T K R COLLEGE OF ENGINEERING &TECHNOLOGY

(Autonomous)

B.TECH. ELECTRICAL AND ELECTRONICS ENGINEERING-R18

COURSE STRUCTURE & SYLLABUS

B. Tech. III Semester

S.No	Course Code	Course Title	L	T	P	Credits
1	**BBSM4**	Numerical Methods & Transforms	**3**	**0**	**0**	**3**
2	**B23PC2**	Electrical Circuit Analysis	**3**	**0**	**0**	**3**
3	**B23PC3**	Electronic Circuits	**3**	**0**	**0**	**3**
4	**B23PC4**	Electrical Machines-I	**3**	**0**	**0**	**3**
5	**B23PC5**	Electromagnetic Fields	**3**	**0**	**0**	**3**
6	**B23PC6**	Electronic Circuits Lab	**0**	**0**	**3**	**1.5**
7	**B23PC7**	Electrical Machines-I Lab	**0**	**0**	**3**	**1.5**
8	**B23PC8**	Electrical Circuit Analysis Lab	**0**	**0**	**3**	**1.5**
9	**B23MC9**	Environmental Science	**0**	**2**	**0**	**0**
					Total	**19.5**

B. Tech - IV Semester

S. No	Course Code	Course Title	L	T	P	Credits
1	**BBSM7**	Special functions & Complex Variables	**3**	**0**	**0**	**3**
2	**B24PC2**	Digital Logic Design	**3**	**0**	**0**	**3**
3	**B24PC3**	Electrical Machines-II	**3**	**0**	**0**	**3**
4	**B24PC4**	Control Systems	**3**	**0**	**0**	**3**
5	**BHSFM**	Fundamentals of Management	**3**	**0**	**0**	**3**
6	**B24PC6**	Digital Logic Design Lab	**0**	**0**	**3**	**1.5**
7	**B24PC7**	Electrical Machines-II Lab	**0**	**0**	**3**	**1.5**
8	**B24PC8**	Control Systems Lab	**0**	**0**	**3**	**1.5**
9	**B24MC9**	Essence of Indian Traditional Knowledge	**0**	**2**	**0**	**0**
					Total	**19.5**

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B.TECH. ELECTRICAL AND ELECTRONICS ENGINEERING - R18

NUMERICAL METHODS & TRANSFORMS -BBSM4

B.Tech. III Semester **L/T/P/C**
3/0/0/3

Prerequisite: Mathematics-I & II

COURSE OBJECTIVES:

1. The topics those deals with methods to find roots of an equation.
2. The topic of integration that deals using numerical techniques.
3. The objective of this course is to familiarize the prospective engineers with techniques in Z and Fourier Transforms.
4. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.
5. Concepts and properties of Z and Fourier Transforms.

COURSE OUTCOMES:

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

1. Find the root of a given equation using numerical methods.
2. Finding integral values using numerical techniques.
3. Use Z - Fourier transform techniques for solving ODE and PDE.
4. Finding a non-periodic function in terms of sine and cosine transforms.
5. Finding a non-periodic function as integral representation.

UNIT I:

Algebraic and Transcendental equations

Solution of algebraic and transcendental equations – Bisection method- Newton-Raphson method and Regula-falsi method.

UNIT-II:

Interpolation and Integration

Finite differences- interpolation using Newton's forward and back ward difference formulae- Interpolation with unequal intervals- Newton's divided difference and Lagrange's formulae- Numerical integration- Trapezoidal rule and Simpson's 1/3 and 3/8 rules.

UNIT III:

Numerical solutions to Ordinary Differential Equations

Ordinary differential equations: Euler and modified Euler's methods- Taylor's series-Runge-Kutta method of fourth order – Predictor corrector method- Newton's bashfourth method-Milnes method.

UNIT IV:

Fourier series and Fourier Transforms

Fourier series: Fourier series for functions of periodicity 2l-Fourier Transforms: Introduction- Fourier Integral theorem- fourier sine and cosine integrals- fourier sine and cosine transforms- properties- inverse transforms- finite fourier transforms.

UNIT V:

Z-Transforms

Z – Transforms and inverse Z- Transforms- damping rule- shifting properties- initial and final value theorems- convolution theorem (without proof)-Solving of difference equations using Z-transforms.

TEXT BOOKS

1. S.S.Sastry- introductory methods of numerical analysis- PHI-4th edition- 2005.
2. Erwinkreyszig- Advanced Engineering Mathematics- 9th Edition- John Wiley & Sons- 2006.
3. VeerarajanT.- Engineering Mathematics for first year-tataMcGraw-Hill- New delhi-2008.
4. RamanaB.v.- Higher Engineering Mathematics-TataMcGrawHillNewDelhi- 11th Reprint- 2010.
5. P.Kandasamy-K.Thilagavathy- K. Gunavathi-Numerial Methods-S.chand& company 2nd edition Reprint 2012
6. N.P. Bali and Manish Goyal- A text book of engineering Mathematics-Laxmi Publications- Reprint- 2008.
7. B.S.Grewal- Higher Engineering Mathematics-Khanna Publishers- 36th Edition- 2010
8. Advanced Engineering Mathematics by S.R.K. Iyengar R.K. Jain - NarosaPublications

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B.TECH. ELECTRICAL AND ELECTRONICS ENGINEERING- R18

ELECTRICAL CIRCUIT ANALYSIS - B23PC2

B.Tech. III Semester **L/T/P/C**

3/0/0/3

Prerequisite: Mathematics

COURSE OBJECTIVES:

1. To understand Network Topology.
2. To analyse transients in Electrical systems.
3. To evaluate Network parameters of given Electrical network
4. To design basic filter configurations.

COURSE OUTCOMES:

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

1. Illustrate about network topology.
2. Obtain the transient and steady-state response of electrical circuits.
3. Analyze circuit analysis using laplace transform.
4. Discuss about two port networks.
5. Design network filters.

UNIT-I:

Network topology

Definitions– Graph – Tree, Basic cut set and Basic Tie set matrices for planar networks – Loop and Nodal methods of analysis of Networks with dependent &independent voltage and current sources - Duality & Dual networks. Mutual coupled circuits, Dot Convention in coupled circuits, Ideal Transformer.

UNIT-II:

Solution of First and Second order networks

Solution of first and second order differential equations for Series and parallel R-L, R-C, R- L-C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response.

UNIT- III:

Electrical Circuit Analysis Using Laplace Transforms

Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, transformed network with initial conditions. Transfer function representation. Poles and Zeros. Frequency response (magnitude and phase plots), series and parallel resonances

UNIT- IV:

Two Port Network and Network Functions

Network functions driving point and transfer impedance function networks, necessary conditions for driving point functions and for transfer function, Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks.

UNIT- V:

Introduction to Filters

Introduction to filters –single tuned and double tuned filters - low pass – high pass and band pass, Band rejection filter – RC, RL, filters- constant K and m derived filters and composite filter design.

TEXT BOOKS

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.
2. D. Roy Choudhury, "Networks and Systems", New Age International Publications,1998.
3. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw HillEducation,2013.

REFERENCE BOOKS

1. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education,2004.
2. K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishers, 1999.
3. Electric Circuits by Schaum's outlines.
4. Problems& Solutions in Electrical Engineering by V.C.Natesan, Parker smith's PART-I, S.CHAND PUBLISHER

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B.TECH. ELECTRICAL AND ELECTRONICS ENGINEERING-R18

ELECTRONIC CIRCUITS – B23PC3

B.Tech. III Semester **L/T/P/C**
3/0/0/3

PREREQUISITE:
Basic Electrical and Electronics Engineering

COURSE OBJECTIVES:
1. To explain the operation, Design and Analysis of Single stage amplifiers using BJT and MOSFET.
2. To analyze Feedback amplifiers, Large Signal amplifiers and Oscillators.
3. To explain the operation of Linear and non Linear wave shaping circuits
4. To understand the switching characteristics of Diode and Transistor

COURSE OUTCOMES:
After completion of this course the student is able to
1. Apply the knowledge of BJT to design practical amplifier circuits.
2. Design electronic sub systems such as Feedback amplifiers, Oscillators.
3. Design Power amplifiers.
4. Design Linear and nonlinear wave shaping circuits with different inputs.
5. Analyze Multi vibrators using transistors.

UNIT - I:
Single Stage Amplifiers: Analysis of CE,CB,&CC Amplifiers Classification of Amplifiers Distortion in Amplifiers, Comparison of CE, CB, CC Amplifiers Low frequency Analysis, Low frequency response of BJT Amplifiers ,Low frequency response of FET Amplifiers Miller Effect Capacitance, High Frequency response of BJT amplifiers, Square Wave Testing.

UNIT – II:
Feedback Amplifiers: Concept of feedback Amplifiers, General characteristics of negative feedback amplifiers, Effect of Feedback on Amplifier characteristics, Voltage series, voltage shunt ,Current series and current shunt Feedback configurations, Illustrative problems **Oscillators:** Conditions for oscillations, Frequency and Amplitude Stability of Oscillators, Generalized analysis of LC Oscillators, Quartz, Hartley, and Colpitt's Oscillators, RC – phase shift and Wein Bridge oscillators.

UNIT – III:
Large Signal Amplifiers: Class A Power Amplifier, Maximum Efficiency of Class –A Amplifier, Transformer Coupled Amplifier, Push Pull Amplifier complimentary metry Class-B Power Amplifier, Phase Inverters, Transistor Power Dissipation, Thermal Runway, and Heat Sinks.

UNIT – IV:

Wave Shaping: High Pass, Low Pass RC Circuits, their response for Sinusoidal, Step, and Pulse And Ramp Inputs.

Clippers and Clampers: Diode Clippers, Transistor Clippers, Clipping at Two Independent Levels, Transfer Characteristics of Clippers, Comparators, Clamping Operation, Clamping Circuits using Diode with different inputs, Clamping Circuit Theorem, Practical Clamping Circuits.

UNIT – V:

Switching Characteristics of Devices:

Diode as a Switch, Piecewise Linear Diode Characteristics, Transistor as a Switch, Breakdown Voltage Consideration of Transistor, Design of Transistor Switch, Transistor Switching Times. **Multi vibrators:** Analysis and Design of Bistable, Monostable, Astable, Multivibrators and Schmitt Trigger using Transistors.

TEXT BOOKS

1. "RobertL Boylestead and Louis Nashelsky", "Electronic Devices and circuit theory", Pearson, Tenth edition 2009
2. "S. Salivahanan, N. Suresh Kumar and A. Vallava Raj", "Electronic Devices and circuits", TMH, 2nd Edition 2008.
3. "David A. Bell", "Solid state Pulse Circuits", PHI ,4th Edition 2007.

REFERENCE BOOKS

1. "Robert T. Paynter", "Introductory Electronic Devices and Circuits", PEI,7 Edition, 2009.
2. "Anil. K. Maini, VarshaAgarwal", "Electronic Devices and Circuits", Wiley, 1st Edition 2009.
3. "Jacob Milliman, Harbert Taub and Mothiki S PrakashRao", "Pulse Digital & Switching Waveforms", TMH, 2nd Edition 2008.

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B.TECH. ELECTRICAL AND ELECTRONICS ENGINEERING-R18

ELECTRICAL MACHINES- I - B23PC4

B.Tech. III Semester **L/T/P/C**
3/0/0/3

PREREQUISITE:
Mathematics, Electrical Circuits

COURSE OBJECTIVES:
1. To study and understand different types of DC generators, Motors and Transformers.
2. To analyze performance aspects of various testing methods.

COURSE OUTCOMES:
After completion of this course, the students will be able to
1. Understand the concepts of magnetic circuits.
2. Understand the operation of dc generators.
3. Understand the operation of dc motors.
4. Analyze single phase transformers circuits.
5. Analyze the three phase transformer circuits.

UNIT –I:
Electromagnetic force and torque : Flux-linkage vs current characteristic of magnetic circuits; linear and nonlinear magnetic circuits; energy stored in the magnetic circuit; force as a partial derivative of stored energy with respect to position of a moving element; torque as a partial derivative of stored energy with respect to angular position of a rotating element. Examples galvanometer coil, relay contact, lifting magnet, rotating element with eccentricity or saliency.

UNIT –II:
D.C. Generators Principle of operation – Action of commutator – constructional features – Armature windings – lap and wave windings – simplex and multiplex windings – use of laminated armature–E. M.F Equation. Armature reaction – Cross magnetizing and de-magnetizing AT/pole – compensating winding– commutation – reactance voltage – methods of improving commutation. Methods of Excitation – separately excited and self-excited generators – Build-up of E.M.F - critical field resistance and critical speed - causes for failure to self-excite and remedial measures. Load characteristics of shunt, series and compound generators.

UNIT-III:
D.C Motors Principle of operation – Back E.M.F. - Torque equation – characteristics and application of shunt, series and compound motors – Armature reaction and commutation. Speed control of D.C. Motors - Armature voltage and field flux control methods. Motor starters (3 point and 4 point starters) Testing of D.C. machines - Losses – Constant & Variable losses – calculation of efficiency – condition for maximum efficiency.

UNIT-IV:

Single Phase Transformers : Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency Testing - open circuit and short circuit tests, polarity test, back-to-back test, separation of hysteresis and eddy current losses.

UNIT-V:

Three Phase Transformers: Three-phase transformer - construction, types of connection and their comparative features, Parallel operation of single-phase and three-phase transformers, Autotransformers - construction, principle, applications and comparison with two winding transformer, Magnetizing current, effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current, Phase conversion - Scott connection, three-phase to six-phase conversion, Tap-changing transformers - No-load and on-load tap-changing of transformers, Three-winding transformers. Cooling of transformers.

TEXT BOOKS

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.

REFERENCE BOOKS

1. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
2. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
3. Problems& Solutions in Electrical Engineering by V.C. Natesan, Parker smith's PART-II, S.CHAND Publisher

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B.TECH. ELECTRICAL AND ELECTRONICS ENGINEERING-R18

ELECTROMAGNETIC FIELDS - B23PC5

B.Tech. III Semester **L/T/P/C**
3/0/0/3

PREREQUISITE: Mathematics

COURSE OBJECTIVES:

1. To introduce the concepts of electric field, magnetic field.
2. Applications of electric and magnetic fields in the development of the theory for power transmission lines and electrical machines.

COURSE OUTCOMES:

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

1. Understand the review of vector calculus.
2. Understand the static electric field.
3. Understand the operation of conductors, dielectrics and capacitance.
4. Analyze about Magnetic Forces, Materials and Inductance.
5. Understand the Time Varying Fields and Maxwell's Equations.

UNIT-I:

Review of Vector Calculus: Vector algebra addition, subtraction, components of vectors, scalar and vector multiplications triple products, three orthogonal coordinate systems (rectangular, cylindrical and spherical). Vector calculus- differentiation, partial differentiation, integration, vector operator Del, gradient, divergence and curl; integral theorems of vectors. Conversion of a vector from one coordinate system to another.

UNIT-II:

Static Electric Field: Coulomb's law, Electric field intensity, Electrical field due to point charges. Line, Surface and Volume charge distributions. Gauss law and its applications. Absolute Electric potential, potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy and Energy density.

UNIT-III:

Conductors, Dielectrics and Capacitance: Current and current density, Ohms Law in Point form, Continuity of current, Boundary conditions of perfect dielectric materials. Permittivity of dielectric materials, Capacitance, Capacitance of a two wire line, Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation, Application of Laplace's and Poisson's equations. Static Magnetic Fields Bio-Savart Law, Ampere Law, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials. Steady magnetic fields produced by current carrying conductors.

UNIT IV:

Magnetic Forces, Materials and Inductance: Force on a moving charge, Force on a differential current element, Force between differential current elements, Nature of magnetic

materials, Magnetization and permeability, Magnetic boundary conditions, Magnetic circuits, inductances and mutual inductances.

UNIT V:

Time Varying Fields and Maxwell's Equations: Faraday's law for Electromagnetic induction, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations, Motional Electromotive forces. Boundary Conditions.

Electromagnetic Waves: Derivation of Wave Equation, Uniform Plane Waves, Maxwell's equation in Phasor form, Wave equation in Phasor form, Plane waves in free space and in a homogenous material. Wave equation for a conducting medium, Plane waves in lossy dielectrics, Propagation in good conductors, Skin effect. Poynting theorem.

TEXT BOOKS

1. M.N.O.Sadiku,"ElementsofElectromagnetics",OxfordUniversityPublication,2014.
2. A.Pramanik,"Electromagnetism-Theoryandapplications",PHILearningPvt.Ltd,New Delhi,2009.
3. W. Hayt, "Engineering Electromagnetics", McGraw HillEducation,2012.

REFERENCE BOOKS

1. A. Pramanik, "Electromagnetism-Problems with solution", Prentice Hall India,2012.
2. G. W. Carter, "The electromagnetic field in its engineering aspects", Longmans,1954.
3. W.J.Duffin,"ElectricityandMagnetism",McGrawHillPublication,1980.
4. W.J.Duffin,"AdvancedElectricityandMagnetism",McGrawHill,1968.
5. E. G. Cullwick, "The Fundamentals of Electromagnetism", Cambridge University Press, 1966.
6. B. D. Popovic, "Introductor Engineering Electromagnetics", Addison Wesley Educational Publishers, International Edition, 1971.
7. Problems & Solutions of Engineering Electromagnetics, S.CHAND PUBLISHER.

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B.TECH. ELECTRICAL AND ELECTRONICS ENGINEERING-R18

ELECTRONIC CIRCUITS LAB – B23PC6

B.Tech. III Semester **L/T/P/ C**
0/0/3/ 1.5

PREREQUISITE:
Electronic Circuits& Switching theory and Logic Design.

COURSE OBJECTIVES:
1. To design and simulate various BJT and FET Voltage and Power amplifiers.
2. To design and simulate various BJT Feedback amplifiers.
3. To design and simulate various BJT Oscillators.
4. To design and simulate linear and nonlinear wave shaping circuits.

COURSE OUTCOMES:
After completion of this lab the student is able to
1. Apply the concepts of amplifiers in the design of Public Addressing System
2. Generate Sinusoidal wave forms
3. Design stable system using feedback concepts.
4. Design multi vibrator using transistor

The following experiments are required to be conducted compulsory experiments:
1. CE amplifier.
2. CC amplifier (Emitter Follower).
3. FET amplifier (Common Source).
4. Wien Bridge and RC Phase shift Oscillator.
5. Current series and Voltage series Feedback Amplifier.
6. Colpitt and Hartley Oscillator.
7. Double stage RC coupled amplifier.
8. Clippers and Clampers

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted:
1. Transistor as a switch
2. Study of Logic gates & some applications
3. Study of Flip-Flops and some applications.
4. Monostable & A stable multi vibrators.
5. Bistable multi vibrator& Schmitt trigger.

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B.TECH. ELECTRICAL AND ELECTRONICS ENGINEERING-R18

ELECTRICAL MACHINES-I LAB - B23PC7

B.Tech. III Semester **L/T/P/C**
0/0/3/1.5

PREREQUISITE:
Electrical Machines-I

COURSE OBJECTIVES:
1. To expose the students to the operation of DC Generator
2. To expose the students to the operation of DC Motor.
3. To examine the self-excitation in DC generators.

COURSE OUTCOMES:
After completion of this lab, the students will be able to
1. Start and control the Different DC Machines.
2. Assess the performance of different machines using different testing methods
3. Identify different conditions required to be satisfied for self - excitation of DC Generators.
4. Separate iron losses of DC machines into different components.

The following experiments are required to be conducted compulsory experiments:
1. Magnetization characteristics of DC shunt generator (Determination of critical field resistance and critical speed)
2. Load test on DC series generator (Determination of characteristics)
3. Load test on DC compound generator (Determination of characteristics).
4. Swinburne's test and speed control on DC Shunt Motor
5. Brake test on DC compound motor (Determination of performance curves)
6. Fields test on DC series machines (Determination of efficiency)
7. Brake test on DC Series Motor
8. OC &SC Test on Single Phase Transformer
9. Scott connection of transformers
10. Sumpner's Test on a Pair of single-phase transformers

In addition to the above experiments, at least any two of the experiments from the following list are required to be conducted:
1. Retardation test on DC shunt motor (Determination of losses at rated speed)
2. Verification of Delta-Star, Delta-Delta, star-star, star-delta transformer.
3. Hopkinson's test on DC shunt machines (Predetermination of efficiency)
4. Parallel operation of a two single phase transformers.

TEXT BOOKS

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.

REFERENCE BOOKS

1. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
2. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
3. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
4. Electrical Machines lab manual by Dr.D.K.Chaturvedi
5. D.P. Kothari & B.S. Umre, "Laboratory Manual for Electrical Machines", 1/e, I.K. International Publishing House Pvt. Ltd.

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B.TECH. ELECTRICAL AND ELECTRONICS ENGINEERING-R18

ELECTRICAL CIRCUIT ANALYSIS LAB - B23PC8

B.Tech. III Semester **L/T/P/C**
0/0/3/1.5

Prerequisite: Electrical Circuits.

COURSE OBJECTIVES

1. To design electrical systems.
2. To analyze a given network by applying various Network Theorems.

COURSE OUTCOMES:

After completion of this lab, the students will be able to

1. Apply suitable theorems to find voltage, current & power in electrical circuits.
2. Understand time response of RC/RL network.
3. Determine Circuit parameters for two port network.

EXPERIMENTS:

Conduct any 10 experiments

1. Verification of Mesh Analysis (Ladder Network)
2. Verification of Nodal Analysis
3. Time response of first order and second order RL, RC and RLC networks.
4. Frequency response of first order and second order RL, RC and RLC networks.
5. Two port parameters –Z & Y Parameters
6. Two port parameters –A, B, C, D& Hybrid Parameters
7. Simulation of Milliman's theorem
8. Simulation of compensation theorem
9. Simulation of Mesh & Nodal Analysis
10. Verification of series resonance.
11. Verification of parallel resonance.

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B.TECH. ELECTRICAL AND ELECTRONICS ENGINEERING-R18

SPECIAL FUNCTIONS AND COMPLEX VARIABLES - BBSM7

B.Tech. IV Semester **L/T/P/C**
3/0/0/3

COURSE OBJECTIVES:

1. The objective of this course is to familiarize the prospective engineers with techniques in special functions and complex variables.
2. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.
3. Evaluation of integrals using Beta and Gamma functions.
4. Differentiation and Integration of complex valued functions.
5. Evaluation of Integrals using Cauchy's integral formula and Residue theorem- Expansion of Laurent's Series.

COURSE OUTCOMES:

1. Solving the problems using Beta and Gamma functions
2. Analyze the complex functions with reference to their analyticity- Integration using Cauchy's integral theorem.
3. Find the Taylor and Laurent's Series Expansion of Complex functions.
4. Solve problems of Bilinear Transformations.
5. Solve problems on Residues using different methods.

UNIT- I:

Beta Gamma Functions

Improper Integrals -Beta and Gamma functions – properties

UNIT-II:

Analytic Functions

Complex Numbers-Limits and continuity of complex functions –derivatives- analytic functions-Cauchy-Riemann equations- harmonic functions- finding harmonic conjugate.

UNIT –III:

Complex Integration

Cauchy integral formula-Cauchy Integral Theorem-Complex line integrals-Taylor's Theorem-Laurent's theorem-applications of Laurent's Theorem.

UNIT- IV:

Residue Calculus

Singularities- Residues- Cauchy Residue theorem-contour integrals.

UNIT –V:

Conformal Mappings

Bilinear Transformations--Mobius transformation-Conformal mappings- properties.

TEXT BOOKS

1. G.B. Thomas and R.L. Finney- Calculus and Analytic geometry- 9th Edition- Pearson- Reprint- 2002.
2. Erwinkreyszig- Advanced Engineering Mathematics- 9th Edition- John Wiley & Sons- 2006.
3. VeerarajanT.- Engineering Mathematics for first year-tataMcGraw-Hill- New delhi-2008.
4. RamanaB.v.- Higher Engineering Mathematics-Tata Mc Graw Hill New Delhi- 11th Reprint- 2010.
5. A first course in Complex Analysis with applications by Dennis G.Zilland Patrick Shanahan- Jhons and Bartlett publishers. Fundementals of Complex Analysis by Saff- E.B. and A.D. Snidder- pearson

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B.TECH. ELECTRICAL AND ELECTRONICS ENGINEERING-R18

DIGITAL LOGIC DESIGN – B24PC2

B.Tech. IV Semester **L/T/P/C**
3/0/0/3

COURSE OBJECTIVES:

This course provides in-depth knowledge of switching theory and the design techniques of digital circuits, which is the basis for design of any digital circuit. The main objectives are:

1. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
2. To understand common forms of number representation in digital electronic circuits and to be able to convert between different representations.
3. To implement simple logical operations using combinational logiccircuits
4. To impart to student the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines.
5. To implement synchronous state machines using flip-flops.
6. To implement memory devices using RAM and ROM

COURSE OUTCOMES:

Upon completion of the Course, the students will be able to

1. Convert numeric information in different forms, e.g. Different bases, signed integers, various codes such as ASCII, Gray, and BCD.
2. Realize simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.
3. Design and analyze small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.
4. Design of combinational logic using various PLD's and synthesizing of threshold functions.
5. Design and analyze small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits.

UNIT –I:

Number System and Boolean Algebra And Switching Functions: Number Systems, Base Conversion Methods, Complements of Numbers, Codes- Binary Codes, Binary Coded Decimal Code and its Properties, Unit Distance Codes, Error Detecting and Correcting Codes.

Boolean Algebra: Basic Theorems and Properties, Switching Functions, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates, Properties of XOR Gates, Universal Gates, Multilevel NAND/NOR realizations.

UNIT –II:

Minimization and Design of Combinational Circuits: Introduction, The Minimization with theorem, The Karnaugh Map Method, Five and Six Variable Maps, Prime and Essential Implications, Don't Care Map conditions, Tabular Method,

Combinational circuits: Introduction, Adders, Subtractors, Multiplexers, Demultiplexers, Encoders, Decoders, Comparator, Code Converters, Hazards.

UNIT –III:

Sequential Circuits I: Introduction, Basic Differences between Combinational and Sequential circuits, The Binary Cell, Latch, Flip-Flop-Types, and Race around condition, Excitation tables and characteristic equations. Conversion from one type of Flip-Flop to another, preset and Clear inputs, Timing and Triggering Consideration, Clock Skew.

UNIT –IV:

Sequential Circuits II: Introduction, Register-Types, Counters –Types, Design of Ripple (mod-N) Counters, Ring Counter.

Memory types- RAM, ROM, Realization of switching functions using PLD's

UNIT –V:

Sequential Machines: State Diagram, Analysis of Synchronous Sequential Circuits, Approaches to the Design of Synchronous Sequential Finite State Machines, Finite state machine-capabilities and limitations, Mealy and Moore models-minimization of completely specified and incompletely specified sequential machines, Partition techniques and Merger chart methods-concept of minimal cover table.

TEXT BOOKS

1. Digital Design- Morris Mano, PHI, 3rd Edition.
2. Switching and Finite Automata Theory- Zvi Kohavi & Niraj K. Jha, 3rd Edition, Cambridge.

REFERENCE BOOKS

1. Anand Kumar, "Switching Theory and Logic Design" PHI, 2008
2. Charles H. Roth, "Fundamentals of Logic Design" Thomson Publications, 5th Edition, 2004

T K R COLLEGE OF ENGINEERING &TECHNOLOGY

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B.TECH. ELECTRICAL AND ELECTRONICS ENGINEERING-R18

ELECTRICAL MACHNIES – II - B24PC3

B.Tech. IV Semester **L/T/P/ C**
3/0/0/3

COURSE OBJECTIVES:

1. To deal with the detailed analysis of poly phase induction motors & Synchronous generators and motors.
2. To understand operation, construction and types of single phase motors and their applications in house hold appliances.
3. To introduce the concept of parallel operation of synchronous generators.
4. To introduce the concept single phase motors and special motors.

COURSE OUTCOMES:

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

1. Identify and understand different parts of Induction motor and specify their operations.
2. Analyze the characteristics and speed control of Induction motor.
3. Understand and analyze the construction, operation and characteristics of synchronous generator.
4. Understand the parallel operation of synchronous generator and working principle of synchronous motor.
5. Analyze the construction and working of single phase and special motors.

UNIT – I:

Polyphase Induction Motors: Constructional details of cage and wound rotor machines-production of a rotating magnetic field - principle of operation - rotor EMF and rotor frequency - rotor reactance, rotor current and Power factor at standstill and during operation.

UNIT – II:

Characteristics of Induction Motors: Rotor power input, rotor copper loss and mechanical power developed and their inter relation-torque equation-deduction from torque equation - expressions for maximum torque and starting torque - torque slip characteristic - equivalent circuit - phasor diagram - crawling and cogging -.No-load Test and Blocked rotor test – Predetermination of performance-Methods of starting and starting current and Torque calculations.

Speed Control Methods: Change of voltage, change of frequency, voltage/frequency, injection of an EMF into rotor circuit (qualitative treatment only)-induction generator- principle of operation.

UNIT – III:

Construction, Principle of operation, Characteristics & Regulation of Synchronous Generator: Constructional Features of round rotor and salient pole machines – Armature windings – Integral slot and fractional slot windings; Distributed and concentrated windings

– distribution, pitch and winding factors – E.M.F Equation. Harmonics in generated e.m.f. – suppression of harmonics – armature reaction - leakage reactance – synchronous reactance and impedance – experimental determination - phasor diagram – load characteristics. Regulation by synchronous impedance method, M.M.F. method, Z.P.F. method and A.S.A. methods – salient pole

alternators – two reaction analysis – experimental determination of X_d and X_q (Slip test) Phasor Diagrams – Regulation of salient pole alternators.

UNIT – IV:

Parallel Operation of Synchronous Generator: Synchronizing alternators with infinite bus bars – synchronizing power torque – parallel operation and load sharing - Effect of change of excitation and mechanical power input. Analysis of short circuit current wave form – determination of sub-transient, transient and steady state reactances.

Synchronous Motors – Principle of Operation: Theory of operation – phasor diagram– Variation of current and power factor with excitation – synchronous condenser – Mathematical analysis for power developed. - hunting and its suppression – Methods of starting – synchronous induction motor.

UNIT – V:

Single Phase Motors & Special Motors:: Single phase induction motor – Constructional features- Double revolving field theory – split-phase motors – shaded pole motor, Capacitor start, Capacitor start – run single phase induction motor, Universal motor.

TEXT BOOKS

1. "I. J. Nagrath& D. P. Kothari", "Electric Machines", Tata McGraw Hill, 7th Edition, 2009.
2. "P.S Bhimbra", "Electrical machines", Khanna Publishers, 2014.

REFERENCE BOOKS

1. "M. G. Say", "Performance and Design of AC Machines", CBS Publishers, 3rd Edition, 2002.
2. "A.E. Fitzgerald, C. Kingsley and S. Umans", "Electric machinery", McGraw Hill Companies, 7th edition,2013.
3. "Langsdorf", "Theory of Alternating Current Machinery", Tata McGraw-Hill Companies, 2nd edition, 1984.
4. "M.V Deshpande", "Electrical Machines", Wheeler Publishing, 2011.
5. Problems& Solutions in Electrical Engineering by V.C. Natesan, Parker smith's PART-II, S.CHAND Publisher.

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B.TECH. ELECTRICAL AND ELECTRONICS ENGINEERING-R18

CONTROL SYSTEMS - B24PC4

B.Tech. IV Semester **L/T/P/C**
3/0/0/3

Prerequisite:
Mathematics, Electrical Circuits

COURSE OBJECTIVES:
1. To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response.
2. To assess the system performance using time domain analysis and methods for improving it.
3. To assess the system performance using frequency domain analysis and techniques for improving the performance.
4. To design various controllers and compensators to improve system performance.

COURSE OUTCOMES:
After completion of this course, the student will be able to
1. Acquiring knowledge about control problems and transfer function representation.
2. Analyze the time response.
3. Analyze the concept of stability of a system in time domain.
4. Analyze the concept of stability of a system in frequency domain.
5. Test system Controllability and Observability using state space representation and applications of state space representation to various systems.

UNIT – I:
Introduction: Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback. Mathematical models – Differential equations - Impulse Response and transfer functions - Translational and Rotational mechanical systems.
Transfer Function Representation: Transfer Function of DC Servo motor - AC Servo motor- Synchro transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples - Block diagram algebra – Representation by Signal flow graph - Reduction using mason's gain formula.

UNIT-II:
Time Response Analysis: Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

UNIT – III:

Stability Analysis: The concept of stability - Routh stability criterion – qualitative stability and conditional stability.

Root Locus Technique: The root locus concept - construction of root loci-effects of adding poles and zeros to G(s) H(s) on the root loci.

Frequency Response Analysis: Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots.

UNIT – IV:

Stability Analysis In Frequency Domain: Polar Plots, Nyquist Plots and applications of Nyquist criterion to find the stability - Effects of adding poles and zeros to G(s)H(s) on the shape of the Nyquist diagrams.

Classical Control Design Techniques: Compensation techniques – Lag, Lead, and Lead- Lag Controllers design in frequency Domain, PID Controllers.

UNIT – V:

State variable Analysis Concepts of state variables, State space model, Diagonalization of State Matrix, Solution of state equations, Eigen values and Stability Analysis, Concept of controllability and Observe ability.

TEXT BOOKS

1. B. C. Kuo, "Automatic Control System", Prentice Hall, 1995.
2. K. Ogata, "Modern Control Engineering", Prentice Hall, 1991.

REFERENCE BOOKS

1. M. Gopal, "Control Systems: Principles and Design", McGraw Hill Education, 1997.
2. I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International, 2009.
3. N. K. Sinha, "Control Systems", New Age International (P) Limited Publishers, 3rd Edition, 1998.
4. N. Nise, "Control Systems Engineering", John wiley, 6th Edition, 2011.
5. Sonveer Singh, "A Textbook of Control Systems Engineering", Khanna Book Publishing CO. (P) Ltd, 2012.
6. Modern Control System Theory by M. Gopal

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B.TECH. ELECTRICAL AND ELECTRONICS ENGINEERING-R18

FUNDAMENTALS OF MANAGEMENT - BHSFM

B.Tech. IV Semester **L/T/P/C**
3/0/0/3

COURSE OBJECTIVES:

1. To make the students to understand the management concepts
2. To analyze the managerial skills.
3. To know the applications of management concepts in practical aspects of business.
4. To interpret, understand and develop the management principles in organizations.
5. To learn the basic concepts of organization its principles and functions.

COURSE OUT COMES:

1. To infer the basic knowledge of management functions, levels and evolution of Management.
2. To ensure the students in decision making problem solving for the issues in corporate in the organization.
3. To acquire the knowledge of entire organization design and structure.
4. To perceive the strategically decision in selection, requirement training and development.
5. To enact and impose the qualities of a leader, mentor and coach.

UNIT – I:

Introduction to Management: Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills, Challenges of Management; Evolution of Management-Classical Approach- Scientific and Administrative Management; The Behavioral approach.

UNIT – II:

Planning and Decision Making: General Framework for Planning - Planning Process, Types of Plans. Decision making and Problem solving - Programmed and Non Programmed Decisions, Steps in Problem Solving and Decision Making

UNIT – III:

Organization and HRM: Principles of Organization: Organizational Design &Organizational Structures; Departmentalization, Delegation; Empowerment, Centralization, Decentralization, Recentralization;

Human Resource Management & Business Strategy: Talent Management, Talent Management Models and Strategic Human Resource Planning; Recruitment and Selection; Training and Development; Performance Appraisal.

UNIT – IV:

Leading and Motivation: Leadership, Power and Authority, Leadership Styles; Behavioral Leadership, Situational Leadership, Leadership Skills, Leader as Mentor and Coach, Leadership during adversity and Crisis.

Motivation - Types of Motivation; Motivational Theories - Needs Hierarchy Theory, Two Factor Theory, Theory X and Theory Y.

UNIT – V:

Controlling: Control, Types and Strategies for Control, Steps in Control Process, Budgetary and Non- Budgetary Controls. Characteristics of Effective Controls

TEXT BOOKS

1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.

REFERENCE BOOKS

1. Essentials of Management, Koontz Kleihrich, Tata Mc - Graw Hill.
2. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.
3. Harold Koontz and Heinz Weihrich, 2010, Essentials of Management, TMH

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B.TECH. ELECTRICAL AND ELECTRONICS ENGINEERING-R18

DIGITLAL LOGIC DESIGN LAB – B24PC6

B.Tech. IV Semester **L/T/P/C**
0/0/3/1.5

COURSE OBJECTIVES:

1. To study the sequential logic circuits design both in synchronous and Asynchronous modes for various complex logic and switching devices, their minimization techniques and their realizations.
2. Knowledge of the methods for analysis and synthesis of combinational and sequential circuits

COURSE OUTCOMES:

On completion of this lab course the students will be able to:

1. Acquires the knowledge of 74XX IC's.
2. Design various combinational & sequential circuits using various Digital ICs.
3. Acquires the knowledge of differentiating between Linear and Digital IC's.
4. Acquires the knowledge of demonstrating by designing digital circuits

To be conducted any 10 experiments List of
Experiments:

1. Study of logic gates.
2. Design a 16 bit Adder / Sub tractor using 4 – bit Adder / Sub tractor IC's
3. Design a 16 x 1 multiplexer using 8 x 1 multiplexer.
4. Design a 4 – bit Gray to Binary and Binary to Gray Converter.
5. Design a 16 x 4 priority encoder using two 8 x 3 priority encoder.
6. Design a 16 bit comparator using 4 bit Comparators.
7. Study of Flip Flops.
8. Design a Ring counter and Twisted ring counter using a 4-bit shift register
9. Design an 8 bit parallel in parallel out shift register using two 4 bit shift register.
10. Design an 8 bit parallel in and serial out shift register using two 4 bit shift register.
11. Design a 4 digit hex counter using synchronous one digit hex counters.
12. Design a 4 digit hex counter using Asynchronous one digit hex counters.

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B.TECH. ELECTRICAL AND ELECTRONICS ENGINEERING-R18

ELECTRICAL MACHINES-II LAB - B24PC7

B.Tech. IV Semester **L/T/P/C**
0/0/3/1.5

PREREQUISITE:
Electrical Machines – I & Electrical Machines – II

COURSE OBJECTIVES:
1. To understand the operation of synchronous machines
2. To understand the analysis of power angle curve of a synchronous machine
3. To understand the equivalent circuit of a single phase transformer and single phase
4. Induction motor
5. To understand the circle diagram of an induction motor by conducting a blocked rotor test.

COURSE OUTCOMES:
After completion of this lab the students will be able to
1. Assess the performance of different machines using different testing methods
2. To convert the Phase from three phase to two phase and vice versa
3. Compensate the changes in terminal voltages of synchronous generator after
4. Estimating the change by different methods
5. Control the active and reactive power flows in synchronous machines
6. Start different machines and control the speed and power factor
7. No-load & Blocked rotor tests on three phase Induction motor
8. Load test on three phase induction motor
9. Separation of core losses of three phase induction motor
10. Equivalent Circuit of a single phase induction motor
11. Regulation of a three –phase alternator by synchronous impedance & m.m.f. methods
12. Determination of Xd and Xq of a salient pole synchronous machine by dynamic slip test
13. V and Inverted V curves of a three phase synchronous motor.
14. Measurement of sequence impedance of a three-phase alternator.

In addition to the above experiments, at least any two of the following experiments are required to be conducted from the following list
1. Regulation of three-phase alternator by Z.P.F. and A.S.A methods
2. Load test on single phase induction motor
3. Heat run test on a bank of 3 Nos. of single phase Delta connected transformers
4. Speed control of single phase induction motor by V/F control.

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B.TECH. ELECTRICAL AND ELECTRONICS ENGINEERING-R18

CONTROL SYSTEMS LAB - B24PC8

B.Tech. IV Semester **L/T/P/C**
0/0/3/1.5

COURSE OBJECTIVES

1. To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response
2. To assess the system performance using time domain analysis and methods for improving it
3. To assess the system performance using frequency domain analysis and techniques for improving the performance
4. To design various controllers and compensators to improve system performance

COURSE OUTCOMES:

After completion of this lab the students will be able to

1. How to improve the system performance by selecting a suitable controller and/or a compensator for a specific application.
2. Apply various time domain and frequency domain techniques to assess the system performance
3. Apply various control strategies to different applications (example: Power systems, electrical drives etc).
4. Test system controllability and observability using state space representation and applications of state space representation to various systems.

The following experiments are required to be conducted compulsorily as a part of curriculum:

1. Time response of Second order system.
2. Characteristics of Synchro pair.
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple Boolean expressions and application of speed control of motor.
4. Effect of feedback on DC servomotor.
5. Transfer function of DC motor.
6. Transfer function of DC generator.
7. Temperature controller using PID.
8. Characteristics of AC servomotor.

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted.

1. Effect of P, PD, PI, PID Controller on a second order systems.
2. Lag and lead compensation – Magnitude and phase plot.
3. (a) Simulation of P, PI, PID Controller.
   (b) Linear system analysis (Time domain analysis, Error analysis) using suitable software.
4. Stability analysis (Bode, Root Locus, NY Quist) of Linear Time Invariant system using suitable Software.
5. State space model for classical transfer function using suitable software-Verification.
6. Design of Lead-Lag compensator for the given system and with specification using suitable Software.
7. Evaluation of error constants using time response plots.

REFERENCE BOOKS AND SOFTWARE

1. Manuals of related software.
2. PSPICE
3. MATLAB