B. TECH.

ELECTRICAL 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: Electrical 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.	EE - 301	Network Analysis and Synthesis	3--1--0	20	10	30	70	100	4
3.	EE - 302	Electrical Measurement and Measuring Instruments	3--0--0	20	10	30	70	100	3
4.	EE - 303	Electrical Machines -I	3--0--0	20	10	30	70	100	3
5.	EC - 304	Analog and Digital Electronics	3--0--0	20	10	30	70	100	3
6.	AS – 302/ AS - 303	Human Values & Ethics / Environment & Ecology	3—0--0	20	10	30	70	100	3
	Practical								
7.	EE - 351	Network Analysis and Synthesis Lab	0--0--2	-	20	20	30	50	1
8.	EE - 352	Electrical Measurement and Measuring Instruments Lab	0--0--2	-	20	20	30	50	1
9.	EE - 353	Electrical Machines Lab - I	0--0--2	-	20	20	30	50	1
10.	EC - 354	Analog Integrated Circuits 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: Electrical 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.	EE - 402	Electrical Machines - II	3--0--0	20	10	30	70	100	3
3.	EE - 403	Basic System Analysis	3--1--0	20	10	30	70	100	4
4.	EC – 402	Electromagnetic Field Theory	3--0--0	20	10	30	70	100	3
5.	EC – 403	Fundamentals of Microprocessors	3--0--0	20	10	30	70	100	3
6.	AS – 402/ AS - 403	Human Values & Ethics/ Environment & Ecology	3—0--0	20	10	30	70	100	3
	Practical								
7.	EE - 452	Electrical Machines Lab - II	0--0--2	-	20	20	30	50	1
8.	EC – 453	Microprocessor Lab	0--0--2	-	20	20	30	50	1
9.	EC - 454	Digital Electronics Lab	0--0--2	-	20	20	30	50	1
10.	EE – 453	Numerical Technique 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.

EE - 301
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, 2007.
3. N.C. Jagan and C. Lakshminarayana, "Network Analysis" B.S. Publications, 2008.

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.

EE - 302
ELECTRICAL MEASUREMENT AND MEASURING INSTRUMENTS

L	T	P
3	0	0

UNIT I **07**

Philosophy Of Measurement:-Methods of Measurement, Measurement System**,** Classification of instrument system, Characteristics of instruments & measurement system**,** Errors in measurement & its analysis, Standards.

Analog Measurement of Electrical Quantities :-Analog Instruments-Classification, Principle of operation of Permanent Magnet Moving Coil (PMMC) and Moving Iron Instruments, Voltmeters & ammeters, Errors in Voltmeter and Ammeters, Range extension, Advantages and disadvantages, Electrodynamometer Instruments, Power & Energy measurement.

UNIT II **07**

Instrument Transformers- Principle of operation and applications, Current transformer and its error analysis, Potential transformer and its error analysis, Miscellaneous Measurement(speed, Frequency & power factor.

UNIT III **07**

Measurement of Parameters:-Different methods of measuring low, medium and high resistances**,** measurement of inductance & capacitance with the help of AC Bridges, Quality factor (Q) Meter.

UNIT IV **09**

AC Potentiometer:-Polar type & Co-ordinate type AC potentiometers, application of AC Potentiometers in electrical measurement

Magnetic Measurement:-Ballistic Galvanometer, flux meter, determination of hysteresis loop, measurement of iron losses**.**

UNIT V **10**

Digital Measurement of Electrical Quantities:-Concept of digital measurement, block diagram Study of digital voltmeter, frequency meter Power Analyzer and Harmonics Analyzer; Electronic Multimeter.

Cathode Ray Oscilloscope:-Basic CRO circuit (Block Diagram), Cathode ray tube (CRT) & its components, application of CRO in measurement, Lissajous Pattern, Dual Trace & Dual Beam Oscilloscopes.

Text Books:

1. A.K. Sawhney, “Electrical& Electronic Measurement & Instrument”, Dhanpat Rai & Sons , India
2. J.B. Gupta, “Electrical Measurements and Measuring Instruments”, S.K. Kataria & Sons.

Reference Books:

1. W.D. Cooper, “Electronic Instrument and Measurement Technique”, Prentice Hall International, India.
2. Forest K. Harries, “Electrical Measurement”, Wiley Eastern Pvt. Ltd. India.
3. M.B. Stout, “Basic Electrical Measurement” Prentice hall of India, India.
4. E.W.Golding & F.C.Widdis, “ Electrical Measurement & Measuring Instruments”,A W Wheeler & Company Pvt. Ltd. India.

EE - 303
ELECTRICAL MACHINES - I

L	T	P
3	0	0

UNIT I **05**

Principles of Electro-mechanical Energy Conversion - Introduction, Flow of Energy in Electromechanical Devices, Energy in magnetic systems (defining energy & Co-energy), singly Excited Systems; determination of mechanical force, mechanical energy, torque equation, Doubly excited Systems; Energy stored in magnetic field, electromagnetic torque.

UNIT II **09**

D.C. Machines:-Construction of DC Machines, operation, Armature winding, Types according to excitation (with circuit representation and equations), emf and torque equation, Armature Reaction, Commutation process, Interpoles and Compensating Windings, Performance Characteristics of DC generators.

UNIT III **09**

D.C. Machines (Contd.):-Performance Characteristics of D.C. motors, Starting of D. C. motors; 3 point and 4 point starters, Speed control of D.C. motors: Field Control, armature control and Voltage Control (Ward Lenonard method); Efficiency and Testing of D.C. machines (Hopkinson's and Swinburne's Test).

UNIT IV **09**

Single Phase Transformer: Construction, working principle, equivalent circuit, Phasor diagram, efficiency and voltage regulation, Losses in Transformer, Separation of hysteresis and eddy current losses, all day efficiency. Testing of Transformers: O.C. and S.C. tests, Sumpner's test, polarity test.
Auto Transformer: Single phase and three phase auto transformers, volt-amp relation, efficiency, merits & demerits and applications.

UNIT V **06**

Three Phase Transformers: Construction, three phase transformer phasor groups and their connections, open delta connection, three phase to 2 phase, 6 phase or 12 phase connections, and their applications, parallel operation and load sharing of single phase and three phase transformers, excitation phenomenon and harmonics in transformers, three winding transformers.

Text Books:-

1. I.J. Nagrath&D.P.Kothari," Electrical Machines", Tata McGraw Hill
2. Husain Ashfaq ," Electrical Machines", Dhanpat Rai & Sons
3. M. G. Say, "The Performance and Design of AC machines", Pit man & Sons.

Reference Books:-

1. A.E. Fitggerald, C.Kingsley Jr and Umans,"Electric Machinery" 6th Edition, McGraw Hill, International Student Edition.
2. Irving L. Kosow, "Electric Machine and Transformers", Prentice Hall of India.
3. P.S.Bhimbhra, Electrical Machinary, Khanna Publications

EC – 304
ANALOG AND DIGITAL ELECTRONICS

L	T	P
3	0	0

ANALOG ELECTRONICS

UNIT I **06**

Special Diodes: LED, Varactor diode, Photo diode, Schottky diode, Tunnel diode and their characteristics and applications, Transistors as a switch.

UNIT II **07**

Frequency Response:-Amplifier transfer function, low and high frequency response of common emitter and common source amplifiers.

Feedback: General feedback structure, properties of negative feedback :series-series, series-shunt, shunt-series and shunt-shunt feedback amplifiers.

UNIT III **07**

Basic principle of sinusoidal oscillator, R-C Phase Shift and Wein Bridge oscillators, tuned oscillators-Collpits , Hartley and Crystal oscillators.

DIGITAL ELECTRONICS

UNIT IV **10**

Combinational Logic Circuits: Multiplexers/Demultiplexers, Encoders/Decoders.

Sequential Logic Circuits: latches, flip-flops- S-R, T, D and J-K.

Shift Registers: Basic principle, serial and parallel data transfer, shift left/right registers, universal shift registers.

Counters: Mode N Counters, ripple counters, synchronous counters and ring/Johnson counters.

UNIT V **10**

OP-AMP applications: Astable, Monostable and Bistable multivibrators, Schmitt trigger, IC-555 Timer, A/D and D/A converters.

Voltage Regulators: Series, shunt and switching regulators, op-amp based configurations.

Memories: Introduction to ROM, RAM; Sequential Memory and Memory organization.

Text Books:

1. A. S. Sedra and K.C. Smith, “Microelectronics Circuits”, Oxford University Press (India).
2. Malvino& Leach, “Digital Principles and applications”, Tata Mc. Graw Hill
3. Anand Kumar, “Switching Theory and Logic Design”, Prentice Hall of India, 2008.
4. Aloke. K. Dutta, “Semiconductor Devices and circuits”, Oxford University Press, 2008.

Reference Books:

1. R. A. Gayakwad, “Op amps and Linear Integrated Circuits”, Prentice Hall of India.
2. Balbir Kumar and Shail B. Jain, “Electronic Devices and Circuits”, Prentice Hall of India, 2007.
3. Taub & Schilling “Digital Electronics”, Tata Mc Graw Hill.
4. Anil K. Maini, “Digital Electronics: Principles and Integrated circuits”, Wiley India Ltd, 2008.

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 Book-

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.

EE - 351
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

EE - 352

ELECTRICAL MEASUREMENT AND MEASURING INSTRUMENTS LAB

L	T	P
0	0	2

LIST OF EXPERIMENTS

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

1. Calibration of
    a. Ammeter for application as Voltmeter and
    b. Voltmeter for application as Ammeter
2. Calibration of a given Sine-Responding Voltmeter for other types of Waveforms (such as Square & Rectangular).
3. Measurement of Signal Amplitude, Frequency and Phase using C.R.O
4. Measurement of low resistance by Kelvin's double bridge
5. Measurement of voltage, current and resistance using dc potentiometer
6. Measurement of inductance by Maxwell's bridge .
7. Measurement of inductance by Hay's bridge.
8. Measurement of inductance by Anderson's bridge.
9. Measurement of capacitance by Owen's bridge .
10. Measurement of capacitance by De Sauty bridge.
11. Measurement of capacitance by Schering bridge.
12. Measurement of Power in a 1-Phase load using 3-Voltmeter method and its Calibration using Wattmeter.
13. Measurement of Earth-Resistance.
14. Calibration of 3-Phase Energy meter.
15. Range extension of ammeter and voltmeter.

EE - 353
ELECTRICAL MACHINES LAB - I

L	T	P
0	0	2

LIST OF EXPERIMENTS

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

1. To obtain magnetization characteristics of a DC shunt generator.
2. To obtain load characteristics of a DC shunt generator.
3. To obtain efficiency of a DC shunt machine using Swinburne's test.
4. To perform Hopkinson's test and determine losses and efficiency of DC machine
5. To obtain speed-torque characteristics of a DC shunt motor.
6. To obtain speed-torque characteristics of a DC series motor.
7. To obtain speed control of DC shunt motor using (a) armature resistance control (b) field control
8. To obtain equivalent circuit, efficiency and voltage regulation of a single phase transformer using O.C. and S.C. tests.
9. To obtain efficiency and voltage regulation of a single phase transformer by Sumpner's test.
10. To obtain 3-phase to 2-phase conversion by Scott connection.
11. To study polarity and ratio test of single phase and 3-phase transformers
12. To obtain speed control of dc separately excited motor using Conventional Ward-Leonard method.
13. To determine excitation phenomenon (B.H. loop) of single phase transformer using C.R.O.

EC - 354
ANALOG INTEGRATED CIRCUITS LAB

L	T	P
0	0	2

LIST OF EXPERIMENTS

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

1. Study of Lab Equipments and Components: CRO, Multimeter and Function Generator, Power supply- Active, Passive Components and Bread Board.
2. To study the *pn*junction diode characteristics under forward and reverse bias conditions
3. To study the application of a zener diode as voltage regulator.
4. 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.
5. To observe the clipping wave forms in different clipping configurations.
6. To observe the clamping wave forms in different clamping configurations.
7. To Plot input / output characteristics for common base transistor.
8. To determine the CE (Common Emitter) characteristics of a given BJT.
9. To Plot input /output characteristics of FET and determine FET parameters at a given operating point.
10. To determine voltage gain, current gain, input impedance and output impedance and frequency response of R-C coupled common emitter amplifier.
11. To design R-C Phase shift / Wein Bridge oscillator and verify experimentally the frequency of oscillation.
12. To study transistor as a switch and determine load voltage and load current when the transistor is ON.
13. To study application of Operational Amplifier as summer integrator and voltage comparator.

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)

EE – 402
ELECTRICAL MACHINES – II

L	T	P
3	0	0

UNIT I **10**

Synchronous Machine-I: Constructional features, Armature winding, EMF Equation, Winding coefficients, equivalent circuit and phasor diagram, Armature reaction, O. C. & S. C. tests, Voltage Regulation using Synchronous Impedance Method, MMF Method, Potier's Triangle Method, Parallel Operation of synchronous generators, operation on infinite bus, synchronizing power and torque co-efficient.

UNIT II **08**

Synchronous Machine-II: Two Reaction Theory, Power flow equations of cylindrical and salient pole machines, operating characteristics Synchronous Motor: Starting methods, Effect of varying field current at different loads, V- Curves, Hunting & damping, synchronous condenser .

UNIT III **10**

Three phase Induction Machine-I: Constructional features, Rotating magnetic field, Principle of operation Phasor diagram, equivalent circuit, torque and power equations, Torque- slip characteristics, no load & blocked rotor tests, efficiency, Induction generator & its applications.

UNIT IV **04**

Three phase Induction Machine-II: Starting, Deep bar and double cage rotors, Cogging & Crawling, Speed Control (with and without emf injection in rotor circuit.)

UNIT V **08**

Single phase Induction Motor: Double revolving field theory, Equivalent circuit, No load and blocked rotor tests, Starting methods, repulsion motors.

AC Commutator Motors: Universal motors, Single phase a.c. series compensated motors, stepper motors.

Text Books:-

1. D.P.Kothari&I.J.Nagrath, "Electric Machines", Tata Mc Graw Hill.
2. Ashfaq Hussain"Electric Machines" Dhanpat Rai & Company.
3. P.S.Bimbhra, "Electrical Machinery", Khanna Publisher

Reference Books

1 Fitzerald,A.E.,Kingsley and S.D.Umans"Electric Machinery", MC Graw Hill.
2 Stephen J Chapman, Electrical Machinery and Power System Fundamentals, McGraw-Hill Higher Education.
3 P.S. Bimbhra, " Generalized Theory of Electrical Machines", Khanna Publishers.
4 M.G.Say, "Alternating Current Machines",Pitman& Sons

EE – 403
BASIC SYSTEM ANALYSIS

L	T	P
3	1	0

UNIT I **06**

Introduction to continuous time signals and systems: Basic continuous time signals, unit step, unit ramp, unit impulse and periodic signals with their mathematical representation and characteristics. Introduction to various types of systems.

Analogous System: Linear mechanical elements, force-voltage and force-current analogy, modeling of mechanical and electro-mechanical systems: Analysis of first and second order linear systems by classical method.

UNIT II **07**

Fourier Transform Analysis : Exponential form and Trigonometric form of Fourier series, Fourier symmetry, Fourier Integral and Fourier Transform. Transform of common functions and periodic wave forms: Applications of Fourier Transform to network analysis.

UNIT III **10**

Laplace Transform Analysis : Review of Laplace Transform , Laplace Transform of periodic functions, Initial and Final Value Theorems, Inverse Laplace Transform , Convolution Theorem, Superposition Integral , Application of Laplace Transform to analysis of networks, waveform synthesis and Laplace Transform of complex waveforms.

UNIT IV **10**

State – Variable analysis : Introduction, State Space representation of linear systems, Transfer Function and state Variables , State Transition Matrix, Solution of state equations for homogeneous and non-homogeneous systems , Applications of State-Variable technique to the analysis of linear systems.

UNIT V **07**

Z-Transform Analysis : Concept of Z-Transform, Z-Transform of common functions, Inverse Z-Transform, Initial and Final Value theorems , Applications to solution of difference equations, Pulse Transfer Function.

Text Books:-

1. Alan V. Oppenheim & Alan S.Wilsky.”Signals and Systems” Pearson
2. B.P. Lathi, “Linear Systems & Signals” Oxford University Press, 2008.

Reference Books:-

1. David K.Cheng; “Analysis of Linear System”, Narosa Publishing Co.
2. C.L.Wadhwa, “Network Analysis and Synthesis”, New Age International Publishers,2007.
3. ME Van-Valkenberg; “ Network Analysis”, Prentice Hall of India .
4. Samarajit Ghosh, “Network Theory: Analysis and Synthesis” Prentice Hall of India, 2008 .
5. Choudhary D.Roy, “Network & Systems”, Wiley Eastern Ltd.
6. I.J. Nagrath, S.N. Saran, R. Ranjan and S.Kumar, “Signals and Systems, “Tata Mc. Graw Hill, 2001.

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:

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

EC - 403

FUNDAMENTALS OF MICROPROCESSOR

L	T	P
3	0	0

Unit-I **08**

Introduction to Microprocessor: Microprocessor evolution and types, microprocessor architecture and its operation, addressing modes, interrupts, data transfer schemes, instruction and data flow, timer and timing diagram, Basic interfacing concepts, Memory interfacing, Interfacing output displays, Interfacing input devices.

Unit-II **09**

Introduction to 8085 microprocessor: Pin diagram and internal architecture of 8085 microprocessor, registers, ALU, Control & status, interrupt and machine cycle. Instruction sets. Instruction formats. Instruction Classification: data transfer, arithmetic, logic, branch operations, looping, counting, indexing, programming techniques, counters and time delays, stacks and subroutines, conditional call and return instructions.

Unit-III **08**

Introduction to 8086 microprocessor: Architecture of 8086 microprocessor, pin diagram, Functional block diagram, register organization, bus interface unit, execution unit, memory addressing, and memory segmentation. Operating modes, Instruction sets, instruction format, Types of instructions. Interrupts: hardware and software interrupts.

Unit-IV **08**

Introduction to Assembly Language: Assembly language programming based on intel 8085/8086. Instructions, data transfer, arithmetic, logic, branch operations, looping, counting, indexing, programming techniques, counters and time delays, stacks and subroutines, conditional call and return instructions.

Unit-V **07**

Peripheral Devices: 8237 DMA Controller, 8255 programmable peripheral interface, 8253/8254 programmable timer/counter, 8259 programmable interrupt controller, 8251 USART and RS232C.

Text Books:

1. Gaonkar, Ramesh S , "Microprocessor Architecture, Programming and Applications with8085", Penram International Publishing.
2. Hall D V ,"Microprocessor Interfacing', TMH
3. Liu Y.C. & Gibson G.A. , " Microcomputer System: The 8086/8088 family'', Pearson Education

Reference Books

1. Ray A. K. Bhurchandi K M, " Advanced Microprocessors and Peripherals" , TMH
2. Brey, Barry B, "INTEL Microprocessors", PHI
3. Aditya P Mathur Sigh, "Microprocessor, Interfacing and Applications M Rafiqzzaman, "Microprocessors, Theory and Applications

EE - 452
ELECTRICAL MACHINES LAB - II

L	T	P
0	0	2

LIST OF EXPERIMENTS

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

1. To perform no load and blocked rotor tests on a three phase squirrel cage induction motor and determine equivalent circuit.
2. To perform load test on a three phase induction motor and draw: (i) Torque -speed characteristics (ii) Power factor-line current characteristics
3. To perform no load and blocked rotor tests on a single phase induction motor and determine equivalent circuit.
4. To study speed control of three phase induction motor by Keeping V/f ratio constant by varying supply voltage.
6. To perform open circuit and short circuit tests on a three phase alternator and determine voltage regulation at full load and at unity, 0.8 lagging and leading power factors by (i) EMF method (ii) MMF method.
7. To determine V-curves and inverted V-curves of a three phase synchronous motor.
8. To determine Xd and Xq of a three phase salient pole synchronous machine using the slip test and draw the power-angle curve.
9. To study synchronization of an alternator with the infinite bus by using:(i) dark lamp method (ii) two bright and one dark lamp method

Software based experiments (Develop Computer Program in 'C' language or use MATLAB or other commercial software)

10. To determine speed-torque characteristics of three phase slip ring induction motor and study the effect of including resistance, or capacitance in the rotor circuit.
11. To determine speed-torque characteristics of single phase induction motor and study the effect of voltage variation.
12. To determine speed-torque characteristics of a three phase induction motor by (i) keeping v/f ratio constant (ii) increasing frequency at the rated voltage.
13. Draw O.C. and S.C. characteristics of a three phase alternator from the experimental data and determine voltage regulation at full load, and unity, 0.8 lagging and leading power factors.
14. To determine steady state performance of a three phase induction motor using equivalent circuit.

EC - 453

MICROPROCESSOR LAB

L	T	P
0	0	2

LIST OF EXPERIMENTS

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

Case studies

1. To study 8085 based microprocessor system
2. To study 8086 and 8086A based microprocessor system
3. To study Pentium Processor

Programming based Experiments (any four)

4. To develop and run a program for finding out the largest/smallest number from a given set of numbers.
5. To develop and run a program for arranging in ascending/descending order of a set of numbers
6. To perform multiplication/division of given numbers
7. To perform conversion of temperature from 0F to 0C and vice-versa
8. To perform computation of square root of a given number
9. To perform floating point mathematical operations (addition, subtraction, multiplication and division)

Interfacing based Experiments (any four)

10. To obtain interfacing of RAM chip to 8085/8086 based system
11. To obtain interfacing of keyboard controller
12. To obtain interfacing of DMA controller
13. To obtain interfacing of PPI
14. To obtain interfacing of UART/USART
15. To perform microprocessor based stepper motor operation through 8085 kit
16. To perform microprocessor based traffic light control
17. To perform microprocessor based temperature control of hot water.

EC – 454
DIGITAL ELECTRONICS LAB

L	T	P
0	0	2

LIST OF EXPERIMENTS

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

1. Introduction to digital electronics lab- 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. Construction of simple Decoder & Multiplexer circuits using logic gates.
4. Design of combinational circuit for BCD to decimal conversion to drive 7-segment display using multiplexer.
5. Construction of simple arithmetic circuits-Adder and Subtractor.
6. Realization of RS-JK & D flip-flops using Universal logic gates.
7. Realization of Universal Register using JK flip-flops & logic gates.
8. Realization of Universal Register using multiplexer & flip-flops.
9. Construction of Adder circuit using Shift Register & full Adder.
10. Realization of Asynchronous Up/Down counter.
11. Realization of Synchronous Up/Down counter.
12. Implementation of Mini Project using digital integrated circuits and other components.

EE – 453
NUMERICAL TECHNIQUE LAB

L	T	P
0	0	2

LIST OF EXPERIMENTS

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

MATLAB Based Experiments

1. Solution of linear equations for under damped and over damped cases.
2. Study of basic matrix operations and verify it manually.
3. Determination of Eigen values and eigenvectors of a square matrix.
4. Determination of roots of a polynomial.
5. Determination of polynomial using method of least square curve fitting.
6. Determination of polynomial fit, analyzing residuals, exponential fit and error bounds from the given data.
7. Solution of differential equations using 4^{th} order Runge-Kutta method.
8. Solution of differential equation using revised Euler method.
9. Solution of difference equations.
10. Determination of time response for different combinations of R-L-C circuit using unit step input.
11. To find the numerical solution of Laplace equation.
12. To find the roots of non-linear equation using Newton's method.