Shri Vaishnav Vidyapeeth Vishwavidyalaya

Bachelor of Technology (Electrical Engineering)

SEMESTER IV

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTEE 401		ELECTRICAL MACHINES-I	2	1	2	4	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

To prepare the students to have a basic and practical knowledge of transformers. To prepare the students to have a basic knowledge of induction motors. To introduce students with the concept of Sngle phase induction machine.

Course Outcomes:

Upon completion of this course students will be able to:

1. Demonstrate various parts of a electrical machine.
2. Conduct Different test on transformer.
3. Choose suitable Induction machine for specific applications.
4. Demonstrate constructional details, principle of operation of Special Machines.

Syllabus:

UNIT I

Single Phase Transformer: Working principle, Construction, types, EMF equation, Transformer on no load and on load, exact and approximate equivalent circuit, O.C & S.C. test on transformer, regulation of transformer, losses & efficiency, condition for maximum efficiency, All day efficiency, Efficiency curve, Sumpner's test, Parallel operation, Conditions, Parallel with equal and unequal voltage ratio.

UNIT II

Auto Transformer: comparison with ordinary transformer, equivalent circuit and phasor diagram, saving of conductor material. PU system of calculation.

UNIT III

Polyphase Transformer: Construction, Various connections and groups, choice of connections, open delta connection, Scott connection, three phase to two phase conversion and vice-versa, Applications.

UNIT IV

Polyphase Induction Motor: Construction, types, rotating magnetic field, principle of operation, equivalent circuit, slip, frequency of rotor current, rotor emf, rotor current, expression for torque, conditions for maximum torque, torque slip characteristics, starting torque in squirrel cage and slip ring motors, relation between full load torque and maximum torque, Power stages in induction motor, speed control of 3 phase motor, starting methods for 3 phase induction motor.

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Registrar
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Shri Vaishnav Vidyapeeth Vishwavidyalaya

Bachelor of Technology (Electrical Engineering)

SEMESTER IV

UNIT V

Single Phase Induction Motor: Introduction, construction, principal, double revolving field theory, equivalent circuit, performance calculations, starting methods, and their types, torque slip characteristics of various types.

Text Books:

1. P.S. Bhimbra, Electrical Machinery, Khanna Pub.
2. I.J. Nagrath & D.P. Kothari, Electric Machines, Tata McGraw Hill , New Delhi,

Reference Books:

1. M.G. Say, Performance & design of AC machines, CBS publishers & distributors, Delhi, 3rd edition
2. A.E. Clayton & N.N. Nancock, The Performance & design of DC machines CBS publications & distributors, Delhi, 3rd edition
3. P.S. Bhimbra, Generalized theory of Electrical Machines, Khanna publishers, Delhi,
4. Ashfaq Husain, Electric Machines, Dhanpat Rai, New Delhi.
5. Syed A. Nasar, Electric Machines & Power Systems, Volume I , Tata McGraw Hill, New Delhi
6. E. Fitzerald, C. Kingsley & S.D. Umans , Electric Machinery Tata McGraw Hill ,New Delhi ,5 edition.

List of Practical's: (If Practical Credit Shown in Syllabus)

Experiments can cover any of the above topics, following is a suggestive list:

1. Evaluation of turn's ratio and polarity test on 1-phase transformer.
2. Performance analysis of load test on a 1-phase transformer and plot its load characteristic
3. Performance analysis of OC and SC tests on a 3-phase transformer and determine its equivalent circuit. Also find its efficiency and regulation at different load and power factor.
4. Separation of No Load Losses in 1 Φ Transformer.
5. Performance analysis of Sumpner's test on two 1-phase transformer and determine its efficiency at various load.
6. Performance analysis of No-load and block rotor test on a 3-phase IM and determine its equivalent circuit.
7. Perform load test on a 3-phase IM and plot its performance characteristics.
8. Study various types of starters used for 3-IMs.
9. Perform No-load and block rotor test on a 1-phase IM and determine its equivalent circuit.
10. Realization of Scott connection.

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Shri Vaishnav Vidyapeeth Vishwavidyalaya
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Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Bachelor of Technology (Electrical Engineering)

SEMESTER IV

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTEC402		DIGITAL ELECTRONICS	2	1	2	4	60	20	20	30	20

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***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

The objective of this course is to-

1. Use of Boolean algebra and Karnaugh Map to simplify logic function.
2. Describe the operation of different Combinational and Sequential Logic Circuits.

Course Outcomes:

After completion of this course the students will be able to-

1. Design an optimal digital logic circuit to meet the given specifications.
2. Evaluate the performance of the given digital logic circuit based on specific criteria for reliable system implementation.

Syllabus:

UNIT 1 **9 Hrs.**

Logic Function Optimization and Arithmetic Circuits

Logic Function, Sum of Product and Product of Sum form, Karnaugh Map minimization, Incompletely specified functions. Arithmetic Circuits- Half Adder, Full Adder, Half Subtractor, Full Subtractor, Parallel Adders/Subtractors- Ripple Carry Adder, Carry Look Ahead Adder, Serial Adders /Subtractors.

UNIT 2 **9 Hrs.**

Combinational Circuits

Multiplexers, Demultiplexers, Encoders- Binary Encoders, Priority Encoders, Decoders, Synthesis of logic functions using Multiplexers and Decoders. Structural modeling of higher order circuits using lower order circuits, Code converters.

UNIT 3

Sequential Design Elements **10 Hrs.**

S-R Latch, D- Latch, Flip Flops- Master Slave and Edge Triggered, S-R, D, J-K, T , State Table, State Equation, Timing Diagram, Excitation Table, Flip Flop Conversions, Setup and Hold Time. 555 Timer chip and its application in multivibrators.

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Shri Vaishnav Vidyapeeth Vishwavidyalaya

Bachelor of Technology (Electrical Engineering)

SEMESTER IV

UNIT 4

Sequential Circuits **9 Hrs.**

Registers, Shift Registers, Counters- Synchronous and Asynchronous counters, Design Examples, Synchronous Sequential Circuits, State Machines, Mealy and Moore Model, State Diagram, State Table, State Assignment, State Minimization, Design Examples.

UNIT 5

Logic Families **8 Hrs.**

Characteristics of Digital ICs- Voltage Levels, Speed, Power, Noise Margin, Fan In, Fan Out. Logic Families- TTL, MOS- NMOS, PMOS, CMOS, ECL, IIL.

Text Books:

1. M. Morris Mano: Digital Logic Design, Pearson Education
2. Salivahanan and Ari Vahagan: Digital Circuits and Design,Vikas Publishing House

References:

1. Anand Kumar: Fundamentals of Digital Circuits, PHI.
2. Floyd and Jain: Digital Fundamentals, Pearson Education.
3. Roland J. Tocci, Widmer, Moss: Digital Systems Principles and Applications, Pearson Education.
4. Stephen Brown I Zvanko Vranesic: Fundamentals of Digital Logic Design, The Mc Graw Hill

List of Practical's: (If Practical Credit Shown in Syllabus)

1. Implementation of Adders and Subtractors.
2. Realization of multiplexers and demultiplexers.
3. Synthesis of logic function using multiplexer.
4. Design and analysis of Encoder and Decoders.
5. Analysis of various flip flops with Preset and Clear capability.
6. Design of Astable , Monostable and Bistable multivibrator using 555 Timer.
7. Design of various Shift registers.
8. Design of Johnson and Ring counter.
9. Design of synchronous and asynchronous up/down counters.
10. Design of logic functions using PLDs.
11. Design of some minor projects based on digital circuits to solve real life problems.

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Indore

Registrar
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Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Bachelor of Technology (Electrical Engineering)

SEMESTER IV

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTEE 403		**POWER SYSTEM -I**	2	1	2	4	60	20	20	30	20

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Course Objectives:

1. To introduce the concepts and phenomenon of different sources of Power Generation.
2. Give an idea about the fundamental concepts of electrical power distribution, both AC & DC
3. Impart the knowledge of different turbines used in the generating stations.

Course Outcomes:

1. Explain mechanical design of transmission line.
2. Calculation of line parameters (Resistance, inductance and capacitance)
3. Compare DC and AC distribution.
4. Explain the representation of different power system components and loading capability of a generator.
5. Describe underground cables.

Syllabus:

UNIT I

Electrical Energy Generation: General background, structure and components of power network Steam/ Thermal Power Plant, Hydel Power Plant, Nuclear Power plant. Non-conventional & distributed generation, Effect of transmission voltage on power system economy. Isolated & interconnected power system. Power Plant Economics - Load curves, base load, peak load, load factor, demand factor, diversity factor, capacity factor, utilization factor, cost of electricity, capital cost, fuel and operation cost.

UNIT II

Transmission Lines Inductance and capacitance of single-phase, three-phase single circuit and double circuit lines, concept of GMD, transposition of lines, effect of earth on capacitance of transmission lines. Characteristics and performance of transmission lines, transmission lines as four terminal networks, nominal-T, nominal-π, equivalent-T, and equivalent-π representation of transmission lines, A, B, C, D constants, distributed parameters of long lines, hyperbolic solutions, Ferrantii effect, surge impedance loadings.

UNIT III

Over head lines and cables Type of overhead conductors, solid conductors, stranded conductors,

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Registrar
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bundled conductors, skin effect, proximity effects, principle of corona Types of cables, insulation resistance of cables, capacitance of cables dielectric stress, capacitance grading of cables, use of inter sheaths

UNIT IV

Main components of overhead lines, conductor materials, line supports, towers, insulators, types of insulators, potential distribution over suspension insulators, string efficiency, methods of improving string efficiency, sag in over head lines, sag and tension calculations, stringing of conductors, sag template, vibration and vibration dampers

UNIT V

Voltage control & Distribution system Ac single phase, 3 phase, 3wire & 4 wire distribution, Kelvin's law for most economical size of conductor Substation layout showing substation equipment, bus bar single bus bar and sectionalized bus bar, main and transfer for bus bar system, sectionalized double bus bar system, ring mains.

Text Books:

1. William Stevenson, Elements of Power System Analysis, McGraw Hill.
2. C.L. Wadhwa, Electrical Power System Analysis, New Age International.
3. D.P. Kothari, I.J. Nagrath, Modern Power System Analysis TMH, III Ed. Reprint 2008.

Reference Books:

1. D.P. Kothari, I.J. Nagrath, Power System Engineering TMH II Ed. Reprint 2009.
2. John Grainger and William Stevenson, Power system Analysis, McGraw Hill.
3. Ashfaq Husain, Electrical Power Systems, Vikas Publishing House.
4. T. Wildi, Electrical Machines, Drives and Power Systems, Pearson Education.
5. C.L. Wadhwa, Generation, Distribution and Utilization of Electrical Energy", New Age International.

List of Practical's: (If Practical Credit Shown in Syllabus)

1. Study and Analysis of Thermal Power plant.
2. Study and Analysis of Hydro Power plant.
3. Study and Analysis of Nuclear Power plant.
4. Study of different types of insulator.
5. Analysis of Ferranti effect and voltage distribution in H.V. long transmission line using transmission line model.
6. Determine the ABCD, H, Z & Image parameters of short transmission line.
7. Determine the ABCD, H, Z & Image parameters of medium transmission line For T network.
8. Determine the ABCD, H, Z & Image parameters for long transmission line.
9. Measure the receiving end voltage of each line under no load or lightly load condition to understand Ferranti effect.
10. Understand the performance of transmission line under different loads with varies Resistive, Inductive, and Capacitive load in different steps.

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Registrar
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Bachelor of Technology (Electrical Engineering)

SEMESTER IV

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTEE 404		ELECTROMAGNETIC FIELD THEORY	3	0	0	3	60	20	20	0	0

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Course Objectives:

To lay the foundations of electromagnetism and its practice in modern communications such as wireless, guided wave principles. To provide the basic skills required to understand, develop, and design various engineering applications involving electromagnetic fields.

Course Outcomes:

After the successful completion of this course students will be able to:

1. Use different coordinate system and apply them to solve real time multidisciplinary issues
2. Apply vector calculus to understand the behavior of static electric fields in standard configurations
3. Apply vector calculus to understand the behavior of static magnetic fields in standard configurations
4. Analyze Maxwell's equation in different forms (differential and integral) and apply them to diverse engineering problems
5. Describe and analyze electromagnetic wave propagation in free-space

Syllabus:

UNIT I

ELECTROSTATICS – I

Sources and effects of electromagnetic fields – Coordinate Systems – Vector fields –Gradient, Divergence, Curl – theorems and applications - Coulomb's Law – Electric field intensity – Field due to discrete and continuous charges – Gauss's law and applications.

UNIT II

ELECTROSTATICS – II

Electric potential – Electric field and equipotential plots, Uniform and Non-Uniform field, Utilization factor – Electric field in free space, conductors, dielectrics - Dielectric polarization - Dielectric strength - Electric field in multiple dielectrics – Boundary conditions, Poisson's and Laplace's equations, Capacitance, Energy density, Applications.

UNIT III

MAGNETOSTATICS

Lorentz force, magnetic field intensity (H) – Biot–Savart's Law - Ampere's Circuit Law – H due to straight conductors, circular loop, infinite sheet of current, Magnetic flux density (B) - B

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Registrar
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in free space, conductor, magnetic materials – Magnetization, Magnetic field in multiple media – Boundary conditions, scalar and vector potential, Poisson's Equation, Magnetic force, Torque, Inductance, Energy density, Applications.

UNIT IV
ELECTRODYNAMIC FIELDS
Magnetic Circuits - Faraday's law – Transformer and motional EMF – Displacement current - Maxwell's equations (differential and integral form) – Relation between field theory and circuit theory – Applications.

UNIT V
ELECTROMAGNETIC WAVES
Electromagnetic wave generation and equations – Wave parameters; velocity, intrinsic impedance, propagation constant – Waves in free space, lossy and lossless dielectrics, conductors- skin depth - Poynting vector – Plane wave reflection and refraction – Standing Wave ratio– Transmission lines – Line equations – transmission line parameters.

Text Books:

1. Mathew N. O. Sadiku, 'Principles of Electromagnetics', 4 th Edition ,Oxford University Press Inc.First India edition, 2009.
2. Ashutosh Pramanik, 'Electromagnetism – Theory and Applications', PHI Learning Private
   Limited, New Delhi, Second Edition-2009.
3. K.A. Gangadhar, P.M. Ramanthan ' Electromagnetic Field Theory (including Antennaes and wave propagation', 16th Edition, Khanna Publications, 2007.

Reference Books:

1. Joseph. A.Edminister, 'Schaum's Outline of Electromagnetics, Third Edition (Schaum's Outline Series), Tata McGraw Hill, 2010
2. William H. Hayt and John A. Buck, 'Engineering Electromagnetics', Tata McGraw Hill 8th Revised edition, 2011.
3. Kraus and Fleish, 'Electromagnetics with Applications', McGraw Hill International Editions, Fifth Edition, 2010.
4. Bhag Singh Guru and Hüseyin R. Hiziroglu "Electromagnetic field theory Fundamentals",Cambridge University Press; Second Revised Edition, 2009.

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Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Bachelor of Technology (Electrical Engineering)

SEMESTER IV

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTEE 405		COMPUTER APPLICATION FOR ELECTRICAL ENGINEERING	2	0	2	3	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

The primary goal is to provide engineering majors with a basic knowledge of numerical methods including: root-finding, elementary numerical linear algebra, integration, interpolation, solving systems of linear equations, curve fitting, and numerical solution to ordinary differential equations. 'C' language is the software environment used for implementation and application of these numerical methods. The numerical techniques learned in this course enable students to work with mathematical models of technology.

Course Outcomes:

Upon completion of this course students will be able to:

1. Assess the approximation techniques to formulate and apply appropriate strategy to solve real world problems.
2. Aware of the use of numerical methods in modern scientific computing.
3. Become familiar with finite precision computation.
4. Become familiar with numerical solution of integration, linear equations, ordinary differential equations, interpolations.

Syllabus:

UNIT-I

Errors: Errors in Numerical Computation, their types and estimation

UNIT-II

Solution Of Transcendental And Polynomial Equations: Bisection method, Secant Method, Newton Raphson method for Polynomial equation.

UNIT-III

Solutoin To System Of Linear Algebraic Equations: Gayss elimination method, Gauss Jordon Method, Gauss Seidal Iteration method.

UNIT-IV

Interpolation: Linear interpolation and high order interpolation using Lagrange's and Newton interpolation methods, Finite difference operators and difference tables.

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Shri Vaishnav Vidyapeeth Vishwavidyalaya

Bachelor of Technology (Electrical Engineering)

SEMESTER IV

UNIT-V

Numerical Integration: Trapezoidal rule, Simpson's 1/3 and 3/8 rules.

Text Books:

1. Shastri S.S. "introductory Methods of Numerical Analysis", Prentice Hal Ltd, 1977
2. Bajpai A.C. "Numerical Methods for Engineers and Scientists"' John Wiley, 1977

Reference Books:

1. Salaria R.S. "Numerical Methods : A computer oriented approach ", BPS Publicaiotns,1996
2. Teukolsky , S.A. Veterling W.T.& Flannery, B.P." Numerical recipes in "C", 2nd ed, Foundation Books Pvt.Ltd.2001.
3. Balagurusamy E." Numerical Methods", Tata McGraw- Hill , New Delhi,2002

List of Practical's: (If Practical Credit Shown in Syllabus)

1. Deduce relation for error involved in polynomial equation.
2. Identify root of the Algebraic and Transcendental equations using Bisection method.
3. Identify root of the Algebraic and Transcendental equations using Regula-Falsi method.
4. Identify root of the Algebraic and Transcendental equations using Newton-Raphson method.
5. Identify root of the Algebraic and Transcendental equations using Iterative method.
6. Implement Numerical Integration using Trapezoidal rule.
7. Implement Numerical Integration using Simpson 1/3 rule.
8. Implement Numerical Integration Simpson 3/8 rule.
9. Implement Newton's Forward Interpolation formula.
10. Implement Newton's Backward Interpolation formula.

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Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Bachelor of Technology (Electrical Engineering)

SEMESTER IV

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTEE 406		BASIC SYSTEM ANALYSIS	3	1	0	4	60	20	20	0	0

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***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

The course will provide strong foundation on signals and systems which will be useful for creating foundation of communication and signal processing. The students will learn basic continuous time and discrete time signals and systems. Student will understand application of various transforms for analysis of signals and systems both continuous time and discrete time. Students will also explore to power and energy signals and spectrum.

Course Outcomes:

1. After learning the course the students should be able to:
2. Understand about various types of signals, classify them, analyze them, and perform various operations on them.
3. Understand about various types of systems, classify them, analyze them and understand their response behavior.
4. Appreciate use of transforms in analysis of signals and system.
5. Carry simulation on signals and systems for observing effects of applying various properties and operations.
6. Create strong foundation of communication and signal processing to be studied in the subsequent semester

Syllabus:

UNIT I

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. Inversion, Shifting and Scaling of signals, Introduction to various types of systems, Causal, Stable, Linear and Time invariant systems.
Analogous System- Linear mechanical elements, Force-voltage and force-current analogy. Modeling of mechanical and electro-mechanical systems.

UNIT II

Fourier Transform Analysis- Exponential form and compact trigonometric form of Fourier series, Fourier symmetry, Fourier Transform: Properties, Applications to network analysis.

UNIT III

Laplace Transform- Review of Laplace Transform, Initial and Final Value theorems, Inverse Laplace Transform, Convolution theorem, Application of Laplace Transform to analysis of

networks, Waveform synthesis and Laplace Transform of complex waveforms

UNIT IV

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

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. Oppenhiem, Wilsky, Nawab, "Signals & Systems", PHI
2. M E Van-Valkenberg; " Network Analysis", Prentice Hall of India
3. A. Anand Kumar, " Signals& Systems", PHI
4. Choudhary D. Roy, "Network & Systems", Wiley Eastern Ltd.

Reference Books:

5. David K. Cheng; "Analysis of Linear System", Narosa Publishing Co
6. Donald E. Scott, "Introduction to circuit Analysis" Mc. Graw Hill
7. B. P. Lathi, "Linear Systems & Signals" Oxford University Press, 2008.
8. I. J. Nagrath, S.N. Saran, R. Ranjan and S. Kumar, "Singnals and Systems", Tata Mc. Graw Hill, 2001.

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