

B.Tech. - Course Structure & Syllabus – RK24**INDUCTION PROGRAMME**

S.No.	Category	Course Name	L-T-P-C
1	MC	Physical Activities -- Sports, Yoga and Meditation, Plantation	0-0-6-0
2	MC	Career Counselling	2-0-2-0
3	MC	Orientation to all branches -- career options, tools, etc.	3-0-0-0
4	EC	Orientation on admitted Branch -- corresponding labs, tools and platforms	2-0-3-0
5	ES	Proficiency Modules & Productivity Tools	2-1-2-0
6	MC	Assessment on basic aptitude and mathematical skills	2-0-3-0
7	MC	Remedial Training in Foundation Courses	2-1-2-0
8	MC	Human Values & Professional Ethics	3-0-0-0
9	BS	Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	2-1-2-0
10	ES	Concepts of Programming	2-0-2-0

Group-A Branches:

Computer Science and Engineering
Computer Science and Engineering (Data Science)

Group-B Branches:


Civil Engineering,
Electrical and Electronics Engineering,
Mechanical Engineering
Electronics and Communication Engineering,
Artificial Intelligence and Machine Learning

Course Code Format:

Regulation	Branch	Year	Semester	Course Serial Number
2 Digits	2 Digits	1 Digit	1 Digit	2 Digits
24	01/02/03/04/05/44/61	1/2/3/4	1/2	01/02/03/04/...../19/20

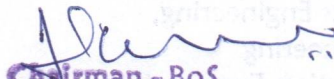
Branch Code:

Code	Branch
01	Civil Engineering
02	Electrical & Electronics Engineering
03	Mechanical Engineering
04	Electronics and Communication Engineering
05	Computer Science and Engineering
44	Computer Science and Engineering (Data Science)
61	Artificial Intelligence and Machine Learning


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B. Tech. – I Year I Semester (for Group-A Branches CSE and CSE-(DS))

S.No.	Course Code	Category	Title	L/D	T	P	Credits
1	24051101/ 24441101	BS & H	Engineering Chemistry	3	0	0	3
2	24051102/ 24441102	BS & H	Linear Algebra & Calculus	3	0	0	3
3	24051103/ 24441103	Engineering Science	Basic Civil & Mechanical Engineering	3	0	0	3
4	24051104/ 24441104	BS & H	Communicative English	2	0	0	2
5	24051105/ 24441105	Engineering Science	Introduction to Programming	3	0	0	3
6	24051106/ 24441106	BS & H	Engineering Chemistry Lab	0	0	2	1
7	24051107/ 24441107	Engineering Science	Engineering Workshop	0	0	3	1.5
8	24051108/ 24441108	BS & H	Communicative English Lab	0	0	2	1
9	24051109/ 24441109	Engineering Science	Computer Programming Lab	0	0	3	1.5
10	24051110/ 24441110	BS & H	Health and wellness, Yoga and Sports	-	-	1	0.5
Total				14	0	11	19.5


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B.Tech. – I Year I Semester (for Group-B Branches CE, EEE, ME, ECE, and AI & ML)

S.No.	Course Code	Category	Title	L/D	T	P	Credits
1	24011111/ 24021111/ 24031111/ 24041111/ 24611111	BS & H	Engineering Physics	3	0	0	3
2	24011112/ 24021112/ 24031112/ 24041112/ 24611112	BS & H	Linear Algebra & Calculus	3	0	0	3
3	24011113/ 24021113/ 24031113/ 24041113/ 24611113	Engineering Science	Basic Electrical & Electronics Engineering	3	0	0	3
4	24011114/ 24021114/ 24031114/ 24041114/ 24611114	Engineering Science	Engineering Drawing	1	0	4	3
5	24011115/ 24021115/ 24031115/ 24041115/ 24611115	Engineering Science	Introduction to Programming	3	0	0	3
6	24011116/ 24021116/ 24031116/ 24041116/ 24611116	BS & H	Engineering Physics Lab	0	0	2	1
7	24011117/ 24021117/ 24031117/ 24041117/ 24611117	Engineering Science	Electrical & Electronics Engineering Workshop	0	0	3	1.5
8	24011118/ 24021118/ 24031118/ 24041118/ 24611118	Engineering Science	IT Workshop	0	0	2	1
9	24011119/ 24021119/ 24031119/ 24041119/ 24611119	Engineering Science	Computer Programming Lab	0	0	3	1.5
10	24011120/ 24021120/ 24031120/ 24041120/ 24611120		NSS / NCC / Scouts & Guides / Community Service	-	-	1	0.5
Total				13	0	15	20.5


B.Tech. – I Year II Semester (for Group-A Branches CSE and CSE-(DS))

S.No.	Course Code	Category	Title	L/D	T	P	Credits
1	24051201/ 24441201	BS & H	Engineering Physics	3	0	0	3
2	24051202/ 24441202	BS & H	Differential Equations & Vector Calculus	3	0	0	3
3	24051203/ 24441203	Engineering Science	Basic Electrical & Electronics Engineering	3	0	0	3
4	24051204/ 24441204	Engineering Science	Engineering Drawing	1	0	3	4
5	24051205/ 24441205	Professional Core	Data structures	3	0	0	3
6	24051206/ 24441206	BS & H	Engineering Physics Lab	0	0	2	1
7	24051207/ 24441207	Engineering Science	Electrical & Electronics Engineering Workshop	0	0	3	1.5
8	24051208/ 24441208	Engineering Science	IT Workshop	0	0	2	1
9	24051209/ 24441209	Professional Core	Data structures Lab	0	0	3	1.5
10	24051210/ 24441210		NSS/NCC/Scouts & Guides/Community Service	-	-	1	0.5
Total				13	0	15	20.5


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B.Tech. – I Year II Semester (for Group-B Branches CE, EEE, ME, ECE, and AI & ML)

S.No.	Course Code	Category	Title	L/D	T	P	Credits
1	24011211/ 24021211/ 24031211/ 24041211/ 24611211	BS & H	Engineering Chemistry	3	0	0	3
2	24011212/ 24021212/ 24031212/ 24041212/ 24611212	BS & H	Differential Equations & Vector Calculus	3	0	0	3
3	24011213/ 24021213/ 24031213/ 24041213/ 24611213	Engineering Science	Basic Civil & Mechanical Engineering	3	0	0	3
4	24011214/ 24021214/ 24031214/ 24041214/ 24611214	BS & H	Communicative English	2	0	0	2
5	24011215/ 24031215 24021215 24041215 24611215	Professional Core	Engineering Mechanics Electrical Circuit Analysis – I Network Analysis Data structures	3	0	0	3
6	24011216/ 24021216/ 24031216/ 24041216/ 24611216	BS & H	Engineering Chemistry Lab	0	0	2	1
7	24011217/ 24021217/ 24031217/ 24041217/ 24611217	Engineering Science	Engineering Workshop	0	0	3	1.5
8	24011218/ 24021218/ 24031218/ 24041218/ 24611218	BS & H	Communicative English Lab	0	0	2	1
9	24011219/ 24031219 24021219 24041219 24611219	Professional Core	Engineering Mechanics Lab Electrical Circuits Lab Network Analysis Lab Data structures Lab	0	0	3	1.5
10	24011220/ 24021220/ 24031220/ 24041220/ 24611220	BS & H	Health and wellness, Yoga and Sports	-	-	1	0.5
Total				14	0	11	19.5

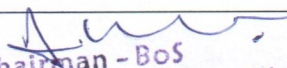
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B. Tech. – II Year I Semester

S.No.	Course Code	Category	Title	L	T	P	Credits
1	24022101	BS&H	Engineering Mathematics (Branch specific)	3	0	0	3
2	24022102	BS&H	Universal Human Values – Understanding Harmony	2	1	0	3
3	24022103	Engineering Science		2	0	0	2
4	24022104	Professional Core		3	0	0	3
5	24022105	Professional Core.		3	0	0	3
6	24022106	Engineering Science		0	0	2	1
7	24022107	Professional Core		0	0	3	1.5
8	24022108	Professional Core		0	0	3	1.5
9	24022109	Skill Enhancement course		0	1	2	2
10	24022110	Audit Course	Environmental Science	2	0	0	-
Total				15	2	10	20

B. Tech. – II Year II Semester

S.No.	Course Code	Category	Title	L	T	P	Credits
1	24022201	Management Course - I		2	0	0	2
2	24022202	Engineering Science		3	0	0	3
3	24022203	Professional Core		3	0	0	3
4	24022204	Professional Core		3	0	0	3
5	24022205	Professional Core		3	0	0	3
6	24022206	Professional Core		0	0	2	1
7	24022207	Professional Core		0	0	3	1.5
8	24022208	Professional Core		0	0	3	1.5
9	24022209	Skill Enhancement course		0	1	2	2
10	24022210	BS&H	Design Thinking & Innovation	1	0	2	2
Total				15	1	12	22
Mandatory Community Service Project Internship of 08 weeks duration during summer vacation							


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B.Tech. – III Year I Semester

S.No.	Course Code	Category	Title	L	T	P	Credits
1	24023101	Professional Core		3	0	0	3
2	24023102	Professional Core		3	0	0	3
3	24023103	Professional Elective - I		2	0	0	2
4	24023104	Open Elective - I		3	0	0	3
5	24023105	Open Elective - II		3	0	0	3
6	24023106	Professional Core		0	0	3	1.5
7	24023107	Professional Core		0	0	3	1.5
8	24023108	Skill Enhancement course		0	1	2	2
9	24023109	BS&H	Tinkering Lab	0	0	2	1
10	24023110	Evaluation of Community Service Internship		-	-	-	2
Total				14	1	10	22

B.Tech. – III Year II Semester

S.No.	Course Code	Category	Title	L	T	P	Credits
1	24023201	Professional Core		3	0	0	3
2	24023202	Professional Core		3	0	0	3
3	24023203	Professional Core		3	0	0	3
4	24023204	Professional Elective - II		3	0	0	3
5	24023205	Professional Elective - III		2	0	0	2
6	24023206	Open Elective - III		3	0	0	3
7	24023207	Professional Core		0	0	2	1
8	24023208	Professional Core		0	0	2	1
9	24023209	Skill Enhancement course		0	1	2	2
10	24023210	Audit Course	Technical Paper Writing & IPR	2	0	0	-
Total				19	1	06	21
Mandatory Industry Internship of 08 weeks duration during summer vacation							


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B.Tech. – IV Year I Semester

S.No.	Course Code	Category	Title	L	T	P	Credits
1	24024101	Professional Core		3	0	0	3
2	24024102	Professional Core		3	0	0	3
3	24024103	Management Course - II		2	0	0	2
4	24024104	Professional Elective - IV		3	0	0	3
5	24024105	Professional Elective - V		3	0	0	3
6	24024106	Open Elective - IV		3	0	0	3
7	24024107	Professional Core		0	0	2	1
8	24024108	Professional Core		0	0	2	1
9	24024109	Skill Enhancement Course		0	1	2	2
10	24024110	Audit Course	Constitution of India	2	0	0	-
11	24024111	Internship	Evaluation of Industry Internship	-	-	-	2
Total				19	1	06	23

B.Tech. – IV Year II Semester

S.No.	Course Code	Category	Title	L	T	P	Credits
1	24024201	Project Work	Full semester Project Work	0	0	12	6
2	24024202	Internship	Full semester Internship	0	0	12	6
Total				0	0	24	12


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L/D	T	P	C
3	0	0	3

BASIC ELECTRICAL & ELECTRONICS ENGINEERING (Common to all Branches of Engineering)

Course Objectives

- To expose to the field of electrical & electronics engineering, laws and principles of electrical/ electronic engineering and to acquire fundamental knowledge in the relevant field.
- To teach the fundamentals of semiconductor devices and its applications, principles of digital electronics.

Course Outcomes: After the completion of the course students will be able to

CO1	Describe fundamental laws, fundamental concepts to derive various equations related to electrical circuits, operating principles of motors/generators
CO2	Calculate electrical load and electricity bill of residential and commercial buildings, operating principles and construction of MC/MI instruments
CO3	Understand the evolution of electronics, characteristics of diodes and transistors and understand the usage of electronic measuring instruments.
CO4	To acquaint the students with the fundamental principles of two-valued logic and various devices used to implement logical operations on variables.

PART A: BASIC ELECTRICAL ENGINEERING

UNIT I

DC, AC Circuits & Machines

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems. **AC Circuits:** A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems). **Machines:** Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

UNIT II

Energy Resources, Electricity Bill & Safety Measures, Measuring Instruments

Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation. **Electricity bill:** Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers. **Equipment Safety Measures:** Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock. **Measuring Instruments:** Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.

Textbooks:

- Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition


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2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020 3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017
3. Basic Electrical and Electronics Engineering, S. K. Bhattacharya, Person Publications, 2018, Second Edition.

Web Resources:

1. <https://nptel.ac.in/courses/108105053>
2. <https://nptel.ac.in/courses/108108076>

PART B: BASIC ELECTRONICS ENGINEERING

UNIT III

SEMICONDUCTOR DEVICES, ELECTRONIC CIRCUITS AND INSTRUMENTATION

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier, Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

UNIT IV

DIGITAL ELECTRONICS

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR simple combinational circuits–Half and Full Adders. Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only).

Text Books:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009

Reference Books:

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

L/D	T	P	C
0	0	3	1.5

ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP (Common to all Branches of Engineering)

Course Objectives:

- To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.
- To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

Course Outcomes: After completion of this course, the student will be able to

CO1	Measure voltage, current and power in an electrical circuit, Resistance using Wheat stone bridge
CO2	Discover critical field resistance and critical speed of DC shunt generators and Investigate the effect of reactive power and power factor in electrical loads
CO3	Identify & testing of various electronic components and understand the usage of electronic measuring instruments
CO4	Plot and discuss the characteristics of various electron devices and explain the operation of a digital circuit


Activities:

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
 - Provide some exercises so that hardware tools and instruments are learned to be used by the students.
2. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
 - Provide some exercises so that measuring instruments are learned to be used by the students.
3. Components:
 - Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.
 - Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

PART A: ELECTRICAL ENGINEERING LAB

List of experiments:

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Measurement of Earth Resistance using Megger
7. Calculation of Electrical Energy for Domestic Premises


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Reference Books:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Note: Minimum Six Experiments to be performed.

PART B: ELECTRONICS ENGINEERING LAB

List of Experiments:

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers
4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates
1) using ICs
8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

Tools / Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

References:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software.


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L/D	T	P	C
3	0	0	3

ELECTRICAL CIRCUIT ANALYSIS - I (Electrical and Electronics Engineering)

Course Objectives: To develop an understanding of the fundamental laws, elements of electrical circuits and to apply circuit analysis to DC and AC circuits.

Course Outcomes:

CO1	Remembering the basic electrical elements and different fundamental laws
CO2	Understand the network reduction techniques, transformations, concept of self-inductance and mutual inductance, phasor diagrams, resonance and network theorems
CO3	Apply the concepts to obtain various mathematical and graphical representations
CO4	Evaluation of Network theorems, electrical, magnetic and single-phase circuits. Analyse nodal and mesh networks

UNIT I

INTRODUCTION TO ELECTRICAL CIRCUITS

Basic Concepts of passive elements of R, L, C and their V-I relations, Sources (dependent and independent), Kirchoff's laws, Network reduction techniques (series, parallel, series - parallel, star-to-delta and delta-to-star transformation), source transformation technique, nodal analysis and mesh analysis to DC networks with dependent and independent voltage and current sources, node and mesh analysis.

UNIT II

MAGNETIC CIRCUITS

Basic definition of MMF, flux and reluctance, analogy between electrical and magnetic circuits, Faraday's laws of electromagnetic induction – concept of self and mutual inductance, Dot convention – coefficient of coupling and composite magnetic circuit, analysis of series and parallel magnetic circuits.

UNIT III

SINGLE PHASE CIRCUITS

Characteristics of periodic functions, Average value, R.M.S. value, form factor, representation of a sine function, concept of phasor, phasor diagrams, node and mesh analysis. Steady state analysis of R, L and C circuits to sinusoidal excitations-response of pure resistance, inductance, capacitance, series RL circuit, series RC circuit, series RLC circuit, parallel RL circuit, parallel RC circuit.

UNIT IV

NETWORK THEOREMS (DC & AC EXCITATIONS)


Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem

RESONANCE AND LOCUS DIAGRAMS

Series Resonance: Characteristics of a series resonant circuit, Q-factor, selectivity and bandwidth, expression for half power frequencies; Parallel resonance: Q-factor, selectivity and bandwidth; Locus diagram: RL, RC, RLC with R, L and C variables.

Textbooks:

1. Engineering Circuits Analysis, Jack Kemmerly, William Hayt and Steven Durbin, Tata Mc Graw Hill Education, 2005, sixth edition.
2. Network Analysis, M. E. Van Valkenburg, Pearson Education, 2019, Revised Third


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Reference Books:

1. Fundamentals of Electrical Circuits, Charles K. Alexander and Mathew N.O. Sadiku, Mc Graw Hill Education (India), 2013, Fifth Edition
2. Electric Circuits (Schaum's outline Series), Mahmood Nahvi, Joseph Edminister, and K. Rao, Mc Graw Hill Education, 2017, Fifth Edition.
3. Electric Circuits, David A. Bell, Oxford University Press, 2009, Seventh Edition.
4. Introductory Circuit Analysis, Robert L Boylestad, Pearson Publications, 2023, Fourteenth Edition.
5. Circuit Theory: Analysis and Synthesis, A. Chakrabarti, Dhanpat Rai & Co., 2018, Seventh Revised Edition.

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc23_ee81/previe
2. <https://nptel.ac.in/courses/108104139>
3. <https://nptel.ac.in/courses/108106172>
4. <https://nptel.ac.in/courses/117106108>


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L/D	T	P	C
3	0	0	3

NETWORK ANALYSIS (Electronics and Communication Engineering)

Course Objectives:

- To introduce basic laws, mesh & nodal analysis techniques for solving electrical circuits
- To impart knowledge on applying appropriate theorem for electrical circuit analysis
- To teach concepts of resonance, explain transient behavior of circuits in time and frequency domains
- To introduce open circuit, short circuit, transmission, hybrid parameters and their interrelationship.

Course Outcomes: At the end of this course students will demonstrate the ability to

CO1	Understand basic electrical circuits with nodal and mesh analysis
CO2	Analyse the circuit using network simplification theorems
CO3	Find Steady state response and Transient response of a network. Analyse electrical networks in the Laplace domain
CO4	Compute the parameters of a two-port network

UNIT I

Types of circuit components, Types of Sources and Source Transformations, Mesh analysis and Nodal analysis, problem solving with resistances only including dependent sources also. Principal of Duality with examples. Network Theorems: Thevenin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Superposition, Max Power Transfer, Tellegens - problem solving using dependent sources also.

UNIT II

Steady State Analysis of A.C Circuits: Impedance concept, phase angle, series R-L, R-C, R-LC circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, Star-Delta conversion, problem solving using Laplace transforms also.

Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, general case-resistance present in both branches, anti-resonance at all frequencies. Coupled Circuits: Coupled Circuits: Self-inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, conductively coupled equivalent circuits- problem solving.

UNIT III

Transients: First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem-solving using R-L-C elements with DC excitation and AC excitation, Response as related to s-plane rotation of roots.

Laplace transform: introduction, Laplace transformation, basic theorems, problem solving using Laplace transform, partial fraction expansion, Heaviside's expansions, problem solving using Laplace transform.

Coupled Circuits: Coupled Circuits: Self-inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, conductively coupled equivalent circuits- problem solving.


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UNIT IV

Two-port Networks: Relationship of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h- parameters, Relationships Between parameter Sets, Parallel & series connection of two port networks, cascading of two port networks, problem solving using dependent sources also.

Image and iterative impedances. Image and iterative transfer constants. Insertion loss. Attenuators and pads. Lattice network and its parameters. Impedance matching networks.

Textbooks:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, revised 3rd Edition, 2019.
2. Engineering Circuit Analysis by William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, 9th Edition 2020.
3. Network lines and Fields by John. D. Ryder 2nd Edition, PHI

Reference Books:

1. D. Roy Choudhury, Networks and Systems, New Age International Publications, 2013.
2. Joseph Edminister and Mahmood Nahvi, Electric Circuits, Schaum's Outline Series, 7th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2017
3. Fundamentals of Electric Circuits by Charles K. Alexander and Matthew N. O. Sadiku, McGraw-Hill Education



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RKCE (Autonomous)

L/D	T	P	C
0	0	3	1.5

ELECTRICAL CIRCUIT ANALYSIS LAB (Electrical and Electronics Engineering)

Course Objectives:

To impart hands on experience in verification of circuit laws and theorems, measurement of circuit parameters, study of circuit characteristics. It also gives practical exposure to the usage of different circuits with different conditions.

Course Outcomes:


CO1	Understand the concepts of network theorems, node and mesh networks, series and parallel resonance and Locus diagrams
CO2	Apply various theorems to compare practical results obtained with theoretical calculations
CO3	Determine self, mutual inductances and coefficient of coupling values, parameters of choke coil
CO4	Analyse different circuit characteristics with the help of fundamental laws and various configurations
CO5	Create locus diagrams of RL, RC series circuits and examine series and parallel resonance

List of Experiments:

1. Verification of Kirchhoff's circuit laws
2. Verification of node and mesh analysis.
3. Verification of network reduction techniques.
4. Determination of cold and hot resistance of an electric lamp
5. Determination of Parameters of a choke coil.
6. Determination of self, mutual inductances, and coefficient of coupling
7. Series and parallel resonance
8. Locus diagrams of R-L (L Variable) and R-C (C Variable) series circuits
9. Verification of Superposition theorem
10. Verification of Thevenin's and Norton's Theorems
11. Verification of Maximum power transfer theorem
12. Verification of Compensation theorem
13. Verification of Reciprocity and Millman's Theorems

Reference Books:

1. Engineering Circuits Analysis, Jack Kemmerly, William Hayt and Steven Durbin, Tata Mc Graw Hill Education, 2005, sixth edition.
2. Network Analysis, M. E. Van Valkenburg, Pearson Education, 2019, Revised Third Edition


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L/D	T	P	C
0	0	3	1.5

NETWORK ANALYSIS AND SIMULATION LAB (Electronics and Communication Engineering)

Course Objectives:

- To gain hands on experience in verifying Kirchoff's laws and network theorems
- To analyze transient behavior of circuits
- To study resonance characteristics
- To determine 2-port network parameters

Course Outcomes: At the end of this course students will demonstrate the ability to

CO1	Verify Kirchoff's laws and network theorems
CO2	Measure time constants of RL & RC circuits
CO3	Analyze behavior of RLC circuit for different cases
CO4	Design resonant circuit for given specifications
CO5	Characterize and model the network in terms of all network parameters

Note: The following experiments need to be performed using both Hardware and simulation Software.

Note: The experiments need to be simulated using software and the same need to be verified using the hardware.

1. Study of components of a circuit and Verification of KCL and KVL.
2. Verification of mesh and nodal analysis for AC circuits
3. Verification of Superposition, Thevenin's & Norton theorems for AC circuits
4. Verification of maximum power transfer theorem for AC circuits
5. Verification of Tellegen's theorem for two networks of the same topology.
6. Study of DC transients in RL, RC and RLC circuits
7. To study frequency response of various 1st order RL & RC networks
8. To study the transient and steady state response of a 2nd order circuit by varying its various parameters and studying their effects on responses
9. Find the Q Factor and Bandwidth of a Series and Parallel Resonance circuit.
10. Determination of open circuit (Z) and short circuit (Y) parameters
11. Determination of hybrid (H) and transmission (ABCD) parameters
12. To measure two port parameters of a twin-T network and study its frequency response.

Hardware Requirements: Regulated Power supplies, Analog/Digital Function Generators, Digital Multimeters, Decade Resistance Boxes/Rheostats, Decade Capacitance Boxes, Ammeters (Analog or Digital), Voltmeters (Analog or Digital), Active & Passive Electronic Components.

Software requirements: Multisim / Pspice / Equivalent simulation software tool, Computer Systems with required specifications.

References:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, revised 3rd Edition, 2019.
2. Engineering Circuit Analysis by William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, and 9th Edition 2020.


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