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B.Tech - Electrical and Electronics Engineering
Course Structure R-22

SEMESTER III

S.No.	Class	Course Code	Name of the Subject	L	T	P	C	I	E	Total
1	**BS**	D3BSM4	Complex Analysis and vector Calculus	3	1	0	4	40	60	100
2	**PC**	D23PC1	Power Systems-I	3	0	0	3	40	60	100
3	**PC**	D23PC2	Analog Electronics	3	0	0	3	40	60	100
4	**PC**	D23PC3	Electrical Machines-I	3	0	0	3	40	60	100
5	**PC**	D23PC4	Electro Magnetic Fields	3	0	0	3	40	60	100
6	**PC**	D23PC5	Analog Electronics Lab	0	0	2	1	40	60	100
7	**PC**	D23PC6	Electrical Machines Lab-I	0	0	2	1	40	60	100
8	**PC**	D23PC7	Data Structures using C Programming Lab	0	1	2	2	40	60	100
TOTAL CREDITS				**15**	**2**	**6**	**20**	**320**	**480**	**800**

SEMESTER IV

S.No.	Class	Course Code	Name of the Subject	L	T	P	C	I	E	Total
1	**ES**	D4ESHM	Solid Mechanics & Hydraulic Machines	3	1	0	4	40	60	100
2	**PC**	D24PC8	Digital Electronics	3	0	0	3	40	60	100
3	**PC**	D24PC9	Electrical Machines-II	3	0	0	3	40	60	100
4	**PC**	D24PC10	Control Systems	3	1	0	4	40	60	100
5	**PC**	D24PC11	Power System-II	3	0	0	3	40	60	100
6	**PC**	D24PC12	Digital Electronics Lab	0	0	2	1	40	60	100
7	**PC**	D24PC13	Electrical Machines Lab – II	0	0	2	1	40	60	100
8	**PC**	D24PC14	Control Systems Lab	0	0	2	1	40	60	100
9	**MC**	MC002	Constitution of India *	3	0	0	0	0	0	0
TOTAL CREDITS				**18**	**2**	**6**	**20**	**320**	**480**	**800**
Mandatory Course: Constitution of India										

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ELECTRICAL AND ELECTRONICS ENGINEERING (R22)

B. Tech III Semester **L/T/P/C**
3/1/0/4

COMPLEX ANALYSIS & VECTOR CALCULUS (D3BSM4)

Pre-requisites: Mathematics courses of first year of study

Course Objectives:

To Learn:

1. Differentiation and integration of complex valued functions.
2. Evaluation of integrals using Cauchy's integral formula and residue theorem
3. Evaluation of integrals using Residues
4. The physical quantities involved in engineering field related to vector valued functions
5. The basic properties of vector valued functions and their applications to line-surface and volumeintegrals.

Course Outcomes:

After learning the contents of this paper the student must be able to

CO1: Analyze the complex functions with reference to their analyticity.

CO2: Evaluate integrals using Cauchy's integral theorem, formula and finding the Taylor and Laurent'sSeries expansion of complex functions.

CO3: Solve problems on Residues using different methods.

CO4: Evaluate real integrals.

CO5: Compute derivatives of vector valued functions, gradient function.

CO6: Evaluate the line-surface and volume integrals and converting them from one to another.

UNIT I

Functions of a Complex Variable:

Introduction, Continuity, differentiability, analyticity, properties, Cauchy Riemann equations in Cartesianand polar co-ordinates, harmonic and conjugate harmonic functions, Milne Thompson method.

UNIT II

Complex Integration:

Line integral, Cauchy integral theorem, Cauchy integral formula, generalized Cauchy integral formula. Power series -Taylor's series, Laurent series. Singular points, isolated singular points, pole of order m, essential singularity.

UNIT III

Residues, **Evaluation of Integrals:**

Residue, Cauchy residue theorem, Types of real integrals Improper real integrals a)$\int_{-\infty}^{\infty} f(x)dx$ b) $\int_{c}^{c+2l} f(cos\Theta, sin\Theta)dx$

UNIT IV

Vector Differentiation:

Vector point functions and scalar point functions- Gradient - Divergence and Curl. Directional Derivatives - Tangent plane and normal line- Vector Identities -Scalar potential functions. Solenoidal and Irrotational vectors.

UNIT V

Vector Integration:

Line integral - Surface integral and Volume Integrals - Vector integral theorems – Green theorem- Gauss theorem and Stokes theorem (without proofs) and their applications.

TEXT BOOKS:

1. Engineering Mathematics by TKV Iyengar, B. Krishna Gandhi, S. Chand and publications
2. Ramana B.v.- Higher Engineering Mathematics- Tata Mc Graw Hill New Delhi- 11thReprint-2010.
3. Complex variables and applications by James ward Brown and Ruel V. Churchill –Eighth Edition–Mc-Graw Hill Higher Education.

REFERENCE BOOKS:

1. Erwin Kreyszig –Advanced Engineering Mathematics- 10thEdition- Wiley – 2021
2. N.P.BaliandManishGoyal-AtextbookofengineeringMathematics-LaxmiPublications-Reprint-2008.
3. B.S. Grewal –Higher Engineering Mathematics- Khanna Publishers- 40thEdition-2015.
4. Advanced Engineering Mathematics by S.R.K. Iyengar R.K. Jain–Narosa Publications
5. Fundamentals of complex Analysis by Saff ,E.B. and A.D.Snider, Pearson

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ELECTRICAL AND ELECTRONICS ENGINEERING (R22)

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

POWER SYSTEM – I (D23PC1)

Prerequisites: Electrical Circuit Analysis-1 & Electrical CircuitAnalysis-2Electrical Machines-I & Electrical Machines-II

Course Objectives:

1. To understand the power generation through conventional and non-conventional sources.
2. To illustrate the economic aspects of power generation and tariff methods.
3. To know about overhead line insulators, substations and AC & DC distribution systems.

Course Outcomes:

After learning the contents of this paper the student must be able to

1. Understand the operation of conventional and renewable electrical power generating stations.
2. Evaluate the power tariff methods and Economics associated with power generation.
3. Analyze the operations of AIS & GIS, Insulators and Distribution systems.

UNIT-I:

GENERATION OF ELECTRIC POWER:

Conventional Sources (Qualitative): Hydro station, Steam Power Plant, Nuclear Power Plant andGasTurbine Plant.

Non-Conventional Sources (Elementary Treatment):

Solar Energy, Wind Energy, Fuel Cells, Ocean Energy, Tidal Energy, Wave Energy, Cogeneration, Energy conservation and storage.

UNIT-II:

ECONOMICS OF POWER GENERATION: Introduction, definitions of connected load, maximum demand, demand factor, load factor, diversity factor, Load duration curve, number and size of generator units. Base load and peak load plants. Cost of electrical energy-fixed cost, running cost, Tariff on charge to customer.

UNIT-III:

OVER HEAD TRANSMISSION LINES: Line conductors, inductance and capacitance of single phase and three phase lines with symmetrical and unsymmetrical spacing, Composite conductors- transposition, bundled conductors, and effect of earth on capacitance, skin and proximity effects.

OVERHEAD LINE INSULATORS: Introduction, types of insulators, Potential distribution over a string of suspension insulators, Methods of equalizing the potential, testing of insulators, Sag and tension calculations.

UNIT-IV:

SUBSTATIONS:

AIR INSULATED SUBSTATIONS (AIS): Indoor & Outdoor substations: Substations layout showing the location of all the substation equipment. Bus bar arrangements in the Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, main and transfer bus bar system with relevant diagrams.

GAS INSULATED SUBSTATIONS (GIS): Advantages of Gas insulated substations, different types ofgas insulated substations, single line diagram of gas insulated substations, bus bar, construction aspects of GIS, Installation and maintenance of GIS, Comparison of Air insulated substations and Gasinsulated substations.

UNIT-V:

DC DISTRIBUTION: Classification of Distribution Systems. - Comparison of DC vs. AC and Under- Ground vs. Over- Head Distribution Systems. - Requirements and Designfeatures of Distribution Systems. -Voltage Drop Calculations (Numerical Problems) in D.C Distributors for the following cases: Radial D.C Distributor fed one end and at the both the ends (equal/unequal Voltages) and Ring Main Distributor.

A.C. DISTRIBUTION: Introduction, AC distribution, Single phase, 3-phase, 3 phase 4 wire system, bus bar arrangement, Selection of site for substation. Voltage Drop Calculations (Numerical Problems) in A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages.

TEXT BOOKS:

1. C.L. Wadhwa, " Generation, Distribution and Utilization of Electrical Energy", 2nd Edition, New AgeInternational, 2009.
2. V.K Mehta and Rohit Mehta, "Principles of Power Systems", S. Chand & Company Ltd, NewDelhi, 2004.

REFERENCE BOOKS:

1. Chakrabarti, M.L. Soni, P.V. Gupta, U.S. Bhatnagar, "A Text book on Power SystemEngineering", Dhanpat Rai Publishing Company (P) Ltd, 2008.
2. C.L. Wadhwa, "Electrical Power Systems", 5th Edition, New Age International, 2009.
3. M.V. Deshpande, "Elements of Electrical Power Station Design", 3rd Edition, Wheeler Pub.1998.
4. H.Cotton & H. Barber, "The Transmission and Distribution of Electrical Energy", 3rd Edition,1970.
5. W.D.Stevenson, "Elements of Power System Analysis", 4th Edition, McGraw Hill, 1984

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ELECTRICAL AND ELECTRONICS ENGINEERING (R22)

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

ANALOG ELECTRONICS (D23PC2)

Course Objectives:

1. To introduce components such as diodes, BJTs and FETs their switching characteristics, applications
2. Learn the concepts of high frequency analysis of transistors.
3. To give understanding of various types of basic and feedback amplifier circuits small signal, cascaded, large signal and tuned amplifiers.
4. To introduce the basic building blocks of linear integrated circuits.
5. To introduce the concepts of waveform generation and introduce some special function ICs.

Course Outcomes: At the end of this course, students will be able to

1. Know the characteristics, utilization of various components.
2. Understand the biasing techniques
3. Design and analyze various rectifiers, small signal amplifier circuits.
4. Design sinusoidal and non-sinusoidal oscillators.
5. Design OP-AMP based circuits with linear integrated circuits.

UNIT-I:

Diode and Bipolar Transistor Circuits: P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, clamping and clipping circuits. Input output characteristics of BJT in CB, CE, CC configurations, biasing circuits, Load line analysis, common-emitter, common- base and common collector amplifiers; Small signal equivalent circuits.

UNIT-II:

FET Circuits: FET Structure and VI Characteristics, MOSFET structure and I-V characteristics. MOSFET as a switch. Small signal equivalent circuit gain, input and output impedances, small-signal model and common-source, common-gate and common-drain amplifiers, trans conductance, high frequency equivalent circuit.

UNIT-III:

Multi-Stage and Power Amplifiers: Direct coupled and RC Coupled multi-stage amplifiers; Differential Amplifiers, Power amplifiers- Class A, Class B, Class C

UNIT-IV:

Feedback Amplifiers: Concepts of feedback– Classification 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-Simple problems.

Oscillators: Condition for Oscillations, RC type Oscillators-RC phase shift and Wien-bridge Oscillators, LC type Oscillators–Generalized analysis of LC Oscillators, Hartley and Colpitts Oscillators.

UNIT-V:

Operational Amplifiers: Ideal op-amp, Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product, Inverting and non-inverting amplifier, Differentiator, integrator, Square-wave and triangular-wave generators.

TEXTBOOKS:

1. Integrated Electronics, Jacob Millman, Christos C Halkias, Mc Graw HillEducation, 2nd edition 2010
2. Op-Amps & Linear ICs–Ramakanth A. Gayakwad, PHI, 2003.

REFERENCE BOOKS:

1. Electronic Devices Conventional and current version-ThomasL.Floyd2015, Pearson.
2. J. Millman and A. Grabel, “Microelectronics”, McGraw Hill Education, 1988.
3. P. Horowitz and W. Hill, “The Art of Electronics”, Cambridge University Press, 1989.
4. P. R. Gray, R. G. Meyer and S. Lewis, “Analysis and Design of Analog Integrated Circuits”, John Wiley & Sons, 2001.

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ELECTRICAL AND ELECTRONICS ENGINEERING (R22)

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

ELECTRICAL MACHINES- I (D23PC3)

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. Identify different parts of a DC machine & understand its operation
2. Carry out different testing methods to predetermine the efficiency of DC machines
3. Understand different excitation and starting methods of DC machines
4. Control the voltage and speed of a DC machines
5. Analyze single phase and three phase transformers circuits.

UNIT –I:

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-II:

DC 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-III:

Testing of DC Machines: Methods of testing – direct, indirect, and regenerative testing – Brake test –Swinburne's test – Hopkinson's test – Field's test - separation of stray losses in a d.c. motor test.

UNIT-IV:

Single Phase Transformers: Types - constructional details-minimization of hysteresis and eddy current losses- EMF equation - operation on no load and on load - phasor diagrams Equivalent circuit - losses and efficiency – regulation - All day efficiency - effect of variations of frequency & supply voltage on iron losses

UNIT-V:

Testing of Transformers and Poly-Phase Transformers: OC and SC tests - Sumpner's test - predetermination of efficiency and regulation- separation of losses test parallel operation with equal and unequal voltage ratios - auto transformers-equivalent circuit - comparison with two winding transformers. Poly-phase transformers – Poly-phase connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and open Δ

TEXT BOOKS

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

REFERENCE BOOKS

1. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers,2011.
2. I.J.NagrathandD.P.Kothari,"ElectricMachines",McGrawHillEducation,2010.
3. Problems& Solutions in Electrical Engineering by V.C. Natesan, Parker smith's

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ELECTRICAL AND ELECTRONICS ENGINEERING (R22)

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

ELECTRO MAGNETIC FIELDS (D23PC4)

Prerequisite: Mathematics-II (Ordinary Differential Equations and Multivariable Calculus) & Applied Physics

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 powertransmission 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:

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, "Elements of Electro magnetics", Oxford University Publication,2014.
2. W. Hayt, "Engineering Electromagnetics", McGraw-Hill Education, 2012.
3. K.A Ganadhar, P.M Ramanathan " Electro magnetic Field Theory" Khanna Publishers,1997.

REFERENCE BOOKS

1. A.Pramanik, "Electro magnetism-Problems with solution", Prentice Hall India,2012.
2. G.W.Carter, "The electro magnetic field in its engineering aspects", Longmans, 1954.
3. W.J.Duffin, "Electricity and Magnetism", McGraw Hill Publication, 1980.
4. W.J.Duffin, "Advanced Electricity and Magnetism", McGraw Hill,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.

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ELECTRICAL AND ELECTRONICS ENGINEERING (R22)

B. Tech III Semester **L/T/P/C**
0/0/2/1

ANALOG ELECTRONICS LAB (D23PC5)

Pre requisites: concepts of Semiconductor Physics

Course Objectives:

1. To introduce components such as diodes, BJTs and FETs their switching characteristics,applications
2. Learn the concepts of high frequency analysis of transistors.
3. To give understanding of various types of basic and feedback amplifier circuits such as smallsignal, cascaded, large signal and tuned amplifiers.
4. To introduce the basic building blocks offline an integrated circuits.
5. To introduce the concepts of waveform generation and introduce some special function ICs.

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

1. Know the characteristics, utilization of various components.
2. Understand the biasing techniques
3. Design and analyze various rectifiers, small signal amplifier circuits.
4. Design sinusoidal and non-sinusoidal oscillators.
5. Design OP-AMP based circuits with linear integrated circuits.

Note: Any 12 Experiments are to be done.

List of Experiments:

1. Draw the VI Characteristics of given PN Junction diode. Determine the Static and Dynamic resistance of the Diode.
2. Determine the Ripple factor, % Regulation PIV and TUF of the given Rectifier with & withoutfilter.
3. Obtain the I/O Characteristics of CE configurations of BJT. Calculate h-parameters from theCharacteristics.
4. Obtain the I/O Characteristics of CB configurations of BJT. Calculate h-parameters from theCharacteristics.
5. Obtain the I/O Characteristics of CC configurations of BJT. Calculate h-parameters from the Characteristics.
6. Obtain the Drain and Transfer characteristics of CD, CS configuration of JFET. Calculate gm, rd from the Characteristics Adder and Subtractor using Op Amp
7. Inverting and Non-inverting Amplifiers using Op Amps
8. Adder and Subtractor using Op Amp
9. Integrator Circuit using IC 741.

10. Differentiator circuit using Op Amp.
11. Current Shunt Feedback amplifier
12. Design an RC phase shift oscillator circuit and derive the gain condition for oscillations practically for given frequency.
13. Design a Colpitts oscillator circuit for the given frequency and draw the output waveform.
14. Design transformer coupled class A power amplifier and draw the input and output waveforms, find its efficiency

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B.TECH- ELECTRICAL AND ELECTRONICS ENGINEERING (R22)

B. Tech III Semester **L/T/P/C**
0/0/2/1

ELECTRICAL MACHINES LAB-I (D23PC6)

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 fieldresistance and critical speed)
2. Load test on DC series generator (Determination of characteristics)
3. Speed control of DC shunt motor
4. Swinburne's test DC Machine
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 Shunt 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 thefollowing list are required to be conducted:

1. Retardation test on DC shunt motor (Determination of losses at rated speed)
2. Load test on DC compound generator
3. Hopkinson's test on DC shunt machines (Predetermination of efficiency)
4. Parallel operation of a two single phase transformers.
5. Load test on single phase transformers.

TEXT BOOKS:

1. A.E.Fitzgerald and C.Kingsley, "Electric Machinery", NewYork, McGrawHill Education, 2013.
2. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBSPublishers,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.Nagrathand D.P.Kothari, "Electric Machines", McGrawHill Education, 2010.
4. Electrical Machines lab manual by Dr.D.K.Chaturved

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ELECTRICAL AND ELECTRONICS ENGINEERING (R22)

B. Tech III Semester **L/T/P/C**
0/1/2/2

DATA STRUCTURES USING C PROGRAMMING LAB (D23PC7)

Course Objective:

Write and execute programs in C to solve problems using data structures such as arrays, linked lists, stacks, queues, trees, graphs, hash tables, search trees and implement various sorting and searching algorithms.

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

1. Identify the appropriate data structures and algorithms for solving real world problems. L2
2. Apply various searching and sorting techniques for solving the given problems L3
3. Apply various data structures such as stacks, queues, search trees, and hash tables to solve the computingproblems.L3
4. Implement different disjoint set operations and k-d trees.L3

C Programming Concepts
Review of C, input and output in C, functions in C-value parameters, reference parameters, Parameter passing, function overloading, function templates, Exceptions- throwing an exception and handling an exception, arrays, pointers, new and delete operators, class and object, access specifies, friend functions, constructors and destructor, Operator overloading, class templates, Inheritance and Polymorphism.

List of Programs to be performed during the Course

1. Write a C program that uses functions to perform the following:
   a) Create a singly linked list of integers.
   b) Delete a given integer from the above linked list.
   c) Display the contents of the above list after deletion.
2. Write a template based C program that uses functions to perform the following:
   a) Create a doubly linked list of elements.
   b) Delete a given element from the above doubly linked list.
   c) Display the contents of the above list after deletion.
3. Write a C program that uses stack operations to convert a given infix expression into its postfix equivalent, Implement the stack using an array.
4. Write a C program to implement a double ended queue ADT using an array, using a doublylinked list.

5. Write a C program that uses functions to perform the following:
    a) Create a binary search tree of characters.
    b) Traverse the above Binary search tree recursively in preorder, in order and postorder.
6. Write a C program that uses function templates to perform the following:
    a) Search for a key element in a list of elements using linear search.
    b) Search for a key element in a list of sorted elements using binary search.
7. Write a C program that implements Insertion sort algorithm to arrange a list of integers in ascending order.
8. Write a template based C program that implements selection sort algorithm to arrange a listof elements in descending order.
9. Write a template based C program that implements Quick sort algorithm to arrange a list ofelements in ascending order.
10. Write a C program that implements Heap sort algorithm for sorting a list of integers in ascending order.
11. Write a C program that implements Merge sort algorithm for sorting a list of integers in ascending order.
12. Write a C program to implement all the functions of a dictionary (ADT) using hashing.
13. Write a C program that implements Radix sort algorithm for sorting a list of integers in ascending order.
14. Write a C program that uses functions to perform the following:
    a) Create a binary search tree of integers.
    b) Traverse the above Binary search tree non-recursively in ignored.
15. Write a C program that uses functions to perform the following:
    a) Create a binary search tree of integers.
    b) Search for an integer key in the above binary search tree non-recursively.
    c) Search for an integer key in the above binary search tree recursively.
16. Write a C program to implement hashing using any hash function.
17. Write a C program to implement extendible hashing.

TEXT BOOKS:

1. Data structures, Algorithms and Applications in C++, 2nd Edition, Sartaj Sahni, Universities Press.
2. Data structures and Algorithms in C++, Adam Drozdek, 4th edition, Cengage learning

Reference Books:

1. Data structures with C++, J. Hubbard, Schaum's outlines, TMH.
2. Data structures and Algorithms in C++, M.T. Goodrich, R. Tamassia and D. Mount, Wiley India.
3. Data structures and Algorithm Analysis in C++, 3rd edition, M. A. Weiss, Pearson.
4. Classic Data Structures, D. Samanta, 2nd edition, PHI.

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ELECTRICAL AND ELECTRONICS ENGINEERING (R22)

B. Tech IV Semester **L/T/P/C**
3/1/0/4

SOLID MECHANICS AND HYDRAULIC MACHINES (D4ESHM)

Course Objectives:

1. To identify an appropriate structural system and work comfortably with basic engineering mechanics and types of loading & support conditions that act on structural systems.
2. To Understand the meaning of centers of gravity, centroids, moments of Inertia and rigid body dynamics.
3. To Study the characteristics of hydroelectric power plant and Design of hydraulic machinery.

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

1. Develop familiarity with the physical concepts and facility with the mathematical methods ofclassical mechanics.
2. Adapt the techniques for analyzing the forces in the bodies.
3. Develop and apply the concept of centroid, centre of gravity and moment of inertia.
4. Elaborate develop the various hydraulic machine in real time application.
5. Evaluate the various performance parameters of Centrifugal and Reciprocating pump.

UNIT–I:

INTRODUCTION OF ENGINEERING MECHANICS: Basic concepts of System of Forces- Coplanar Forces–Components in Space–Resultant- Moment of Forces and its Application – Couples and Resultant of Force System-Equilibrium of System of Forces- Free body diagrams- Direction of Force Equations of Equilibrium of Coplanar Systems and Spatial Systems – Vector cross product- Support reactions different beams for different types of loading – concentrated, uniformly distributed and uniformly varying loading. Typesof friction – Limiting friction – Laws of Friction – static and Dynamic Frictions – Angle of Friction –Cone of limiting friction

UNIT–II:

CENTROID AND CENTER OF GRAVITY: Centroids – Theorem of Pappus- Centroids of Composite figures – Centre of Gravity of Bodies – Area moment of Inertia:–polar Moment of Inertia–Transfer– Theorems - Moments of Inertia of Composite Figures.

SIMPLE STRESSES AND STRAINS ANALYSIS: Concept of stress and strain- St. Venant's Principle-Stress and Strain Diagram - Elasticity and plasticity – Types of stresses and strains- Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Pure shear and Complementary shear - Elastic moduli, Elastic constants and the relationship between them.

UNIT–III:

KINEMATICS & KINETICS: Introduction – Rectilinear motion – Motion with uniform and variable acceleration–Curvilinear motion– Components of motion– Circular motion Kinetics of a particle – D'Alembert's principle – Motion in a curved path – work, energy and power. Principleof conservation of energy – Kinetics of a rigid body in translation, rotation – work done – Principle of work-energy – Impulse-momentum.

UNIT-IV:

BASICS OF HYDRAULIC MACHINERY: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, Jet striking centrally and at tip, Velocity triangles at inlet and outlet, expressions for work done and efficiency Elements of a typical Hydropower installation – Heads and efficiencies

UNIT-V:

TURBINES & PUMPS: Classification of turbines – Pelton wheel – Francis turbine –Kaplan turbine –working, working proportions, velocity diagram, work done and efficiency, hydraulic design. Draft tube – Classification, functions and efficiency. Governing of turbines, Performance of turbines Pump installation details – classification – work done – Mano metric head – minimum starting speed –losses and efficiencies – specific speed. Multistage pumps – pumps in parallel

TEXT BOOKS:

1. M.V. Seshagirirao and Durgaih, "Engineering Mechanics", University Press.
2. P.N Modi and Seth, " Fluid Mechanics and Hydraulic Machinery", standard Book House

REFERENCE BOOKS:

1. B. Bhattacharya, "Engineering Mechanics", Oxford University Publications.
2. Hibbler, "Engineering Mechanics (Statics and Dynamics)", Pearson Education.
3. Fedrinand L. Singer, "Engineering Mechanics" Harper Collings Publishers.
4. A.K.Tayal, "Engineering Mechanics", Umesh Publication.
5. Domkundwar & Domkundwar, "Fluid mechanics & Hydraulic Machines", Dhanpat Rai & C
6. R.C.Hibbeler, "Fluid Mechanics", Pearson India Education Services Pvt. Ltd
7. D.S.Kumar, "Fluid Mechanic & Fluid Power Engineering", Kataria & Sons Publications Pvt.Ltd.
8. Banga & Sharma, "Hydraulic Machines" Khanna Publishers.

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ELECTRICAL AND ELECTRONICS ENGINEERING (R22)

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

DIGITAL ELECTRONICS (D24PC8)

COURSE OBJECTIVES:

1. To learn basic techniques for the design of digital circuits and fundamental concepts used inthe design of digital systems.
2. To understand common forms of number representation in digital electronic circuits and tobe able to convert between different representations.
3. To implement simple logical operations using combinational logic circuits
4. To impart to student the concepts of sequential circuits, enabling them to analyze sequentialsystems 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

CO1: Convert numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray, and BCD.

CO2: Realize simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.

CO3: Design and analyze of combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.

CO4: Design of sequential logic circuits and synthesizing of threshold functions.

CO5: 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 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.

UNIT –II:

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.

Minimization of Boolean Functions: 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.

UNIT –III:

Combinational circuits: Introduction, Adders, Subtractors, Multiplexers, Demultiplexers, Encoders, Decoders, code converters, Comparators and Hazards.

UNIT –IV:

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.

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

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.

REFERENCES BOOKS

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

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ELECTRICAL AND ELECTRONICS ENGINEERING (R22)

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

ELECTRICAL MACHNIES – II (D24PC9)

Prerequisite:
Basic Electrical Engineering, Electrical Machines-I

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 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 ofsynchronous generator.
4. Understand the parallel operation of synchronous machines and workingprinciple of synchronous motor.
5. Analyze the construction and working of single phase and special motors.

UNIT – I:

Poly- Phase Induction Machines: 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 Machines: 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:

Synchronous Machines:

Constructional Features of round rotor and salient pole machines – Armature windings – Integralslot 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 Machines:

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 statereactances.

Synchronous Motors – 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 Machines:: Single phase induction motor – Constructional features- Double revolving field theory – split-phase motors – shaded pole motor, Capacitorstart, 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, 7thedition, 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'

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ELECTRICAL AND ELECTRONICS ENGINEERING (R22)

B. Tech IV Semester **L/T/P/C**
3/1/0/4

CONTROL SYSTEMS (D24PC10)

Prerequisite: Linear Algebra and Calculus, Ordinary Differential Equations and Multivariable Calculus Laplace Transforms , Numerical Methods and Complex variables

COURSEOBJECTIVES:

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 to Control system: Concepts of Control Systems- Different examples of control systems - Classification of control systems, Open Loop and closed loop control systems and their differences- Feedback Characteristics, Effects of feedback. Mathematical modelling of Translational and Rotational mechanical systems.

Block diagram representation: Block diagram algebra – Representation by Signal flow graph – Reduction of SFG 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, Time response of second order systems synthesis & calculations - 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.

UNIT – IV:

Frequency Response Analysis: Introduction, Frequency domain specifications-Relationship between time and frequency response, Bode Plots, Polar Plots, Nyquist Stability Criterion. Compensation techniques – Introduction to Lag, Lead, and Lead- Lag 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 Observeability.

TEXTBOOKS:

1. B. C. Kuo, “Automatic Control System”, Prentice Hall, 1995.
2. I. J. Nagrath and M. Gopal, “Control Systems Engineering”, New Age International, 2009.

REFERENCE BOOKS:

1. M. Gopal, “Control Systems: Principles and Design”, McGraw Hill Education,1997
2. K. Ogata, “ Modern Control Engineering” , Prentice Hall, 1991.
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.

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ELECTRICAL AND ELECTRONICS ENGINEERING (R22)

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

POWER SYSTEM – II (D24PC11)

Prerequisites: Power Systems –I & Electro Magnetic Fields

Course Objectives:

1. To study the performance of transmission lines and travelling waves.
2. To understand the concept of voltage control, compensation methods and per unit representation of power systems.
3. To know the methods of overvoltage protection, Insulation coordination, Symmetrical components and fault calculation analysis.

Course Outcomes: After learning the contents of this paper the student must be able to

1. Analyze transmission line performance and Apply load compensation techniques to control reactive power.
2. Understand the application of per unit quantities in power systems.
3. Design over voltage protection, insulation coordination and determine the faultcurrents for symmetrical and unbalanced faults.

UNIT - I:

PERFORMANCE OF LINES: Representation of lines, short transmission lines, medium length lines, nominal T and PI- representations, long transmission lines. The equivalent circuit representation of a long Line, A, B, C, D constants, Ferranti Effect.

Corona: Introduction, disruptive critical voltage, corona loss, Factors affecting corona loss and methodsof reducing corona loss, Disadvantages of corona, interference between power and Communication lines.

UNIT-II:

VOLTAGE CONTROL & POWER FACTOR IMPROVEMENT: Introduction – methods of voltage control, shunt and series capacitors / Inductors, tap changing transformers, synchronous phase modifiers, power factor improvement methods.

COMPENSATION IN POWER SYSTEMS: Introduction - Concepts of Load compensation – Load ability characteristics of overhead lines – Uncompensated transmissionline – Symmetrical line – Radial line with asynchronous load – Compensation of lines.

UNIT-III:

PER UNIT REPRESENTATION OF POWER SYSTEMS: The one-line diagram, impedance and reactance diagrams, per unit quantities, changing the base of per unit quantities, advantages of per unit system.

TRAVELLING WAVES ON TRANSMISSION LINES: Production of travelling waves, open circuited line, short-circuited line, line terminated through a resistance, line connected to a cable, reflection and refraction at T-junction line terminated through a capacitance, capacitor connection at a T-junction, Attenuation of travelling waves.

UNIT-IV:

OVERVOLTAGE PROTECTION AND INSULATION COORDINATION: Over voltage due to arcing ground and Peterson coil, lightning, horn gaps, surge diverters, rod gaps, expulsion type lightning arrester, valve type lightning arrester, ground wires, ground rods, counter poise, surge absorbers, insulation coordination, volt-time curves.

UNIT-V:

SYMMETRICAL COMPONENTS AND FAULT CALCULATIONS: Significance of positive, negative and zero sequence components, Average 3-phase power in terms of symmetrical components, sequence impedances and sequence networks, fault calculations, sequence network equations, single line to ground fault, line to line fault, double line to ground fault, three phase fault, faults on power systems, faults with fault impedance, reactors and their location, short circuit capacity of a bus.

TEXT BOOKS:

1. C.L. Wadhwa, "Electrical Power Systems", New Age International Pub. Co, Third Edition, 2001.
2. D.P. Kothari and I.J. Nagrath, "Modern Power System Analysis", Tata Mc Graw Hill Pub. Co.,New Delhi, Fourth edition, 2011.

REFERENCE BOOKS:

1. Chakrabarti, M.L. Soni, P.V. Gupta, U.S. Bhatnagar, "A Text book on Power System Engineering", Dhanpat Rai Publishing Company (P) Ltd, 2008.
2. John J. Grainger & W.D. Stevenson, "Power System Analysis", Mc Graw Hill International,1994.
3. Hadi Scadat, "Power System Analysis", Tata Mc Graw Hill Pub. Co. 2002.
4. W.D. Stevenson, "Elements of Power system Analysis", McGraw Hill International Student Edi

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ELECTRICAL AND ELECTRONICS ENGINEERING (R22)

B. Tech IV Semester **L/T/P/C**
0/0/2/1

DIGITAL ELECTRONICS LAB (D24PC12)

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.
3. To study the theory and applications of 74XX combinational and sequential series IC's.

COURSE OUTCOMES:

On completion of this lab course the students will be able to:
CO1: Acquires the knowledge of 74XX IC's.
CO2: Design various combinational & sequential circuits using various Digital ICs.
CO3: Acquires the knowledge of differentiating between Linear and Digital IC's.
CO4: Acquires the knowledge of demonstrating by designing digital circuits

Note:

1. To perform any twelve experiments.
2. Verify the functionality of the IC in the given application.

LIST OF EXPERIMENTS

Design and Implementation of:

1. Study of logic gates.
2. Deign a 4-bit Gray to Binary and Binary to Gray Converter.
3. Design a 16 bit Adder/ Subtractor using 4-bit Adder /Subtractor IC's.
4. Design a 3*8 Decoder.
5. Design a16x4 priority encoder using two 8x3 priority encoder.
6. Design a 16*1 multiplexer using 8x1 multiplexer.
7. Design a 16bit comparator using 4 bit comparators.
8. Study of Flip flops.
9. Design an 8 bit parallel load and serial out shift register using two 4 bit shift register.
10. Design an 8 bit serial in and serial out shift register using two 4 bit shift register.
11. Deign a Ring counter and twisted ring counter using a 4-bit shift register.
12. Design a modulo counter using two decade counters.
13. Design a 4 digit hex counter using synchronous one digit hex counters.
14. Design a 4 digit hex counter using Asynchronous one digit hex counters.
15. Design a 4 bit pseudo random sequence generator using 4-bit ring counter.

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ELECTRICAL AND ELECTRONICS ENGINEERING (R22)

B. Tech IV Semester **L/T/P/C**
0/0/2/1

ELECTRICAL MACHINES LAB –II (D24PC13)

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 Inductionmotor
4. 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 estimating thechange by different methods
4. Control the active and reactive power flows in synchronous machines
5. Start different machines and control the speed and power factor

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

1. No-load & Blocked rotor tests on three phase Induction motor
2. Load test on three phase induction motor
3. Separation of core losses of three phase induction motor
4. Equivalent Circuit of a single phase induction motor
5. Regulation of a three –phase alternator by synchronous impedance & m.m.f. methods
6. Determination of Xd and Xq of a salient pole synchronous machine by dynamic slip test
7. V and Inverted V curves of a three phase synchronous motor.
8. 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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ELECTRICAL AND ELECTRONICS ENGINEERING (R22)

B. Tech IV Semester **L/T/P/C**
0/0/2/1

CONTROL SYSTEMS LAB (D24PC14)

Prerequisite: Control Systems

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, electricaldrives etc).
4. Test system controllability and Observability using state space representation and applicationsof 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, simpleBoolean 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 suitableSoftware.
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 suitableSoftware.
7. Evaluation of error constants using time response plots.

REFERENCE BOOKS AND SOFTWARE

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

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ELECTRICAL AND ELECTRONICS ENGINEERING (R22)

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

CONSTITUTION OF INDIA (MC002)

Course Objectives:
Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence ofnationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolutionin 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes:
Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP]under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution
4. Discuss the passage of the Hindu Code Bill of 1956.

UNIT - I
History of Making of the Indian Constitution- History of Drafting Committee. Philosophy of the Indian Constitution- Preamble Salient Features

UNIT - II
Contours of Constitutional Rights & Duties - Fundamental Rights

- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

UNIT - III

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

UNIT - IV

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO Zila Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

UNIT - V

Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested Reading:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.