UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS

For

B. Tech

Electronics and Communication Engineering

Of

Second Year

(Effective from the Session: 2014-15)

STUDY AND EVALUATION SCHEME

YEAR: 2nd SEMESTER-III

S. No.	Subject	Name of Subject	Periods			Evaluation Scheme				Subject	Credit
			L	T	P	CT	TA	Total	ESC		
1.	NAS-301/ NOE-031-NOE-039	Eng Mathematics-III/Science based Electives*	3	1	0	30	20	50	100	150	4
2.	NEC-301	Network Analysis & Synthesis	3	1	0	30	20	50	100	150	4
3.	NEC-302	Fundamental of Electronic Devices	3	1	0	30	20	50	100	150	4
4.	NEC-303	Signals and Systems	3	1	0	30	20	50	100	150	4
5.	NHU-301/ NHU-302	Industrial Psychology/Industrial Sociology	2	0	0	15	10	25	50	75	2
6.	NEC-304	Switching Theory & Logic Design	2	1	0	15	10	25	50	75	3
7.	AUC-001/ AUC-002	Human Values & Professional Ethics/Cyber Security	2	0	0	15	10	25	50	75**	--
PRACTICAL/DESIGN/DRAWING											
7.	NEC-351	Network Analysis & Synthesis Lab.	0	0	3	10	10	20	30	50	1
8.	NEC-352	Electronics Workshop & PCB Design	0	0	3	10	10	20	30	50	1
9.	NEC-353	Logic Design Lab.	0	0	2	10	10	20	30	50	1
10.	NEC-354	Electronic Device Lab.	0	0	2	10	10	20	30	50	1
11.	NGP-301	NGP						50		50	--
		Total	18	5	10					1000	25

STUDY AND EVALUATION SCHEME

YEAR: 2nd SEMESTER-IV

S. No.	Subject Code	Name of Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	CT	TA	Total	ESC		
1.	NOE-041-NOE-049/NAS-401	Science based Elective/ Eng Mathematics-III	3	1	0	30	20	50	100	150	4
2.	NEC-401	Data Structure	3	1	0	30	20	50	100	150	4
3.	NEC-402	Electronic Circuits	3	1	0	30	20	50	100	150	4
4.	NEC-408	Electronic Measurements & Instrumentation	3	1	0	30	20	50	100	150	4
5.	NHU-401/NHU-402	Industrial Sociology/Industrial Psychology	2	0	0	15	10	25	50	75	2
6.	NEC-404	Electromagnetic Field Theory (EMFT)	2	1	0	15	10	25	50	75	3
7.	AUC-002/AUC-001	Cyber Security/ Human Values & Professional Ethics	2	0	0	15	10	25	50	75**	--
PRACTICAL/DESIGN/DRAWING											
8.	NEC-451	Data Structure Lab.	0	0	3	10	10	20	30	50	1
9.	NEC-452	Electronic Circuits Lab.	0	0	3	10	10	20	30	50	1
10.	NEC-453	Digital Electronics Lab.	0	0	2	10	10	20	30	50	1
11.	NEC-454	Electronics Measurement Lab.	0	0	2	10	10	20	30	50	1
12.	NGP-401	NGP						50		50	--
		Total				40				1000	25

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

PROGRAMME OUTCOMES (POs) OF B.TECH. (ELECTRONICS & COMMUNICATION ENGINEERING)

Such graduating students attain the ability:

a) Apply the knowledge of mathematics, science and fundamentals of Electronics & Communication Engineering to solve engineering problems.
b) Identify, formulate and analyze complex problems in the field of Electronics & Communication Engineering using first principles of mathematics, natural sciences and engineering.
c) Design and develop system components and processes to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, manufacturability, and sustainability.
d) Design and conduct experiments using research –based knowledge and analyze and interpret data to provide valid conclusions.
e) Use the concepts, techniques and modern engineering tools necessary for prediction, modeling and design of an engineering system.
f) Understand and assess the issues related to society, safety, health and culture and the consequent responsibilities of professional engineering practice.
g) Demonstrate the understanding and knowledge of the impact of engineering solutions in societal and environmental context in order to have sustainable development.
h) Understand and apply ethical principles and responsibilities towards professional engineering practice.
i) Understand individual and team responsibilities to be able to become a member or leader in diverse and multidisciplinary teams.
j) Design and prepare reports and deliver effective presentations by learning oral, verbal and written communication skills to be able to communicate effectively on engineering activities with the engineering community and society at large.
k) Understand the engineering and management principles and apply them to manage projects in multidisciplinary environments.
l) Recognize the need for and engage in life- long learning in the context of technological change.

MATHEMATICS-III (NAS-301/NAS-401)

Preamble:

- The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

Course Objective:

a) The subject thoroughly explains the principles of differentiation and integration.

b) Subject was clear to understand Fourier transform and enhances the ability to solve engineering problems related to signal processing and heat and mass transfer.

c) The subject clearly explains the method for analyzing the data by using Chi-Square test and t-test.

d) The subject clearly explains the method to find roots of various polynomials and also enhanced the ability of forecasting using interpolation.

e) The subject explains the techniques used for solving the integration and differentiation real life problems such as traffic and population.

Course Outcomes:

Students will be able to:

1. Solve the complex integrals using contour integrals.
2. Characterize the data with the help of correlation and regression analysis.
3. Determine the discrepancy between theory and experiments for small and large data.
4. Determine the techniques of estimating the value of a function for any intermediate value of the independent variable using interpolation.
5. Describe the numerical methods for the solution of ordinary differential equation appearing in physical problems which cannot be solved analytically.

Pre-Requisite:

- Mathematics-I

Links to Other Courses:

- All engineering subject

Course Content:

Unit – I: Function of Complex variable

Analytic function, C-R equations, Harmonic Functions, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions, Taylor's and Laurent's series, Singularities, Zeroes and Poles, Residue theorem, Evaluation of real integrals of the type $\int_0^{2\pi} f(\cos\theta, \sin\theta)d\theta$ and $\int_{-\infty}^{\infty} f(x)dx$

Unit – II: Integral Transforms

Fourier integral, Complex Fourier transform, Inverse Transforms, Convolution Theorems,
Fourier sine and cosine transform, Applications of Fourier transform to simple one dimensional heat transfer equations, wave equations and Laplace equations Z-transform and its application to solve difference equations

Unit – III: Statistical Techniques

Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves, Correlation, Linear, non – linear and multiple regression analysis, Binomial, Poisson and Normal distributions, Tests of significations: Chi-square test, t-test

Unit – IV: Numerical Techniques – I

Zeroes of transcendental and polynomial equations using Bisection method, Regula-falsi method and Newton-Raphson method, Rate of convergence of above methods.
Interpolation: Finite differences, Newton's forward and backward interpolation, Lagrange's and Newton's divided difference formula for unequal intervals**.**

Unit – V: Numerical Techniques –II

Solution of system of linear equations, Matrix Decomposition methods, Jacobi method, Gauss- Seidal method. Numerical differentiation, Numerical integration, Trapezoidal rule, Simpson's one third and three-eight rules, Solution of ordinary differential equations (first order,second order and simultaneous) by Euler's, Picard's and fourth-order Runge- Kutta methods.

Test Books:

1. Peter V. O'Neil, Advance Engineering Mathematics Thomson (Cengage) Learning, 2007.

2. Jain, Iyenger Jain, Numerical Methods for Scientific and Engineering Computation, New Age International, New Delhi
3. J.N. Kapur, Mathematical Statistics, S. Chand & company Ltd.
4. B.S.Grewal,Higher Engineering Mathematics, Khanna Publishers

Reference Books:

1. R.K. Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publication House,.
2. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudralaya, 1996.
3. S.S.Sastry,Introductory Methods of Numerical Analysis, PHI Learning Private Limited, New Delhi
4. E. Balagurusamy, Numerical Methods, Tata McGraw-Hill Publishing Company Limited , New Delhi
5. T. Veerajan & T. Ramchandrandran, Theory & Problems in Numerical Methods, TMH, New Delhi

NEC-301 NETWORK ANALYSIS & SYNTHESIS

Preamble:

- This course provides the exposure of advanced skills of network analysis and synthesis.

Course Objectives:

- To analyze and synthesize circuits and to become familiar with the propagation of signals through network.
- To analyze the circuits in time and frequency domain
- To study network functions, inter relationship among various circuit parameters, solve more complex network using these parameters.

Course Outcomes:

Student will be able to

1. Apply knowledge of Kirchoff's Voltage & Current law, to the analysis and design of electrical & electronics circuits.
2. Understand and solve engineering problems related to the two port networks in the area of circuit theory.
3. Understand the S-domain analysis of transfer function to find the stability of the electrical networks.
4. Study of networks theorems and how to apply them in solving complex networks.
5. Analyze and synthesize the active networks in a practical environment.

Pre-Requisite:

- Basic electrical and electronics engineering

Links to Other Courses

- Fundamental to all courses of electrical and electronics engineering

Course Content:

Unit 1:

Signal analysis, complex frequency, network analysis, network synthesis, General characteristics and descriptions of signals, step function and associated waveforms,

The unit impulse Introduction to network analysis, network elements, initial and final conditions, step and impulse response, solution of network equations.

Unit 2:

Review of Laplace transforms, poles and zeroes, initial and final value theorems, the transform circuit, Thevenin's and Norton's theorems, the system function, step and impulse responses, the convolution integral. Amplitude and phase responses, Network functions, relation between port parameters, transfer functions using two port parameters, interconnection of two ports.

Unit 3:

Hurwitz polynomials, positive real functions, Properties of real immittance functions, synthesis of LC driving point immittances, properties of RC driving point impedances, synthesis of RC impedances or RL admittances, properties of RL impedances and RC admittances.

Unit 4:

Properties of transfer functions, zeroes of transmission, synthesis of Y21 and Z21 with 1Ω terminations.

Unit 5:

Introduction to active network synthesis, Active Network Synthesis

Text Book:

1. Franklin F. Kuo, "Network Analysis and synthesis", 2nd Edition, Wiley India Pvt Ltd.
2. Behrouz Peikari, "Fundamentals of Network Analysis & synthesis", Jaico Publishing House, 2006.

Reference Books:

1. M. E. Van Valkenberg, "Network Analysis", 2nd Edition, Prentice Hall of India Ltd.
2. Ghosh-Network Theory: Analysis and Synthesis, PHI Learning Pvt. Ltd

NEC-302 FUNDAMENTAL OF ELECTRONIC DEVICES

Preamble:

- To delivers the knowledge to student regarding properties, characteristics and governing principles of materials used for Electronic device design.

Course Objective:

- To understand the physical operation of semiconductor devices
- To understand the different parameters of the transistors and also to analyze the working of power devices and photoconductive devices to know necessary techniques for prediction, modeling and design of these devices

Course Outcomes:

Students will be able to:

1. Apply knowledge of Miller indices, Energy Band Theory and Schrodinger wave equation to the analysis and design of semiconductor devices.
2. Solve engineering problems in the area of optical absorption and diffusion of carriers in semiconductors.
3. To analyze the different parameters of transistors such as depletion width and channel width for understanding the functioning and design of this component.
4. Analyze the working of power devices and photoconductive devices to know necessary techniques for prediction, modeling and design of these devices.
5. To design an electronic component to meet desired needs by understanding the required properties of materials used for fabrication.

Pre-Requisite:

- Some information from basic electronics

Links to Other Courses:

- This is related with all electronic devices.

Course Content:

Unit 1:

Crystal Properties and charge Carriers in Semiconductors: Elemental and compound semiconductor materials, crystal lattice structure, Bonding forces and energy bands in solids, charge carriers in semiconductors, carrier concentrations, drift of carriers in electric and magnetic fields.

Unit 2:

Excess Carriers in Semiconductors: Optical absorption, luminescence, carrier life time and photo conductivity, diffusion of carriers.

Unit 3:

Junction Properties: Equilibrium conditions, biased junctions, steady state conditions, reverse bias break down, transient and AC conditions. Metal semiconductor junctions.

Unit 4:

Transistors: Metal-semiconductor-field-effect-transistors (MESFET), Metal-insulator-semiconductor-field-effect- transistors (MISFET), Metal oxide semiconductor field effect transistor (MOSFET): Construction, Operation and characteristics of above devices. Bipolar junction transistors: Fundamentals of BJT operation, amplification with BJTs.

Unit 5: Some special devices:

Photodiodes, photo detectors, solar cell, light emitting diodes, semi-conductor lasers, light emitting materials. Tunnel Diode: degenerate semiconductors, IMPATT diode; The transferred electron mechanism: The GUNN diode. P-N-P-N diode, semiconductor controlled rectifier (SCR), bilateral devices: DIAC, TRIAC, IGBT.

Text Book:

1. B. G. Streetman and S. Banerjee “Solid state electronics devices”, 5th Edition, PHI.

Reference Books:

1. Alok Dutta, “Semiconductor Devices and circuits”, Oxford University Press.
2. Donald A Neaman, “Semiconductor Physics and Devices Basic Principles” 3rd Ed TMH India.

Signals and Systems (NEC-303)

Preamble:

- To provide foundation of signal and system concepts to areas like communication, control and comprehend applications of signal processing in communication systems.

Course Objective:

- To provide insights into signals and types, methods of processing and transformation
- To expose students to types of discrete systems, types and application
- To introduce students to the idea of signal and system analysis and characterization in time and frequency domain

Course Outcomes:

Student will be able to:

1) Apply the knowledge of signals and transformation of signals to understand fundamental properties of linear systems, causal system, stable system and their significance
2) Understand the use of signals and basic system building blocks and their roles for design of complex system.
3) Identify the role of Fourier series or Fourier transform, Z-transform, and further be able to use the properties and apply them to the analysis of ideal filtering, amplitude modulation and sampling.
4) Develop mathematical skills to solve problems involving convolution, filtering, modulation and sampling
5) Understand the properties, as well the analysis and design implications, of interconnections of LTI systems(parallel, series (cascade), and feedback) in the time and transform domains

Pre-Requisite:

- Knowledge on mathematics

Links to Other Courses:

- This course is related with electrical and electronics engineering.

Course Content:

Unit 1: Signals

Definition, types of signals and their representations: continuous-time/discrete-time, periodic/non-periodic, even/odd, energy/power, deterministic/ random, one-dimensional multidimensional; commonly used signals (in continuous-time as well as in discrete-

time): unit impulse, unit step, unit ramp (and their interrelationships), exponential, rectangular pulse, sinusoidal; operations on continuous-time and discrete-time signals (including transformations of independent variables).

Unit 2: Laplace-Transform (LT) and Z-transform (ZT):

1. One-sided LT of some common signals, important theorems and properties of LT, inverse LT, solutions of differential equations using LT, Bilateral LT, Regions of convergence (ROC).
2. One sided and Bilateral Z-transforms, ZT of some common signals, ROC, Properties and theorems, solution of difference equations using one-sided ZT, s- to z-plane mapping.

Unit 3: Fourier Transforms (FT):

1. Definition, conditions of existence of FT, properties, magnitude and phase spectra, Some important FT theorems, Parseval's theorem, Inverse FT, relation between LT and FT.
2. Discrete time Fourier transform (DTFT), inverse DTFT, convergence, properties and theorems, Comparison between continuous time FT and DTFT.

Unit 4: Systems

Classification, linearity, time-invariance and causality, impulse response, characterization of linear time-invariant (LTI) systems, unit sample response, convolution summation, step response of discrete time systems, stability.
Convolution integral, co-relations, signal energy and energy spectral density, signal power and power spectral density, properties of power spectral density

Unit 5: Time and frequency domain analysis of systems

Analysis of first order and second order systems, continuous-time (CT) system analysis using LT, system functions of CT systems, poles and zeros, block diagram representations; discrete-time system functions, block diagram representation, illustration of the concepts of system bandwidth and rise time through the analysis of a first order CT low pass filter.

Text Book:

1. P. Ramakrishna Rao, `Signal and Systems' 2008 Ed., Tata McGraw Hill, New Delhi

Reference Books:

1. Chi-Tsong Chen, `Signals and Systems', 3rd Ed., Oxford University Press, 2004
2. Oppenheim, A.S. Willsky & S. Hamid Nawab, 'Signals & System', Pearson Education, 2nd Ed., 2003.

Industrial Sociology (NHU - 302)

Preamble:

- To provide knowledge about work places it is a social system at first. To make one aware about how to improve job satisfaction as well as company productivity as it is vital to success of many organizations.

Course Objective:

- To understand the ability, responsibility and accountability for society as an engineer. The course intends to impart knowledge and learning of different aspects of society especially in organizational context.

Course Outcomes:

Students should be able to

1 Understand their own society and social structure
2 Know their responsibility and accountability for society as an engineer.
3 Learn about different managerial approaches and their implications.
4 Know the impacts of industrialization on different social institutions.
5 Become familiar with industrial grievances and grievances handling procedures.
6 Get awareness about different regulations/ acts regarding employees welfare in the industry.
7 Understand the role of trade unions in an organization.

Pre-Requisite:

- Knowledge about human nature, need and personality type.

Links to Other Courses:

- Industrial Sociology links with HRM, business management.

Course Content:

Unit 1: Industrial Sociology:
Nature, Scope and Importance of Industrial Sociology. Social Relations in Industry, Social Organization in Industry - Bureaucracy, Scientific Management and Human Relations.

Unit-II: Rise and Development of Industry:
Early Industrialism – Types of Productive Systems – The Manorial or Feudal system. The Guild system, the domestic or putting-out system, and the Factory system. Characteristics of the factory system. Causes and Consequences of industrialization.Obstacles to and Limitations of Industrialization.

Unit-III:

Industrialization in India Industrial Policy Resolutions – 1956.Science Technology and Innovation Policy of India 2013.

Unit-IV: Contemporary Issues :

Grievances and Grievance handling Procedure. Industrial Disputes: causes, Strikes and Lockouts. Preventive Machinery of Industrial Disputes: Schemes of Workers Participation in Management- Works Committee, Collective Bargaining, Bi-partite & Tri-partite Agreement, Code of Discipline, Standing Orders. Labour courts & Industrial Tribunals,

References:

1. GISBERT PASCAL, Fundamentals of Industrial sociology, Tata McGraw Hill Publishing Co., New Delhi, 1972.
2. SCHNEIDER ENGNO V., Industrial Sociology 2nd Edition, McGraw Hill Publishing Co., New Delhi, 1979.
3. MAMORIA C.B. And MAMORIA S., Dynamics of Industrial Relations in India.
4. SINHA G.P. and P.R.N. SINHA, Industrial Relations and Labour Legislations, New Delhi, Oxford and IBH Publishing Co., 1977.
5. NADKARNI, LAKSHMI, Sociology of Industrial Worker,Rawat,Jaipur,1998.
6. BHOWMICK SHARIT,Industry,Labour and Society,Orient,2012.

Switching Theory and Logic Design (NEC-304)

Preamble:

- To provide insights into design of devices using digital techniques.
- To provide students knowledge about binary systems, logic families and applications based on binary system.

Course Objective:

- To introduce the fundamental concepts and methods for design of various digital circuits.
- To build the skill of digital system design and testing used in various fields of computing, communication, automatic control of mechanisms and instrumentation

Course Outcomes:

Students will be able to:

1. Apply knowledge of number systems, codes and Boolean algebra to the analysis and design of digital logic circuits.
2. Identify and formulate arithmetic circuits to design digital logic to automate the computations required for implementing complex systems.
3. Use the sequential circuits such as flip flops, counters, registers etc., to design practical projects, necessary for engineering practice.
4. To design a practical digital system with the help of components such as RAM, ROM, PLA, PAL etc., to meet desired needs in realistic constraints.
5. To function on multi-disciplinary teams through digital circuit experiments and projects.

Pre-Requisite:

- Basic electrical and electronics engineering

Links to Other Courses:

- This is related with all Digital systems.

Course Content:

Unit 1:

Digital system and binary numbers: Signed binary numbers, binary codes. Gate-level minimization: The map method up to four variable, don’t care conditions, POS simplification, NAND and NOR implementation, Quine Mc-Clusky method (Tabular method).

Unit 2:

Combinational Logic: Combinational circuits, analysis procedure, design procedure, binary adder-subtractor, decimal adder, binary multiplier, magnitude comparator, decoders, encoders, multiplexers.

Unit 3:

Synchronous Sequential logic: Sequential circuits, storage elements: latches, flip flops, analysis of clocked sequential circuits, state reduction and assignments, design procedure. Asynchronous Sequential logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flow table, race free state assignment, hazards.

Unit 4:

Registers and counters: Shift registers, ripple counter, synchronous Counter, other counters. Memory and programmable logic: RAM, ROM, PLA, PAL.

Text Book:

1. M. Morris Mano and M. D. Ciletti, “Digital Design”, 4th Edition, Pearson Education.

Reference Books:

1. Hill & Peterson, “Switching Circuit & Logic Design”, Wiley.
2. Mohammad A. Karim and Xinghao Chen,”Digital Design-Basic concepts and principal”, CRC Press Taylor & Francies group, 2010

LABORATORY

NEC- 351 NETWORK ANALYSIS & SYNTHESIS LAB

1. Study and verification of network theorems with input signal of 1 kHz, 10kHz and 100kHz.
2. Verification of two port network parameters
3. Step and Ramp response of series and parallel RC circuits
4. Verification of properties of RC circuits
5. Verification of properties of RL circuits
6. Verification of properties of LC circuits
7. Verification of inverting, non-inverting and voltage follower VCVS circuits using 741 op-amp
8. Verification of inverting integrator using 741 op-amp
9. Design a finite gain differential amplifier with infinite input impedance and verify the output response.

NEC- 352 ELECTRONIC WORKSHOP & PCB LAB

Objective: To create interest in Hardware Technology.

1. Study of CRO, DMM & Function Generator
2. Identification of Active & Passive Components
3. Winding shop: Step down transformer winding of less than 5VA.
4. Soldering shop: Fabrication of DC regulated power supply
5. PCB Lab: (a) Artwork & printing of a simple PCB. (b) Etching & drilling of PCB.
6. Wiring & fitting shop: Fitting of power supply along with a meter in cabinet.
7. Testing of regulated power supply fabricated.

NEC- 353 LOGIC DESIGN LAB

Objective: To understand the digital logic and create various systems by using these logics.

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, Concept of V_{cc} and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder/De-multiplexer and Encoder using logic gates.
5. Implementation of 4x1 multiplexer using logic gates.
6. Implementation of 4-bit parallel adder using 7483 IC.
7. Design, and verify the 4-bit synchronous counter.
8. Design, and verify the 4-bit asynchronous counter.
9. Mini Project (Imp)

NEC- 354 ELECTRONIC DEVICES LAB

Objective: To attain expertise in lab equipment handling and understanding the basic devices, their properties, Characteristics in detail. Along with their practical usage in the circuit

1. **Study of lab equipments and components:** CRO, Multimeter, Function Generator, Power supply- Active, Passive Components & Bread Board.
2. **P-N Junction Diode**: Characteristics of PN Junction diode-Static and dynamic resistance measurement from graph.
3. **Applications of PN junction diode**: Half & Full wave rectifier- Measurement of Vrms, Vdc, and ripple factor-use of filter- ripple reduction (RC Filter)-Clipper & Clamper
4. **Properties of junctions** Zener diode characteristics. Heavy doping alters the reverse characteristics. Graphical measurement of forward and reverse resistance.
5. **Application of Zener diode:** Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.
6. **Characteristic of BJT**: BJT in CB and CE configuration- Graphical measurement of h parameters from input and output characteristics. Measurement of Av, AI, Ro and Ri of CE amplifier with potential divider biasing.
7. **Characteristic of FET**: FET in common source configuration. Graphical measurement of its parameters gm, rd & m from input and output characteristics.
8. **Characteristic** of silicon-controlled rectifier.
9. **To plot** V-I Characteristics of DIAC.
10. **To draw** V-I characteristics of TRIAC for different values of Gate Currents.

NEC-401 DATA STRUCTURE

Preamble:

- To provide exposure to students to advanced concepts in programming
- To develop the skills of the students in applying concepts of OOPs and data structure for application development

Course Objective:

- Be familiar with basic techniques of algorithm analysis
- Be familiar with writing recursive methods
- Be familiar with advanced data structures such as balanced search trees, hash tables, priority queues and the disjoint set union/find data structure
- Be familiar with several sub-quadratic sorting algorithms including quick sort, merge sort and heap sort
- Be familiar with some graph algorithms such as shortest path and minimum spanning tree
- Master analyzing problems and writing program solutions to problems using the above techniques

Course Outcomes:

Students will be able to:

1. Compare and contrast the cost and benefits of dynamic and static structure implementations.
2. Identify, understand and determine the usage of various data structures, operations and associated algorithms
3. Describe the concept of recursion and give examples of its use, identifying the base case and the general case of a recursively defined problem.
4. Design and apply appropriate data structure using simple algorithms for modeling and solving given computing problems
5. Understand, analyze and develop programs to implement different data structures such as: arrays, linked lists, stacks, queues, trees, hash tables, and graphs and related algorithms.

Pre-Requisite:

- Basic information in C Language

Links to Other Courses:

- Java

Course Content:

Unit 1:
Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off. Abstract Data Types (ADT) Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations. Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List.

Unit 2:
Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion. Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.

Unit 3:
Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: In order, Preorder and Post order, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.

Unit 4:
Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transistive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks.

Unit 5:
Searching : Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort.

Text book:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein “Data Structures Using C and C++” , PHI.

References:

1. Horowitz and Sahani, “Fundamentals of Data Structures”, Galgotia Publication.
2. Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with applications”, McGraw Hill.
3. R. Kruse etal, “Data Structures and Program Design in C”, Pearson Education.
4. Lipschutz, “Data Structures” Schaum’s Outline Series, TMH.
5. G A V Pai, “Data Structures and Algorithms”, TMH.

NEC-402 ELECTRONIC CIRCUITS

Preamble:

- To deliver the core concepts and reinforce the analytical skills learned in Electronics Circuits
- To motivate students to use op-amp, BJT and MOS devices for designing and analyzing electronic Circuits which will help them to understand the fundamentals of VLSI design.

Course Objective:

- To understand physical operation of semiconductor devices
- To understand DC and AC models of semiconductor devices
- To apply concepts of DC and AC modeling of semiconductor devices for the design and analysis
- To verify the theoretical concepts through laboratory and simulation experiments.

Course Outcomes:

Students will be able to-

1. Understand the operating principle of major electronics devices & their frequency domain behavior to design efficient electronics devices & circuits.
2. Analyze and design of all kinds of basic Electronics Circuits like Amplifiers, Negative feedback, Oscillators & Power Amplifiers.
3. Analyze single stage transistor amplifier using Small Signal Model & find the parameters of the amplifier to be able to design electronics systems which meet the given specifications.
4. Determine the stability of feedback amplifiers and their steady state performance.
5. Understand the basic concept of Operational Amplifier & apply the knowledge of different OpAmp circuits to design practically feasible systems.

Pre-Requisite:

- Knowledge of basic electronics

Links to Other Courses:

- Analog Electronic systems

Course Content:

Unit 1:

Operational Amplifier: Inverting and non-inverting configurations, difference amplifier, Effect of finite open loop gain and bandwidth on circuit performance, Large signal operation of op-amp.

Unit 2:

MOSFET: Review of device structure operation and V-I characteristics. Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, small-signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier.

Unit 3:

BJT: Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, frequency response of CE amplifier.

Unit 4:

Differential Amplifier: MOS differential pair, small signal operation of the MOS differential pair, BJT differential pair, other non-ideal characteristic of the Differential amplifier (DA), DA with active load.

Unit 5:

Feedback: The general feedback structure, properties of negative feed back, the four basic feedback topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, the shunt-shunt and shunt- series feedback amplifier. **Oscillators:** Basic principles of sinusoidal oscillators, op-amp RC oscillator circuits, LC oscillator.

Text Book:

1. S. Sedra and K. C. Smith, “Microelectronic Circuits”, Oxford University Press, 5th Ed.

Reference Books:

2. Jacob Millman and Arvin Grabel, “Microelectronics”, 2nd Ed TMH

NEC-403 ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Preamble:

- To enable the students gain knowledge about different types of measuring techniques for measurement of circuit components and electrical quantities using electrical and electronic instruments.

Course Objective:

- To develop the basic knowledge and skills of the students in the areas of measurement techniques
- To develop the skills of the students in the areas of several domestic applications of measuring instruments

Course Outcomes:

Student will be able to:

1. Understand the errors in measurements and their rectification&perform accurate measurements for any engineering system.
2. Understand the basic construction of a permanent magnet moving coil (PMMC) instrument, its operation in various arrangements & its limitations.
3. Understanding and implementation of various AC and DC bridges for specific applications.
4. Measure various electrical parameters using relevant instrument to function on multi-disciplinary projects.
5. Understand the use of various test and measuring instruments to develop engineering system which meet the given specifications within realistic constraints.

Pre-Requisite:

- Basic Electrical Engineering
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Links to Other Courses:

- Projects

Course Content:

Unit 1:

Unit, dimensions and standards: Scientific notations and metric prefixes. SI electrical units, SI temperature scales, Other unit systems, dimension and standards. Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination,

basics of statistical analysis. PMMC instrument, galvanometer, DC ammeter, DC voltmeter, series ohm meter.

Unit 2:

Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, probes Digital voltmeter systems, digital multimeters, digital frequency meter system.

Unit 3:

Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, low resistance measuring instruments AC bridge theory, capacitance bridges, Inductance bridges, Q meter.

Unit 4:

CRO: CRT, wave form display, time base, dual trace oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Oscilloscope specifications and performance. Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO applications.

Unit 5:

Instrument calibration: Comparison method, digital multimeters as standard instrument, calibration instrument Recorders: X-Y recorders, plotters.

Text Book:

1. David A. Bell, “Electronic Instrumentation and Measurements”, 2nd Ed., PHI , New Delhi 2008.

Reference Books:

1. Oliver and Cage, “Electronic Measurements and Instrumentation”, TMH, 2009.
2. Alan S. Morris, “Measurement and Instrumentation Principles”, Elsevier (Buterworth Heinmann), 2008**.**

NEC-404 ELECTROMAGNETIC FIELD THEORY

Preamble:

- To provide exposure to students to the principles governing Electromagnetic, working, radiating systems, waveguides, transmission lines and antenna and the respective applications

Course Objective:

- This course introduces the basics concepts of electromagnetic theory. Vector differential techniques are used to analyze the behavior of static and dynamic electromagnetic fields. Maxwell's equations are introduced and the behavior of electromagnetic waves explored. Transmission lines are introduced using distributed circuit concepts. Two port parameters are used to characterize circuits and devices. Complex networks, including poly-phase networks, are analyzed

Course Outcomes:

Students will be able to-

1. Understand the fields originating due to static and moving charges.
2. Identify and understand how materials are affected by electric and magnetic fields.
3. Analyze, formulate and solve the equations for time varying electric and magnetic fields.
4. Interpret the significance of Maxwell’s equations and understand their applications.
5. Study the phenomena of wave propagation in different media and its interfaces.

Pre-Requisite:

- Knowledge of physics and mathematics

Links to Other Courses:

- Related with electronics and electrical engineering.

Course Content:

Unit 1:

Coordinate systems and transformation: Cartesian coordinates, circular cylindrical coordinates, spherical coordinates Vector calculus: Differential length, area and volume, line surface and volume integrals, del operator, gradient of a scalar, divergence of a vector and divergence theorem, curl of a vector and Stoke’s theorem, Laplacian of a scalar.

Unit 2:

Electrostatics: Electrostatic fields, Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses's Law – Maxwell's equation, Electric dipole and flux lines, energy density in electrostatic fields. Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, dielectric constants, continuity equation and relaxation time, boundary condition. Electrostatic boundary value problems: Poission's and Laplace's equations, general procedures for soling Poission's or Laplace's equations, resistance and capacitance, method of images.

Unit 3:

Magnetostatics: Magneto-static fields, Biot-Savart's Law, Ampere's circuit law, Maxwell's equation, application of ampere's law, magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential. Magnetic forces, materials and devices: Forces due to magnetic field, magnetic torque and moment, a magnetic dipole, magnetization in materials, magnetic boundary conditions, inductors and inductances, magnetic energy.

Unit 4:

Waves and applications: Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, displacement current, Maxwell's equation in final form. Electromagnetic wave propagation: Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane wave in free space, plain waves in good conductors, power and the pointing vector, reflection of a plain wave in a normal incidence.

Text Book:

1. M. N. O. Sadiku, "Elements of Electromagnetics", 4^{th} , Ed, Oxford University Press.

Reference Books:

1. W. H. Hayt and J. A. Buck, "Electromagnetic field theory", 7^{th} Ed., TMH.
2. Pramanik-Electromagnetism: Vol.1-Theory, PHI Learning Pvt. Ltd

NOE-043: LASER SYSTEMS AND APPLICATIONS

Preamble:

- To provides an exposure to understand the various types of laser system and their real application like in medical, defense, communication.

Course Objective:

- To understand the knowledge of quantum physics, concept of duality property of light to the analysis light emitting devices and laser
- To solve Einstein coefficient to obtain basic principle of stimulated emission to design high performance LASER
- To analyze laser in the area of medical, industrial, optical communication and military

Course Outcomes:

Students will be able to:

1. Apply knowledge of quantum physics, concept of duality property of light to the analysis light emitting devices like LED and LASER.
2. Solve Einstein coefficient to obtain basic principle of stimulated emission to design high performance LASER.
3. To calculate rate equation of different type of laser for design of LASER.
4. Specific geometry of LASER is required to obtain specific application.
5. To design and analyze LASERs in the area of medical, industrial, optical communication and military.

Pre-Requisite:

- Knowledge of physics

Links to Other Courses:

- Related with optical fiber communication.

Course Content:

UNIT-I & II
Introduction:
Review of elementary quantum physics, Schrodinger equation, concept of coherence, absorption, spontaneous emission and stimulated emission processes, relation between Einstein's A and B coefficients, population inversion, pumping, gain, optical cavities

UNIT-III & IV

Lasers & Laser Systems:

Main components of Laser, principle of Laser action, introduction to general lasers and their types. Three & four level Lasers, CW & Pulsed Lasers, atomic, ionic, molecular, excimer, liquid and solid state Lasers and systems, short pulse generation and Measurement.

UNIT-V

Applications:

Laser applications in medicine and surgery, materials processing, optical communication, metrology and LIDAR and holography. **7**

Text/ Reference Books:

1. K.R. Nambiar, “Laser Principles, Types and Application” New Age International.
2. S. A. Ahmad, “Laser concepts and Applications” New Age International

LABOROTARY

NEC- 451 DATA STRUCTURE LAB

Program in C or C++ for following:

1. To implement addition and multiplication of two 2D arrays.
2. To transpose a 2D array.
3. To implement stack using array.
4. To implement queue using array.
5. To implement circular queue using array.
6. To implement stack using linked list.
7. To implement queue using linked list.
8. To implement circular queue using linked list.
9. To implement binary tree using linked list.
10. To implement binary search tree using linked list.
11. To implement tree traversals using linked list.
12. To implement BFS using linked list.
13. To implement DFS using linked list.
14. To implement Linear Search.
15. To implement Binary Search.
16. To implement Bubble Sorting.
17. To implement Selection Sorting.
18. To implement Insertion Sorting.
19. To implement Merge Sorting.
20. To implement Heap Sorting.

NEC- 452 ELECTRONIC CIRCUITS LAB

Objective: To design and implement the circuits to gain knowledge on performance of the circuits and its applications.

Measurement of Operational Amplifier Parameters: Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.
Applications of Op-amp- Op-amp as summing amplifier, Difference amplifier, Integrator and differentiator **Field Effect Transistors**-Single stage Common source FET amplifier –plot of gain in dB Vs frequency, Measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier **Bipolar Transistors**- Design of single stage RC coupled amplifier –design of DC biasing circuit using potential divider arrangement –Plot of frequency versus gain in dB. Measurement of bandwidth of an amplifier, input impedance and Maximum Signal Handling Capacity of an amplifier.
Two stage Amplifier. Plot of frequency Vs gain. Estimation of Q factor, bandwidth of an amplifier
Common Collector Configuration-Emitter Follower (using Darlington pair)-Gain and input impedance measurement of the circuit.

Power Amplifiers-Push pull amplifier in class B mode of operation –measurement of gain. **Differential Amplifier** –Implementation of transistor differential amplifier .Non ideal characteristics of differential amplifier **Oscillators** -Sinusoidal Oscillators- (a) Wein bridge oscillator (b) phase shift oscillator **Simulation of Amplifier** circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.

NEC- 453 DIGITAL ELECTRONIC LAB

1. TTL Transfer Characteristics and TTL IC Gates.
2. CMOS Gate Transfer Characteristics.
3. Implementation of a 3-bit SIPO and SISO shift registers using flip-flops.
4. Implementation of a 3-bit PIPO and PISO shift registers using flip-flops.
5. Design of Seven segment display driver for BCD codes.
6. BCD Adders & Subtractors
7. A L U
8. 8085 Assembly Language Programming

NEC - 454 ELECTRONIC MEASUREMENT LAB

1. Study of semiconductor diode voltmeter and its us as DC average responding AC voltmeter
2. Study of L.C.R. bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given oscillator
4. Study of the transistor tester and determination of the parameters of the given transistors
5. Study of the following transducer (i) PT-100 trans (ii) J- type trans. (iii) K-type trans (iv) Presser trans
6. Measurement of phase difference and frequency using CRO (lissajous figure)
7. Measurement of low resistance Kelvin’s double bridge.
8. Radio Receiver Measurements

NHU-402: INDUSTRIAL PSYCHOLOGY

Preamble:

- To provide knowledge about work places it is a social system at first. To make one aware about how to improve job satisfaction as well as company productivity as it is vital to success of many organizations.

Course Objective:

- To study the human behavior and to suggest various ways and means to improve the efficiency of worker in industries.
- To understand that how to improve the labour relationship with industries.

Course Outcomes:

Students should be able to

1. Learn about different managerial approaches and their implications.
2. Understand and implement motivational techniques for improvement of personnel.
3. Manage stress; maintain organizational culture through effective leadership.
4. Know about engineering psychology to create effective work environment.
5. Analyze the jobs for right recruitment and selection.
6. Get the awareness about different organizational training and development methods.
7. Know about the overall performance management techniques of personnel.

Pre-Requisite:

- Knowledge about human nature, need and personality

Course Content:

Unit-I

Introduction to Industrial Psychology: Definitions & Scope, Major influences on Industrial Psychology- Scientific Management and Human relations -Hawthorne Experiments. Implications of Industrial Psychology on Modern Industries

Unit-II

Individual in Workplace: Motivation and Job satisfaction, Stress management, Organizational culture, Leadership and Group dynamics.

Unit-III

Work Environment & Engineering Psychology-fatigue, Monotony, and Boredom, Accidents and Safety. Job Analysis, Recruitment, Selection and Interview, Reliability & Validity of recruitment tests.

Unit –IV
Performance Management: Training & Development.

References :
1. Miner J.B. (1992) Industrial/Organizational Psychology. N Y : McGraw Hill.
2. Blum & Naylor (1982) Industrial Psychology. Its Theoretical & Social Foundations CBS Publication.
3. Aamodt, M.G. (2007) Industrial/Organizational Psychology : An Applied Approach (5th edition)
Wadsworth/Thompson : Belmont, C.A.
4. Aswathappa K. (2008). Human Resource Management (fifth edition) New Delhi : Tata McGraw Hill.
5. Bisen Vikram & Priya (2008), Industrial Psychology (third edition), New Age International *Publishers*, New
Delhi