interfacing with 8051: external memory, 8255, keyboards, display devices, DAC/ADC, DC Motor, Stepper Motor, Servomotor, power management, Sensor interfacing and signal conditioning.

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 Books:

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

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).