B. TECH.

ELECTRONICS & COMMUNICATION ENGINEERING

Third & Fourth Semester

EVALUATION SCHEME & SYLLABUS

Effective from session (2018-19)

FACULTY OF ENGINEERING
UNIVERSITY OF LUCKNOW
LUCKNOW

UNIVERSITY OF LUCKNOW
FACULTY OF ENGINEERING

Evaluation Scheme for B. Tech.

(Effective from session 2018-19)

Branch: Electronics & Communication Engineering

SEMESTER - III

S. No.	Subject Code	Subject Name	L-T-P	Evaluation					Credit
				Sessional			ESE	Grand Total	
				CT	TA	Total			
	Theory								
1.	AS – 301	Mathematics – III	3--1--0	20	10	30	70	100	4
2.	CS – 301	Data Structure Primer using C	3--0--0	20	10	30	70	100	3
3.	EC -301	Digital Circuits & Logic Design	3--0--0	20	10	30	70	100	3
4.	EC – 302	Solid State Devices & Circuits	3--0--0	20	10	30	70	100	3
5.	EC – 303	Signals and Systems	3--1--0	20	10	30	70	100	4
6.	AS – 302/ AS - 303	Human Values & Ethics / Environment & Ecology	3—0--0	20	10	30	70	100	3
	Practical								
7.	CS - 351	Data Structure Lab	0--0--2	-	20	20	30	50	1
8.	EC - 351	Digital Circuits &Logic Design Lab	0--0--2	-	20	20	30	50	1
9.	EC - 352	Solid State Devices Lab	0--0--2	-	20	20	30	50	1
10.	EC - 353	Signals and Systems Lab	0--0--2	-	20	20	30	50	1
11.	GP - 301	General Proficiency				50		50	
Total			**18-2-8**					**800**	**24**

UNIVERSITY OF LUCKNOW

FACULTY OF ENGINEERING

Evaluation Scheme for B. Tech.

(Effective from session 2018-19)

Branch: Electronics & Communication Engineering

SEMESTER - IV

S. No.	Subject Code	Subject Name	L-T-P	Evaluation					Credit
				Sessional			ESE	Grand Total	
				CT	TA	Total			
	Theory								
1.	AS – 401	Computer Oriented Numerical Techniques	3--1--0	20	10	30	70	100	4
2.	EC – 401	Electronics Instrumentation and Measurements	3--0--0	20	10	30	70	100	3
3.	EC – 402	Electromagnetic Field Theory	3--0--0	20	10	30	70	100	3
4.	EC– 403	Computer Architecture & Organization	3--0--0	20	10	30	70	100	3
5.	EE – 401	Network Analysis and Synthesis	3--1--0	20	10	30	70	100	4
6.	AS – 402/ AS - 403	Human Values & Ethics/ Environment & Ecology	3—0--0	20	10	30	70	100	3
	Practical								
7.	EC – 451	Electronics Workshop & PCB Design Lab	0--0--2	-	20	20	30	50	1
8.	EC - 452	Electronics Instrumentation and Measurements Lab	0--0--2	-	20	20	30	50	1
9.	EC - 453	Numerical Technique Lab	0--0--2	-	20	20	30	50	1
10.	EE - 451	Network Analysis and Synthesis Lab	0--0--2	-	20	20	30	50	1
11.	GP - 401	General Proficiency				50		50	
Total			**18-2-8**					**800**	**24**

AS - 301
MATHEMATICS- III

L	T	P
3	1	0

Unit- I: Sequences and Series **08**

Sequences, Limit of a sequence, Convergence, Divergence and Oscillation of a sequence, Infinite series, Necessary condition for convergence, Standard infinite series, Geometric series and Harmonic series. Tests for convergence and divergence, Comparison test (only for series with positive terms), Cauchy's integral test, D'alembert's ratio test, Cauchy's nth root test, Raabe's test (higher ratio test), Logarithmic test, Demorgan's and Bertrand's tests, Alternating series Leibnitz's theorem (without proof), Absolute convergence and Conditional convergence, Power series.

Unit- II: Function of Complex variable **08**

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- III: Integral Transforms **08**

Fourier integral, Complex Fourier transform, Inverse transform, Convolution theorem, 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- IV: Statistical Techniques – I **08**

Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves etc., Correlation, Linear, non- linear and multiple regression analysis, Probability theory.

Unit- V: Statistical Techniques – II **08**

Binomial, Poisson and Normal distributions, Sampling theory (small and large), Tets of significations: Chi- square test, t-test, Analysis of variance (one way), Application to engineering, medicine, agriculture etc. Time series and forecasting (moving and semi- averages), Statistical quality control methods, Control charts, $\bar{X}$, R, p, np and c charts.

Test Books :-

1. Peter V. O'Neil, Advance Engineering Mathematics Thomson (Cengage) Learning, 2007.
2. J.N. Kanpur, Mathematical Statistics, S. Chand & company Ttd., 2000

Reference Books :-

1. R.K. Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publication House, 2002.
2. Chandika Prasad, Advanced Mathematics for Engineers, Prasad Mudralaya, 1996.
3. B. V. Ramana, Higher Engineering Mathematics, Mc Gra Hill Education, 2016.
4. E. Kreysig, Advanced Engineering Mathematics, John Wiley & Sons, 2005.
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2005.
6. S.P. Gupta, Statistical Methods, Sultan and Sons, New Delhi, 2004.
7. Devore, Probability and Statistics, Thomson (Cengage) Learning, 2007.
8. Walpole, Myers, Myers & Ye, Probability and Statistics for Engineers & Scientists, Pearson Education, 2003.

CS - 301
DATA STRUCTURE PRIMER USING 'C'

L	T	P
3	0	0

Unit –I **07**

Introduction: Basic Terminology, Elementary Data Organization, Built in Data Types, Abstract Data Types.
Arrays: Single and Multidimensional Arrays, Representation of Arrays, Derivation of Index Formulae for 1D, 2D, 3D & nD Array Application of arrays, Sparse Matrices and their representations.
Linked lists: Implementation of Singly Linked List using Array, and Pointer, Doubly Linked List, Circularly Linked List, Operations on a Linked List: Insertion, Deletion, Traversal, Polynomial Representation.

Unit – II **08**

Stacks: Basic operations: Push & Pop, Array and Linked List Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Iteration and Recursion- Principles of recursion, Tail recursion, Removal of recursion Problem solving using iteration and recursion with examples such as binary search, Fibonacci numbers, and Hanoi towers. Trade-offs between iteration and recursion.
Queues: Basic operations: Create, Add, Delete, Circular queues, Array and linked list implementation of queues in C, Dequeue and Priority Queue.

Unit – III **09**

Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array and Pointer (Linked List) Representation, Binary Search Tree, Strictly Binary Tree, Complete Binary Tree. Extended Binary Trees, Tree Traversal algorithms: In-order, Pre-order and Post-order, Constructing Binary Tree from given Tree Traversal, Insertion , Deletion, Searching & Modification of data in Binary Search. Threaded Binary trees, Traversing Threaded Binary trees. Huffman coding using Binary Tree. Concept & Basic Operations for AVL Tree, B Tree & Binary Heaps.

Unit – IV **08**

Searching: Sequential search, Index Sequential Search, Binary Search.
Hashing: Concept of Hashing & Collision resolution Techniques.
Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Merge Sort, Heap Sort, Radix Sort.

Unit – V **08**

Graphs: Basic terminology, Graph Representations: Adjacency Matrices, Adjacency List, Adjacency. Graph Traversal: Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm.

Text Books:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein "Data Structures Using C and C++" , PHI
2. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education
3. Thareja, "Data Structure Using C" Oxford Higher Education.

Reference Books:

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

EC-301
DIGITAL CIRCUITS & LOGIC DESIGN

L	T	P
3	0	0

Unit-I **09**

Digital system and binary numbers: Number System: Binary, Octal, Hexadecimal, Character Codes (BCD, ASCII, EBCDIC) and its arithmetic, Signed binary numbers, Cyclic codes, error detecting and correcting codes, Hamming Code.

Gate-level minimization: Boolean algebra: definition, axioms, basic theorems, and properties, Boolean functions, Canonical and standard forms, NAND and NOR implementation, K- map method up to five variable, don't care conditions, Quine Mc-Clusky method (tabular method).

Unit-II **07**

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

Unit-III **08**

Sequential logic: Sequential circuits, storage elements: latches, flip flops, analysis of clocked sequential circuits, state reduction and assignments, design procedure.

Registers and Counters: Shift registers, ripple counter, synchronous counter, other counters: Johnson & Ring Counter.

Unit-IV **08**

Synchronous and Asynchronous Sequential Circuits: Analysis of clocked sequential circuits with state machine designing, State reduction & assignments, Design procedure. Analysis procedure of Asynchronous sequential circuits, circuit with latches, design procedure, Reduction of state and flow table, Race-free state assignment.

Unit-V **08**

Memory and programmable logic: Introduction to Digital Logic families, RAM, ROM, PLA, PAL, Introduction to VHDL, Basics, Design of Combinational and Sequential circuits using VHDL.

Text Books:

1. M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.
2. David J. Comer, "Digital Logic & State Machine Design", Oxford University Press
3. RP Jain, "Modern Digital Electronics", Tata McGraw Hill Publication.
4. Donald P.Leach and Albert Paul Malvino, Digital Principles and Applications, 6thEdition, TMH.

Reference Books:

1. DP Kothari and J.S. Dhillon, "Digital Circuits and Design", Pearson Education
2. A. Anand Kumar, "Fundamentals of Digital Circuits", PHI Learning Pvt. Ltd.
3. Douglas L. Perry, "VHDL: Programming by Example", McGraw-Hill
4. Jairam Bhaskar, "A VHDL Primer", Prentice Hall PTR

EC - 302
Solid State Devices and Circuits

L	T	P
3	0	0

UNIT I **08**

Diodes: Energy Band Theory of Crystals, Semiconductors, Mechanism of Conduction, Mass Action Law, Drift and Diffusion Currents, Semiconductor Equations, P-N Junction Diode, Depletion Region, Transition Capacitance, Junction Breakdown Diodes. Diffusion Capacitance, I-V Characteristics and Equation, Models: Piece-wise & Small Signal, Effect of Temperature, Switching Characteristics, Special Diodes: Schottky Barrier Diodes, Varactors, Photodiodes, Solar Cells.

UNIT II **08**

Transistors: Introduction to Bipolar Junction Transistors, Basic Transistor Operation, Transistor current components.

Field Effect Transistors: Theory and Operation of MOSFET, I-V Characteristics, Biasing, MOSFET circuits at DC, MOSFET as an amplifier and as a switch, Biasing in MOSFETs.

UNIT II **08**

Analysis of Single Stage MOS Amplifier: Small signal Operation and Model, Analysis of Single Stage CS, CG & CD (MOSFET Amplifiers) in Mid-band & High Frequency Region, Frequency Response of the CS Amplifier.

UNIT I **08**

Classification of Amplifiers: Multistage Amplifiers, Power Amplifiers, Feedback Amplifiers, Basic Concept of Feedback, Effect of Negative Feedback, Simple Analysis, and Stability of Feedback Amplifier.

UNIT V **08**

Oscillators and Power Supplies: Condition for Oscillations, Generalized form of Hartley & Colpitts Oscillators, Op-Amp Based RC Phase Shift, Wein Bridge, Crystal Oscillators.

Power Supply: Unregulated Power Supply, Ripple Factor, Filters, Rectifier Efficiency. Regulated Power Supply, Regulation, Shunt Regulators, Series Regulators.

Text Books:

1. Millman, J. & Halkias, C. / "Integrated Electronics" / McGraw-Hill International.
2. Sedra, Adel S., Smith, Kenneth C. / "Microelectronic Circuits"/ Oxford University Press / 5th Edition
3. Shilling, D. H. & Belove, Ch. / "Electronic Circuit"/ McGraw-Hill International.

Reference Books:

1. Streetman, B.G. & Banerjee, Sanjay / "Solid State Electronic Devices" / Pearson Education, 5th Ed
2. Bell, David A. / "Electronic Devices & Circuits"/Pearson, 4th Ed.
3. Millman, J. and Grabel, A. / "Microelectronics"/ McGraw –Hill.
4. Nair, B. Somanathan /"Electronic Devices & Applications"/ Prentice-Hall (India)
5. Nagrath , I.J. / "Electronics, Analog & Digital"/ Prentice-Hall (India).
6. Neamen, Donald A. / "Electronic circuit Analysis & design" / Tata McGraw Hill

EC 303
SIGNALS & SYSTEMS

L	T	P
3	1	0

Unit I **08**

Signals: Definition, types of signals and their representations: continuous-time/discrete-time, periodic/nonperiodic, even/odd, energy/power, deterministic / random, one-dimensional/multi-dimensional; commonly used signals (in continuous-time as well as in discrete-time): unit impulse, unit step, unit ramp (and their inter-relationships), exponential, rectangular pulse, sinusoidal; operations on continuous-time and discrete time signals (including transformations of independent variables).

Unit II **08**

Laplace-Transform (LT) and Z-transform (ZT): (i) 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) (ii) 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 III **08**

Fourier Transforms (FT): (i) 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 (ii) Discrete time Fourier transform (DTFT), inverse DTFT, convergence, properties and theorems, Comparison between continuous time FT and DTFT

Unit IV **08**

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 V **08**

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 Books:

1. AV Oppenheim, A.S. Willsky and S. Hamid Nawab, 'Signals and Systems', Pearson Education,2016.
2. P. Ramakrishna Rao, `Signal and Systems'., Tata McGraw Hill, New Delhi,2013.
3. TK Rawat, "Signals and Systems", Oxford University Press.

Reference Books:

1. Chi-Tsong Chen, `Signals and Systems', 3rd Ed., Oxford University Press, 2004
2. BP Lathi, "Principals of Linear Systems and Signals", Oxford University Press.
3. Kishore S. Trivedi, "Probability & Statistics with Reliability Queuing and Computer Science Applications", Wiley Publication.

AS – 302/402
HUMAN VALUES AND ETHICS

L	T	P
3	0	0

UNIT 1 **08**

Course Introduction

1. Understanding: Why humans are ethical, why they are not;
2. Understanding the need, basic guidelines, content and process for Value Education;
3. Self Exploration–what is it? – It's content and process;
4. 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration;
5. Right understanding of Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority;
6. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario;
7. Method to fulfil the above human aspirations: understanding and living in **harmony** at various levels

UNIT 2 **08**

Understanding of Human Values and Ethics

1. Understanding the needs of Self ('I') and Body ('Me');
2. Understanding values in human-human relationship;
3. Meaning of Co-existence and Mutual Satisfaction;
4. Understanding Respect;
5. Understanding Comprehensive Human Goals;

UNIT 3 **08**

Effects of Holistic Harmony on Professional Ethics

1. World as a Nation;
2. Definitiveness of Ethical Human Conduct;
3. Basis for Humanistic Education and Humanistic Universal Order;
4. Competence in professional ethics:
    a) Ability to utilize the professional competence for augmenting universal human order;
    b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,;
    c) Ability to identify and develop appropriate technologies and management patterns for above production system;
5. Strategy for transition from the present state to Universal Human Order:
    a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers;
    b) At the level of society: as mutually enriching institutions and organizations;

UNIT 4 **08**

Effects of Holistic Personality for Success

1. Negotiation as a tool for success;
2. Leadership as an attribute of a successful Professional;
3. Managing Stress and Time;
4. Team Building--creating a harmonious environment with apathy to each other;
5. Understanding difference between evolution and revolution;

UNIT 5 **08**

Managing Relationship for Success

1. Understanding and valuing Cross-Cultural Ethics;
2. Managing Relationships (Networking), Personal Effectiveness and Self Leadership;
3. Theory of Constraints;
4. A Decision Making Model: Ethics as making decisions and choices;
5. Conflicts and Ethical Dilemmas;
6. Entrepreneurship and Ethics: A sense of business Ethics;
7. Pragmatic Behaviour of Business to its Colleagues/Competitors

Text Books:

1. Kazuo Ishiguro, 1989, *The Remains of the Day*, Faber and Faber
2. B. L. Bajpai, 2004, *Indian Ethos and Modern Management*. New Royal Book Co., Lucknow. Reprinted 2008;
3. Sussan George, 1976, *How the Other Half Dies*. Penguin Press, Reprint 1991;

Reference Books:

1. Amitabh Ghosh, 2008, *Sea of Poppies*. John Murray Publications.
2. R. K. Narayan, 1958, *The Guide*, Viking Press.
3. P. L. Dhar, R. R. Gour, 1990, *Science and Humanism*, Commonwealth Publishers;
4. R. R. Gaur, R. Sangal and G. P. Bagaria, 2010, A Foundation Course in Human Values and Professional Ethics, Excel Books.

Relevant movies and documentaries:

1. Story of Stuff (Documentary);
2. The Remains of the Day (Movie);
3. Pursuit of Happyness (Movie);
4. Fences (Movie);
5. Gifted (Movie)

AS – 303/ AS - 403
ENVIRONMENT AND ECOLOGY

L	T	P
3	0	0

Unit I- Fundamentals of Environment & Ecology **08**

Definition, Scope & Importance and Need for public awareness.
Ecosystem- Definition, Energy flow in ecosystem, Ecological succession and Balanced ecosystem.
Effect of human activities on food, Shelter, Economic and social security.
Effect of human activities on environment - Agriculture, Housing, Industry, Mining and Transportation activities.
Basics of Environmental Impact, Assessment and Sustainable development.

Unit II- Natural Resources & Environmental Quality standard **09**

Water resources- Availability and quality aspects. Mineral resources, Material Cycle- Carbon, Nitrogen & Sulphur cycles, DO, BOD and COD.
Modern techniques used in analysis of Pollutants- Determination of disinfectants, Pesticides, Ambient Quality standards, Water quality parameters and standards, Turbidity, pH, Suspended solids and hardness,

Unit III- Environmental Pollution & Current Environmental issues **09**

Environmental Pollution-Definition, Causes, Effects and control measure of:

1. Air Pollution
2. Water Pollution
3. Soil pollution
4. Marine Pollution

Current environmental issues of importance: Population growth, Climate change & Global warming- effects, Urbanization, Cause of global warming, Acid rain. Ozone layer depletion- causes and effects on health, Control measures. Photochemical smog, Solid waste management, Waste water treatment.

Unit IV- Energy-Types , Sources and Uses **08**

Different types of energy, Conventional and nonconventional sources- Hydro-electric, Fossil fuel based, Nuclear, Solar, Biomass, Geothermal energy and Biogas. Hydrogen as alternative future source of energy.

Unit V- Environmental protection **06**

Role of Government, Legal aspects, Environment protection Act, Introduction to ISO 14000, Green building concept.

Text Books-

1. Environmental Studies- Dr. D. L. Manjunath, Pearson Education
2. Text book of Environment Science and Engineering- M. Anji Reddy- B S Publication
3. Elements of Environmental Science and Engineering- Dr. P. Meenakshi- Prentice-Hall of India Pvt Ltd, New Delhi, 2008.
4. Environment and Ecology- P.D. Sharma- Rastogi publication 2009.

Reference Books-

1. Principle of Environmental Science and Engineering- P. Venugopalan Rao, Prentice Hall of India.
2. Environmental studies- R. Rajagopalan- Oxford Publication-2005.

CS-351
DATA STRUCTURE LAB

L	T	P
0	0	2

LIST OF EXPERIMENTS

Note :- At least **ten** experiments are to be conducted from the following list.

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 stack using linked list.
5. To implement queue using array.
6. To implement queue using linked list.
7. To implement circular queue using array.
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.

EC-351
DIGITAL CIRCUITS & LOGIC DESIGN LAB

L	T	P
0	0	2

LIST OF EXPERIMENTS

Note:- Minimum ten experiments are to be performed from the following list.

1. Nomenclature of digital ICs, specifications, study of the data sheet, Concept of Vcc and ground, verification of the truth tables of logic gates using TTL ICs.
2. Realization of basic gates using Universal logic gates.
3. To implement BCD to Excess-3 & vice-versa.
4. To implement 4-bit parity generator & comparator circuits.
5. Construction of simple Decoder & Multiplexer circuits using logic gates.
6. Design of combinational circuit for BCD to decimal conversion to drive 7-segment display using multiplexer
7. To implement Adder and Subtractor.
8. Realization of RS-JK & D flip-flops using Universal logic gates.
9. Realization of Universal Register using JK flip-flops & logic gates.
10. Realization of Universal Register using multiplexer & flip-flops.
11. Construction of Adder circuit using Shift Register & full Adder.
12. Realization of Asynchronous Up/Down counter.
13. Realization of Synchronous Up/Down counter.
14. Implementation of Mini Project using digital integrated circuits and other components.

EC - 352
SOLID STATE DEVICES AND CIRCUITS LAB

L	T	P
0	0	2

LIST OF EXPERIMENTS

Note: Minimum ten experiments are to be performed from the following list.

1. To study the *pn* junction diode characteristics under forward and reverse bias conditions.
2. To study the application of a zener diode as voltage regulator.
3. To draw wave shape of the electrical signal at input and output points of the half wave, full wave (Bridge) rectifiers and determine it's ripple factor.
4. To observe the clipping wave forms in different clipping configurations.
5. To observe the clamping wave forms in different clamping configurations.
6. To Plot input / output characteristics for common base transistor.
7. To determine the CE (Common Emitter) characteristics of a given BJT
8. To Plot input /output characteristics of FET and determine FET parameters at a given operating point.
9. To determine voltage gain, current gain, input impedance and output impedance and frequency response of R-C coupled common emitter amplifier.
10. To design R-C Phase shift / Wein Bridge oscillator and verify experimentally the frequency of oscillation.
11. To study transistor as a switch and determine load voltage and load current when the transistor is ON.
12. To study application of Operational Amplifier as summer integrator and voltage comparator.

EC-353

SIGNALS AND SYSTEMS LAB

L	T	P
0	0	2

Note: Minimum ten experiments out of the following list:

MATLAB Based Experiments

1. Introduction to MATLAB
   a) To define and use variables and functions in MATLAB
   b) To define and use Vectors and Matrices in MATLAB.
   c) To study various MATLAB arithmetic operators and mathematical functions.
   d) To create and use m-files.
2. Write a MATLAB program to plot the following Continuous time and discrete time signals
   a) Step Function
   b) Impulse Function
   c) Exponential Function
   d) Ramp Function
   e) Sine Function.
3. Write a MATLAB program to perform amplitude-scaling, time-scaling and time-shifting on a given signal.
4. Write a MATLAB program to obtain linear convolution of the given sequences.
5. Autocorrelation and Cross-correlation
   a) Write a MATLAB program to compute autocorrelation of a sequence x(n) and verify the property.
   b) Write a MATLAB program to compute cross-correlation of sequences x(n) and y(n) and verify the property.
6. Laplace Transform
   a) Write a MATLAB program to calculate the Laplace transform of signals.
   b) Write a MATLAB program to generate partial fraction expansion in Laplace transform.
7. Write a MATLAB program to plot Fourier Transform and Z-transform of a given signal.
8. Pole-zero diagram
   a) Write a MATLAB program to find the poles and residues and pole-zero plot of a given system function.
   b) Write a MATLAB program to find the partial fraction expansion and pole-zero plot of a function.
9. Discrete-time Fourier Transform
   a) Write a MATLAB program to calculate the DTFT of a sequence.
   b) Write a MATLAB program to find Time convolution property of DTFT.
10. Write a MATLAB program to plot magnitude and phase response of a given system.
11. Impulse response and Step response of a given system
    a) Write a MATLAB program to find the impulse response and step response of a system form its difference equation.
12. Compute and plot the response of a given system to a given input

AS - 401
COMPUTER ORIENTED NUMERICAL TECHNIQUES

L	T	P
3	1	0

Unit I **08**

Problem solving on computer, Algorithms and flow charts.
Introduction to numerical computing, approximations and errors in numerical computations, truncation and round off errors, propagation of errors.
Root finding: Bisection method, regula-falsi method, iteration method, Newton Raphson method, Secant method, systems of nonlinear equations. Rate of convergence of iterative method.

Unit II **06**

Matrix algebra & solution of simultaneous linear algebraic equations: Gauss elimination, Gauss Jordan method, LU Decomposition, Jacobi method, Gauss Seidel method, SOR method, convergence of iterative methods. Tridiagonal systems and Thomas algorithm, Condition of a system and stability issues.

Unit III **10**

Interpolation and Extrapolation: Finite differences, Newton's forward and backward interpolation formula, Lagrange interpolation formula. Divided differences and Newton's formula.
Numerical differentiation. Numerical integration: Trapezoidal and Simpson's rules. Newton-Cotes integration formulas, Romberg integration, Gaussian quadrature.

Unit IV **08**

Numerical solution of O.D.E.: Taylor series method, Euler's method, Runge Kutta method.
Multistep method: Milne,s method, Adams method, accuracy, convergence criteria, stiffness.

Unit V **08**

Boundary Value problems: Finte difference method, solving eigenvalue problems, polynomial method and power method.
Numerical solution of Partial Differential equations. Elliptic, Parabolic and hyperbolic PDEs.

Text Books :

1. Jain, Iyengar and Jain, Numerical Methods for Scientific and Engineering Computation (2003), New Age International, New Delhi.
2. Grewal B.S., Numerical Methods in Engineering and Science, Khanna Publishers, Delhi.
3. E.Balagurusamy, Numerical Methods, Tata Mc Graw hill.

Reference Books :

1. Sastry, S.S. Introductory Methods of Numerical Analysis, 3rd ed. Prentice Hall of India, New Delhi (2002).
2. Schaum's Outlines: Numerical Analysis, 2nd ed. Tata Mc Graw Hill Publishing Co. Limited (1968).
3. Kandasamy, P. Thialagawathy, K. & Gumawathy, K. Numerical Method, S Chand & Company Ltd., New Delhi (1999)
4. Balaguruswanmy, E. Numerical Methods. Tata Mc Graw Hilll Publishing Co. Limited, New Delhi (2001)

EC 401
ELECTRONICS INSTRUMENTATION & MEASUREMENT

L	T	P
3	0	0

Unit I **10**

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 II **08**

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

Unit III **06**

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

Unit IV **08**

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 V **08**

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

Text Books:

1. David A. Bell, “Electronic Instrumentation and Measurements”, Oxford University Press, New Delhi 2017.
2. H.S. Kalsi, “Electronic Instrumentation”,Mc Graw Hill Education, 2016.

Reference Books:

1. Oliver and Cage, “Electronic Measurements and Instrumentation”, TMH, 2009.
2. Alan S. Morris, “Measurement and Instrumentation Principles”, Elsevier (Buterworth Heinmann).
3. Banerjee, “Electrical and Electronics Measurements”, PHI Learning, 2017.
4. Oliver, “Electronic Measurements & Instrumentation”, McGraw Hill Education, 2017
5. Pukrait’ “Electrical & Electronics Measurements and Instrumentation”, McGraw Hill Education, 2017.
6. Joseph J.Carr, “Elements of Electronic Instrumentation and Measurement”, Pearson, 2017.

EC - 402
ELECTROMAGNETIC FIELD THEORY

L	T	P
3	0	0

Unit I: **08**

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 vector and Stake's theorem, Laplacian of a scalar.

Unit II: **10**

Electrostatics: Electrostatic fields, Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausse'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: Poisson's and Laplace's equations, general procedures for solving Poisson's or Laplace's equations, resistance and capacitance, method of images.

Unit III: **08**

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 IV: **08**

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 spsce, plain waves in good conductors, power and the pointing vector, reflection of a plain wave in a normal incidence.

Unit V: **06**

Transmission lines: Transmission line parameters, Transmission line equations, input impedance, standing wave ratio and power The Smith chart, some applications of transmission lines.

Text Books:

1. M.N.O.Sadiku, "Elements of Electromagnetic" , 4th Ed, Oxford University Press.
2. Hayt, W.H. and Buck, J.A., "Electromagnetic Tata Mc. Graw Hill Publishing.

Reference Books:

3. Jordan E.C. and Balmain K.G., "Electromagnetic Wave and radiating Systems", Prentice Hall International, 2nd Edition.
4. Kraus, F. "Electromagnetic", Tata Mc. Graw Hill 5th Edition.
5. Ramo S, whinnery T.R. and Vanduzer T, "Field and Waves in Communication Electronics", John Wiely and Sons 3rd Edition.

EC - 403
COMPUTER ARCHITECTURE AND ORGANIZATION

L T P
3 0 0

Unit-I **09**

Functional units of digital system and their interconnections, buses, bus architecture and types of buses. Register, bus and memory transfer, Processor organization, general register organization and stack organization. Ripple carry adder/subtractor and look ahead carry adders. Multiplication: Signed operand multiplication, Booth's algorithm and array multiplier. Division and logic operations, , Arithmetic & logic unit design.

Unit-II **08**

Instruction types, formats, instruction cycles and sub cycles (fetch, execute etc), micro-operations, execution of a complete instruction, Hardwire and micro-programmed control: micro-programme sequencing, concept of horizontal and vertical microprogramming.

Unit-III **08**

Basic concept and hierarchy, semiconductor RAM memories, 2D & 2½ D memory organization. ROM memories, Cache memories: concept and design issues & performance, address mapping and replacement, Auxiliary memories: magnetic disks, magnetic tapes and optical disks, Virtual memory: concept & implementation.

Unit-IV **07**

Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions, Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors, Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.

Unit-V **08**

Architectural Classification Schemes, Flynn's & Feng's Classification, Performance Metrics and Measures, Speedup Performance Laws, Pipelining and Memory Hierarchy Basic and Intermediate Concepts, Linear and Nonlinear Pipeline Processors, Optimization of Cache Performance.

Text Books:

1. William Stalling, "Computer Organization", PHI
2. M. Morris Mano, "Computer System Architecture", Pearson Learning
3. Vravice, Hamacher & Zaky, "Computer Organization", TMH

Reference Books:

1. Miles Murdocca, Vincent Heuring "Computer Architecture and Organisation: An Integrated Approch" 2nd Edition
2. Kai Hwang, "Advance Computer Architecture", TMH
3. John P Hays, "Computer Organization", McGraw Hill
4. Tannenbaum, "Structured Computer Organization", PHI
5. P Pal Chaudhry, "Computer Organization & Design" PHI
6. Dezso and Sima, "Advanced Computer Architecture", Pearson
7. Alan Clements "Computer Organization and Architecture" , Cengage Learning
8. Behrooz Parhami "Computer Architecture", Oxford.
9. Patterson, "Computer Organization and Design" Elsevier Pub. 2009

EE - 401
NETWORK ANALYSIS AND SYNTHESIS

L	T	P
3	1	0

UNIT I **05**

Graph Theory:- Graph of a Network, definitions, tree, co tree , link, basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix Duality, Loop and Nodal methods of analysis.

UNIT II **07**

Network Theorems (Applications to AC networks):-Concept of linearity, and homogeneity Principle, Super-position theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, Reciprocity theorem. Millman's theorem, compensation theorem, Tellegen's theorem.

UNIT III **07**

Network Functions:-Concept of Complex frequency, Transform Impedances, Network functions of one port and two ports networks, concept of poles and zeros, properties of driving point and transfer functions, time response and stability from pole zero plot.

UNIT IV **09**

Two Port Networks:-Characterization of LTI two port networks ZY, ABCD and h parameters, reciprocity and symmetry. Inter-relationships between the parameters, inter-connections of two port networks, Ladder and Lattice networks. T & Π Representation, Concepts of multi-port networks and their practical examples.

UNIT V **12**

Network Synthesis:-Positive real function; definition, properties and limitations; properties of LC, RC and RL driving point functions, synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms, similarities and dissimilarities between Foster's and Cauer's forms.

Filters: Image parameters and characteristics impedance, passive and active filter fundamentals, low-pass, high-pass, (constant K type) filters, and introduction to active filters.

Text Books:-

1. A.Chakrabarti, "Circuit Theory" Dhanpat Rai & Co.
2. C.L Wadhwa, "Network Analysis and Synthesis" New Age International Publishers.
3. N.C. Jagan and C. Lakshminarayana, "Newwork Analysis" B.S. Publications.

Reference Books:-

1. D.Roy Choudhary, "Networks and Systems" Wiley Eastern Ltd.
2. M.E. Van Valkenburg, "Network Analysis", Prentice Hall of India
3. Donald E. Scott: "An Introduction to Circuit analysis: A System Approach" McGraw Hill.
4. M.E. Van Valkenburg, "An Introduction to Modern Network Synthesis",Wiley Eastern Ltd.

EC - 451
ELECTRONICS WORKSHOP & PCB DESIGN LAB

L	T	P
0	0	2

LIST OF EXPERIMENTS

Note: Minimum ten experiments are to be performed from the following list**.**

1. Study of CRO, DMM & Function Generator.
2. Study of various types of Active & Passive Components based on their ratings.
3. Winding shop: Step down transformer winding of less than 5VA.
4. Soldering shop: Fabrication of DC regulated power supply
5. Identification of various types of Printed Circuit Boards (PCB) and soldering Techniques.
6. Introduction to PCB Design software
7. PCB Lab: (a). Artwork & printing of a simple PCB. (b). Etching & drilling of PCB.
8. Wiring & fitting shop: Fitting of power supply along with a meter in cabinet
9. To design Half and Full wave rectifier and measurement of V_{rms}, V_{dc} and ripple factor.
10. To design Zener Shunt regulator and measurement of the output voltage.
11. Implementation of Mini Project using analog integrated circuits and other components

EC - 452
ELECTRONIC MEASUREMENT & INSTRUMENTATION LAB

L	T	P
0	0	2

LIST OF EXPERIMENTS

Note:- Minimum ten experiments are to be performed from the following list.

1. Calibration of
    a. Ammeter for application as Voltmeter
    b. Voltmeter for application as Ammeter
2. To carry out measurement of Signal Amplitude, Frequency and Phase using C.R.O
3. To extend the range of given voltmeter and ammeter.
4. To find the value of unknown resistor using Wheatstone bridge.
5. To find the value of unknown capacitance using Wein's series and parallel bridge.
6. To find the value of unknown capacitance and inductance using Maxwell's bridge.
7. To study and verify characteristics of variable resistor transducer (strain gauge).
8. To study and verify characteristics of LVDT.
9. To study and verify characteristics of Thermocouple/RTD.
10. Measurement of LCR Q- meter.
11. To demonstrate the functionality of IC tester and to perform test on various ICs

EC - 453
NUMERICAL TECHNIQUE LAB

L	T	P
0	0	2

LIST OF EXPERIMENTS

Note:- Minimum ten experiments are to be performed from the following list.

MATLAB Based Experiments

1. To find out Solution of linear equations for under damped and over damped cases.
2. Determination of Eigen values and eigenvectors of a square matrix.
3. Write a program to find the roots of Algebric equations using Bisection method.
4. Write a program to find the roots of Algebric equations using Regula- falsi method.
5. Write a program to find the roots of Algebric equations using Newton Raphson method.
6. Determination of polynomial using method of least square curve fitting.
7. Determination of polynomial fit, analyzing residuals, exponential fit and error bounds from the given data.
8. Solution of differential equations using 4^{th} order Runge-Kutta method.
9. Solution of differential equation using revised Euler method.
10. Solution of difference equations.
11. Determination of time response of an R-L-C circuit.

EE - 451
NETWORKS ANALYSIS AND SYNTHESIS LAB

L	T	P
0	0	2

LIST OF EXPERIMENTS

Note :- At least ten experiments are to be conducted from the following list.

1. Verification of principle of superposition theorem with AC source.
2. Verification of Thevenin's and Norton's theorem with AC source.
3. Verification of Maximum power transfer theorem in AC circuits.
4. Verification of Tellegen's theorem for two networks of the same topology.
5. Determination of transient response of current in RL and RC circuits with step voltage input.
6. Determination of transient response of current in RLC circuit with step voltage input for under damped, critically damped and over damped cases.
7. Determination of frequency response of current in RLC circuit with sinusoidal AC input.
8. Determination of z and h parameters for a two-port network and compute other parameters.
9. Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values.
10. Determination of image impedance and characteristic impedance of T and Π networks, using O.C. and S.C. tests.
11. Verification of parameter properties in inter-connected two port networks: series, parallel and cascaded.
12. Determination of frequency response of a Twin – T notch filter.
13. To determine attenuation characteristics of a low pass / high pass active filters