SIDDHARTHAINSTITUTEOFENGINEERING&TECHNOLOGY
Vinobha Nagar, Ibrahimpatnam, RangaReddyDistrict501506
(Approved by AICTE, Affiliated to JNTUH, Accredited to NBA & NAAC)

B.Tech. in ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE STRUCTURE&SYLLABUS

ApplicablefromAY2023-24Batch

I Year I Semester

S.No.	Course Code	CourseTitle	L	T	P	Credits
1	MA101BS	MatricesandCalculus	3	1	0	4
2	CH102BS	EngineeringChemistry	3	1	0	4
3	EE103ES	CProgrammingandDataStructures	3	0	0	3
4	EE105ES	ElectricalCircuitAnalysis– I	3	0	0	3
5	ME105ES	Computer AidedEngineeringGraphics	1	0	4	3
6	EE106ES	ElementsofElectricalandElectronicsEngineering	0	0	2	1
7	CH107BS	EngineeringChemistryLaboratory	0	0	2	1
8	EE108ES	CProgrammingandDataStructuresLaboratory	0	0	2	1
9		InductionProgram				
		TotalCredits	**13**	**2**	**10**	**20**

I Year II Semester

S.No.	Course Code	CourseTitle	L	T	P	Credits
1	MA201BS	OrdinaryDifferentialEquationsandVectorCalculus	3	1	0	4
2	PH202BS	AppliedPhysics	3	1	0	4
3	ME203ES	EngineeringWorkshop	0	1	3	2.5
4	EN204HS	EnglishforSkillEnhancement	2	0	0	2
5	EE205ES	ElectricalCircuitAnalysis- II	2	0	0	2
6	PH207BS	AppliedPhysicsLaboratory	0	0	3	1.5
7	EN208HS	EnglishLanguageandCommunicationSkills Laboratory	0	0	2	1
8	EE206ES	AppliedPythonProgrammingLaboratory	0	1	2	2
9	EE209ES	ElectricalCircuitAnalysisLaboratory	0	0	2	1
10	*MC210	EnvironmentalScience	3	0	0	0
		TotalCredits	**13**	**2**	**14**	**20**

II YEAR I SEMESTER

S.No.	Course Code	CourseTitle	L	T	P	Credits
1	MA301BS	NumericalMethodsandComplexvariables	3	1	0	4
2	EE302PC	PowerSystem-I	3	0	0	3
3	EE303PC	AnalogElectronicCircuits	3	0	0	3
4	EE304PC	ElectricalMachines-I	3	1	0	4
5	EE305PC	ElectroMagneticFields	3	0	0	3
6	EE306PC	ElectricalMachinesLaboratory-I	0	0	2	1
7	EE307PC	AnalogElectronicCircuitsLaboratory	0	0	2	1
8	EE308PC	ElectricalSimulationtoolsLaboratory	0	0	2	1
9	*MC310	GenderSensitizationLaboratory	0	0	2	0
		TotalCredits	**15**	**2**	**08**	**20**

II YEAR II SEMESTER

S.No.	Course Code	CourseTitle	L	T	P	Credits
1	EE401ES	SolidMechanics &HydraulicMachines	3	1	0	4
2	EE402PC	MeasurementsandInstrumentation	3	0	0	3
3	EE403PC	ElectricalMachines–II	3	0	0	3
4	EC404PC	DigitalElectronics	2	0	0	2
5	EE405PC	PowerSystem-II	3	0	0	3
6	EE406PC	DigitalElectronicsLaboratory	0	0	2	1
8	EE407PC	MeasurementsandInstrumentationLaboratory	0	0	2	1
9	EE408PC	ElectricalMachinesLaboratory-II	0	0	2	1
10	EE409PC	Real-timeResearchProject/FieldBasedProject	0	0	4	2
11	*MC410	ConstitutionofIndia	3	0	0	0
		TotalCredits	**17**	**1**	**10**	**20**

ELECTRICALCIRCUIT ANALYSIS–I

B.Tech. I Year I Sem.

L	T	P	C
3	0	0	3

Prerequisites:Mathematics

CourseObjectives:

- Togainknowledgein circuitsandtounderstandthefundamentalsofderivedcircuitlaws.
- Tolearnsteadystateandtransientanalysisofsinglephaseand3-phase circuits.
- TounderstandTheoremsandconceptsof coupledcircuits.

CourseOutcomes: Afterlearningthecontentsofthispaper thestudentmustbeableto

- Understandnetworkanalysis,techniquesusingmeshandnodeanalysis.
- EvaluatesteadystateandtransientbehaviorofcircuitsforDCandACexcitations.
- Analyzeelectriccircuitsusingnetworktheoremsandconceptsofcoupledcircuits.

CourseObjectives	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Togainknowledgeincircuits and to understand the Fundamentals of derivedcircuitlaws.	3	3	3	3	3	3	1	1	2	2	1	3
Tolearnsteadystateand transient analysisofsingleandthree Phasecircuits.	3	2	3	2	3	3	2	2	2	3	2	3
To understand Theorems and concepts of coupledCircuits.	3	2	3	1	3	3	1	1	2	2	2	3

CourseOutcomes	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Understand networkanalysis, techniques usingmeshandnodeanalysis.	3	3	3	3	3	3	3	1	2	1	1	2
Evaluatesteadystateand transient behaviourofcircuitsfor DCand ACexcitations.	3	3	3	3	3	3	3	3	3	3	2	3
Analyse electric circuitsusingnetworktheorems and conceptsofcoupledcircuits.	3	2	2	2	3	3	3	2	1	3	3	2

UNIT-I:

Network Elements & Laws: Active elements, Independent and dependent sources. Passive elements— R, L and C, Energy stored in inductance and capacitance, Kirchhoff's laws, Source transformations, Star-delta transformations, Node voltage method, Mesh current method including super node and super mesh analysis.

UNIT-II:

Single-Phase Circuits: RMS and average values of periodic sinusoidal and non- sinusoidal waveforms, Phasorrepresentation, Steady-state response ofseries, parallel and series-parallel circuits. Impedance, Admittance, Current locus diagrams of RL and RC series and parallel circuits with variation of various parameters. Resonance: Series and parallel circuits, Band width and Q-factor.

UNIT-III:

Network theorems: Superposition theorem, Thevinin's theorem, Norton's theorems, Maximum power Transfer theorem, Tellegen's theorem, Compensation theorem, Milliman's theorem and Reciprocity theorem. (AC & DC).

UNIT-IV:

Poly-phaseCircuits: Analysis of balanced and unbalanced 3-phase circuits, Star and delta connections, Measurement of three-phase power for balanced and unbalanced loads.

UNIT-V:

Coupled circuits: Concept of self and mutual inductance, Dot convention, Coefficient of coupling, Analysis of circuits with mutual inductance.

Topological Description of Networks: Graph, tree, chord, cut-set, incident matrix, circuit matrix and cut-set matrix,

TEXTBOOKS:

1. VanValkenburgM.E,"NetworkAnalysis",PrenticeHallofIndia,3rdEdition,2000.
2. RavishRSingh,"NetworkAnalysisandSynthesis", McGrawHill, 2ndEdition,2019.

REFERENCEBOOKS:

1. B. Subramanyam,"ElectricCircuitAnalysis",DreamtechPress&Wiley,2021.
2. JamesW.Nilsson,SusanA.Riedel,"ElectricCircuits",Pearson,11thEdition,2020.
3. ASudhakar,ShyammohanSPalli,"CircuitsandNetworks:AnalysisandSynthesis",McGrawHill,5thEdition,2017.
4. JaganN.C,LakshrninarayanaC.,"NetworkAnalysis",B.S.Publications,3rdEdition,2014.
5. William Hayt H,Kimmerly Jack E. and Steven Durbin M, "Engineering Circuit Analysis", McGrawHill,6th Edition,2002.
6. ChakravarthyA.,"CircuitTheory",DhanpatRai&Co., FirstEdition,1999.

ELEMENTSOFELECTRICALANDELECTRONICSENGINEERING

B.Tech. IYearISem. **L T P C**
0 0 2 1

Prerequisites:ElementsofElectricalEngineering

CourseObjectives:

- To measure the electricalparameters fordifferent types ofDC and AC circuits using conventional and theorems approach.
- TostudythetransientresponseofvariousR,LandCcircuitsusingdifferentexcitations.
- TodeterminetheperformanceofdifferenttypesofDCmachinesandTransformers.

CourseOutcomes: Afterlearningthecontentsofthispaper thestudentmustbeableto

- VerifythebasicElectricalcircuitsthroughdifferentexperiments.
- Evaluate the performance calculations of Electrical Machines and Transformers through various testing methods.
- AnalyzethetransientresponsesofR,LandCcircuitsfordifferentinputconditions.

CourseObjectives	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
To measure the electricalparametersfordifferenttypesofDCandACcircuits using conventional and theoremsapproach	3	2	1		2	0	0	1	2	0	1	2
Tostudythetransientresponse of various R, LandCcircuitsusing differentexcitations	3	2	1	1	3	0	0	0	2	0	1	1
Todeterminetheperformance ofdifferenttypesofDCmachines and Transformers	3	2	0		3	0	0	0	1	2	1	1

CourseOutcomes	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Verify the basic Electrical circuits through different experiments	3	2	1	0	1	0	0	0	2	0	2	2
Evaluate the performance calculations of Electrical Machinesand Transformers throughvarioustesting methods	3	2	1	0	3	1	0	1	1	2	1	2
Analysethetransientresponses of R, L and Ccircuitsfordifferent inputconditions	3	2	1	1	3	2	0	0	1	0	2	2

Listofexperiments/demonstrations:

PART-A(compulsory)

1. VerificationOhm'sLaw
2. VerificationofKVLandKCL
3. VerificationofThevenin'sandNorton'stheorem

4. VerificationofSuperpositiontheorem
5. CalculationsandVerificationofImpedanceandCurrentofRL,RCandRLCseriescircuits
6. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
7. PerformanceCharacteristicsofaDCShuntMotor
8. Open Circuitand ShortCircuitTestson 1-phaseTransformer

PART-B (anytwoexperimentsfromthegivenlist)

1. Load TestonSinglePhaseTransformer (CalculateEfficiencyandRegulation)
2. VerificationofReciprocityandMilliman'sTheorem.
3. VerificationofMaximumPowerTransferTheorem.
4. Determinationofformfactorfornon-sinusoidal waveform
5. TransientResponseof SeriesRLandRC circuitsforDCexcitation

TEXTBOOKS:

1. D.P.KothariandI.J.Nagrath,"BasicElectricalEngineering",TataMcGrawHill,4th Edition,2019.
2. MSNaiduandSKamakshaiah,"BasicElectricalEngineering",TataMcGrawHill,2nd Edition,2008.

REFERENCEBOOKS:

1. P.Ramana,M.Suryakalavathi, G.T.Chandrasheker,"BasicElectricalEngineering",S.Chand,2nd Edition,2019.
2. D.C.Kulshreshtha,"BasicElectricalEngineering",McGrawHill,2009
3. M.S.Sukhija,T.K.Nagsarkar,"BasicElectricalandElectronicsEngineering",Oxford,1st Edition,2012.
4. AbhijitChakrabarthi,SudiptaDebnath,ChandanKumarChanda,"BasicElectricalEngineering",2nd Edition, McGrawHill, 2021.
5. L.S.Bobrow,"FundamentalsofElectrical Engineering", OxfordUniversityPress,2011.
6. E.Hughes,"ElectricalandElectronicsTechnology",Pearson,2010.
7. V. D.Toro,"ElectricalEngineeringFundamentals",PrenticeHall India,1989.

ELECTRICALCIRCUITANALYSIS–II

B.Tech.IYear IISem. **L T P C**
2 0 02

Prerequisites:Mathematics

CourseObjectives:

- TostudythetransientanalysisofvariousR,LandCcircuitsfordifferent inputs
- TounderstandtheFourierseriesandLaplacetransformation.
- Tolearnabouttwo-port networksandconceptoffilters.

CourseOutcomes: Afterlearningthecontentsofthispaper thestudentmustbeableto

- ObservetheresponseofvariousR,LandCcircuitsfor differentexcitations.
- Examine the behavior of circuits using Fourier, Laplace transforms and transfer function of single port network.
- Obtaintwoportnetworkparametersandapplicationsanddesignofvariousfilters.

CourseObjectives	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Tostudythetransientanalysisofvarious R,LandCcircuitsfordifferentinputs	3	3	3	3	3	3	1	1	2	2	1	3
TounderstandtheFourierseriesandLaplace transformation.	3	2	3	2	3	3	2	2	2	3	2	3
Tolearnabouttwo-portnetworksandconcept offilters.	3	2	3	1	3	3	1	1	2	2	2	3

CourseOutcomes	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Observe the responseof variousR,LandCcircuits fordifferentexcitations	3	3	3	3	3	3	3	1	2	1	1	2
ExaminethebehaviorofcircuitsusingFourier,Laplacetransformsandtransferfunctionofsingleportnetwork.	3	3	3	3	3	3	3	3	3	3	2	3
Obtaintwoportnetwork parametersandapplications and designofvarious filters.	3	2	2	2	3	3	3	2	1	3	3	2

UNIT-I:

Transient analysis: Transient response of R, L & C circuits, Formulation of integral differential equations,Initial conditions, Transient Response of RL, RC and RLC (series and parallel) networks subjected to internalenergy,Responsetoimpulse, step,andramp, exponentialandsinusoidalexcitations.

UNIT-II:

Electrical circuit Analysis using Laplace Transforms: Application of Laplace Transforms to RL, RCand RLC(seriesandparallel)Networksforimpulse,step,andramp,exponential andsinusoidalexcitations.

UNIT-III:

Two port network parameters: Open circuit impedance, short-circuit admittance, Transmission, Hybrid parameters & inter-relationships, Series, parallel andcascade connection of two port networks, System function, and Impedance and admittance functions.

UNIT-IV:

FourierSeriesandIntegral: Fourierseriesrepresentationofperiodicfunctions,Symmetryconditions,ExponentialFourierseries,Discretespectrum,Fourierintegralanditsproperties,Continuousspectrum,Applicationtosimplenetworks

UNIT-V:

Filters: Classification of filters – Low pass, High pass, Band pass and Band Elimination, Constant-k and M-derived filters-Low pass and High pass Filters and Band pass and Band elimination filters (Elementary treatmentonly)

TEXTBOOKS:

1. VanValkenburgM.E,"NetworkAnalysis",PrenticeHallofIndia,3rdEdition,2000.
2. RavishRSingh,"NetworkAnalysisandSynthesis", McGrawHill, 2ndEdition,2019.

REFERENCEBOOKS:

1. B. Subramanyam,"ElectricCircuitAnalysis",DreamtechPress&Wiley,2021.
2. JamesW.Nilsson,SusanA.Riedel,"ElectricCircuits",Pearson,11thEdition,2020.
3. ASudhakar,ShyammohanSPalli,"CircuitsandNetworks:AnalysisandSynthesis",McGrawHill,5thEdition,2017.
4. JaganN.C,LakshrninarayanaC.,"NetworkAnalysis",B.S.Publications,3rdEdition,2014.
5. WilliamHaytH,KimmerlyJackE.andStevenDurbinM,"EngineeringCircuitAnalysis",McGrawHill,6th Edition,2002.
6. ChakravarthyA.,"CircuitTheory",DhanpatRai&Co., FirstEdition,1999.

ELECTRICALCIRCUITANALYSISLABORATORY

B.Tech.IYear IISem.

L	T	P	C
0	0	2	1

Prerequisites:ElementsofElectricalEngineering&ElectricalCircuitAnalysis

CourseObjectives:

- TodesignelectricalsystemsandanalyzethembyapplyingvariousNetworkTheorems
- TomeasurethreephaseActiveandReactivepower.
- Tounderstand thelocusdiagramsandconceptofresonance.

CourseOutcomes: Afterlearningthecontentsofthispaper thestudentmustbeableto

- AnalyzecomplexDCandAClinearcircuits
- Applyconceptsofelectricalcircuitsacrossengineering
- Evaluateresponseofagivennetworkbyusingtheorems.

CourseObjectives	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Todesignelectricalsystemsandanalysethembyapplying various NetworkTheorems	2	1	2	2	2	2	2	1	1	1	2	3
TomeasurethreephaseActiveandReactivepower	2	1	2	2	2	2	2	1	1	1	2	3
Tounderstandthelocusdiagramsandconcept of resonance.	2	1	2	2	2	2	2	1	1	1	2	3

CourseOutcomes	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
AnalysecomplexDCandAClinearcircuits.	2	1	2	2	2	2	2	1	2	1	2	3
Applyconceptsofelectrical circuitsacrossengineering	2	1	2	2	2	2	2	1	2	1	2	3
Evaluate responseof agiven network by usingtheorems.	2	1	2	2	2	2	2	1	2	1	2	3

Thefollowingexperimentsarerequiredtobeconductedascompulsory

1. TodrawthelocusDiagramsofRL(R-Varying)andRC(R-Varying)SeriesCircuits.
2. VerificationofSeriesandParallelResonance.
3. DeterminationofTimeresponseoffirstorderRLandRCcircuitforperiodicnon–sinusoidalinputs–TimeConstantandSteadystateerror.
4. DeterminationofTwoportnetworkparameters–Z&Yparameters.
5. DeterminationofTwoportnetworkparameters–A,B,C,Dparameters.
6. DeterminationofCo-efficientofCouplingandSeparationofSelfandMutualinductanceinaCoupledCircuits.
7. FrequencydomainanalysisofLow-passfilter.
8. FrequencydomainanalysisofBand-passfilter.

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

1. Harmonic Analysis of non-sinusoidal wave form signals using Harmonic Analyzer and plotting frequency spectrum.

2. MeasurementofActivePowerforStarandDeltaconnectedbalancedloads.
3. MeasurementofReactivePowerforStarandDeltaconnectedbalancedloads.
4. FrequencydomainanalysisofHigh-passfilter.
5. DeterminationofTwoportnetworkparameters-Hybridparameters.
6. TodrawthelocusDiagramsofRL(L-Varying)andRC(C-Varying)SeriesCircuits.
7. Determination ofTimeresponseoffirstorderRLCcircuitforperiodicnon–sinusoidalinputs –TimeConstantandSteadystateerror.

TEXTBOOKS:

1. VanValkenburgM.E,"NetworkAnalysis",PrenticeHallofIndia,3rdEdition,2000.
2. RavishRSingh,"NetworkAnalysisandSynthesis", McGrawHill, 2ndEdition,2019.

REFERENCEBOOKS:

1. B. Subramanyam,"ElectricCircuitAnalysis",DreamtechPress&Wiley,2021.
2. JamesW.Nilsson,SusanA.Riedel,"ElectricCircuits",Pearson,11thEdition,2020.
3. ASudhakar,ShyammohanSPalli,"CircuitsandNetworks:AnalysisandSynthesis",McGrawHill,5thEdition,2017.
4. JaganN.C,LakshrninarayanaC.,"NetworkAnalysis",B.S.Publications,3rdEdition,2014.
5. WilliamHaytH,KimmerlyJackE.andStevenDurbinM,"EngineeringCircuitAnalysis",McGrawHill,6th Edition,2002.
6. ChakravarthyA.,"CircuitTheory",DhanpatRai&Co., FirstEdition,1999.

POWER SYSTEM-I

B.Tech.IIYearISem. **L T P C**
3 0 0 3

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

CourseObjectives:

- Tounderstandthepowergenerationthroughconventionalandnon-conventional sources.
- Toillustratetheeconomicaspectsofpowergenerationandtariffmethods.
- Toknowaboutoverheadlineinsulators,substationsandAC&DCdistributionsystems.

CourseOutcomes: Afterlearningthecontentsofthispaper thestudentmustbeableto

- Understandtheoperationofconventionalandrenewableelectricalpowergeneratingstations.
- Evaluatethepowertariffmethodsand Economicsassociated withpowergeneration.
- AnalyzetheoperationsofAIS&GIS,InsulatorsandDistributionsystems.

CourseObjectives	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
To understand thepower generationthrough conventionaland non-conventionalsources	3	3	3	1	1	3	2	3	1	1	2	2
To illustrate theeconomicaspectsof powergenerationandtariffmethods	3	3	2	1	1	3	2	2	1	1	2	1
To know about overhead line insulators, substationsandAC& DC distribution systems	3	3	2	1	1	3	2	3	1	1	1	1

CourseOutcomes	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Understand the operation of conventional andrenewable electricalpower generatingstations	3	3	2	1	1	3	2	2	2	1	2	1
Evaluatethepowertariff methodsandEconomics associated with powergeneration	3	3	2	1	1	3	2	3	2	1	2	1
Analyse the operationsofAIS & GIS,InsulatorsandDistributionsystems	3	3	3	3	1	2	2	2	1	1	1	1

UNIT-I:

GENERATIONOFELECTRICPOWER:

Conventional Sources (Qualitative): Hydro station, Steam Power Plant, Nuclear Power Plant and Gas Turbine 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 andthree 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 ofsuspension insulators,Methodsofequalizingthepotential,testingofinsulators,Sagandtensioncalculations.

UNIT-IV:

SUBSTATIONS:

AIR INSULATED SUBSTATIONS (AIS): Indoor & Outdoor substations: Substations layout showing thelocation of all the substation equipment. Bus bar arrangements in the Sub-Stations: Simple arrangements likesinglebus bar,sectionalizedsinglebusbar,mainandtransferbusbarsystemwithrelevantdiagrams.

GAS INSULATED SUBSTATIONS (GIS): Advantages of Gas insulated substations, different types of gasinsulated 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 Gas insulated substations.

UNIT-V:

DC DISTRIBUTION: Classification of Distribution Systems. - Comparison of DC vs. AC and Under-Groundvs. Over- Head Distribution Systems. - Requirements and Design features of Distribution Systems. - VoltageDrop 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 bararrangement,Selectionofsiteforsubstation.VoltageDropCalculations(NumericalProblems)in

A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and with respect torespectiveloadvoltages.

TEXTBOOKS:

1. C.L.Wadhwa,"Generation,DistributionandUtilizationofElectricalEnergy",2nd Edition,NewAgeInternational, 2009.
2. V.KMehtaandRohitMehta,"PrinciplesofPowerSystems",S.Chand&Company Ltd,NewDelhi,2004.

REFERENCEBOOKS:

1. A.Chakrabarti,M.L.Soni,P.V.Gupta,U.S.Bhatnagar,"ATextbookonPower SystemEngineering",DhanpatRaiPublishingCompany(P)Ltd, 2008.
2. C.L.Wadhwa,"ElectricalPowerSystems",5th Edition,NewAgeInternational,2009.
3. M.V. Deshpande,"ElementsofElectricalPowerStationDesign",3rd Edition,WheelerPub.1998.
4. H.Cotton&H.Barber,"TheTransmissionandDistributionofElectricalEnergy",3rd Edition,1970.
5. W.D.Stevenson,"ElementsofPowerSystemAnalysis",4th Edition,McGrawHill,1984.

ELECTRICALMACHINES- I

B.Tech.IIYearISem. **L T P C**
3 1 0 4

Prerequisites:Electrical CircuitAnalysis-1&ElectricalCircuitAnalysis-2

CourseObjectives:

- TostudyandunderstanddifferenttypesofDCmachinesandtheirperformanceevaluationthroughvarioustes tingmethods.
- Tounderstandtheoperationofsingleandploy-phaseTransformers
- Toanalyzethe performanceoftransformersthroughvarioustestingmethods.

CourseOutcomes: Afterlearningthecontentsofthispaper thestudentmustbeableto

- IdentifydifferentpartsofaDCmachines&understandtheiroperation.
- Carryoutdifferent excitation,starting,speedcontrolmethodsandtestingofDCmachines.
- Analyzesingle&threephasetransformersandtheir performancethroughtesting.

CourseObjectives	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
To study andunderstand differenttypes of DCmachinesan dtheirperformanceevalua tion through various testing methods.	3	2	3	1	1	1	3	1	2	1	2	3
To understand theoperationofsin gleand ploy-phaseTransformers	3	3	3	2	2	1	3	1	2	2	2	3
To analyse the performance of transformersthrough various testing methods	3	2	3	2	2	2	3	1	2	1	3	3

CourseOutcomes	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Identifydifferentpartsof aDCmachines& understand theiroperation	2	2	2	3	3	2	1	1	3	3	3	3
Carry out differentexcitat ion, starting, speed control methodsandtesting ofDCmachines	2	1	3	1	2	3	3	1	3	2	2	3
Analyse single &three phase transformers and their performance throughtesting	1	1	2	1	1	3	3	1	3	3	3	3

UNIT-I:

D.C. GENERATORS: Principle of operation – Action of commutator – constructional features – armaturewindings – lap and wave windings – simplex and multiplex windings – use of laminated armature – E. M.FEquation.

Armature reaction – Cross magnetizing and de-magnetizing AT/pole – compensating winding – commutation – reactancevoltage –methodsofimprovingcommutation.

Methods of Excitation – separately excited and self-excited generators – build-up of E.M.F - critical fieldresistance and critical speed - causes for failure to self-excited and remedial measures. Load characteristics and applications of shunt, series and compound generators.

UNIT-II:

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) Testingof D.C. machines - Losses – Constant &Variablelosses–calculationofefficiency–conditionformaximumefficiency.

UNIT-III:

TESTING OF DC MACHINES: Methods of Testing–direct, indirect, and regenerative testing– Braketest–Swinburne'stest–Hopkinson'stest–Field'stest-separationofstraylossesinaD.C.motortest.

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 and Applications. 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: Open Circuit and Short Circuit tests - Sumpner's test - predetermination of efficiency and regulation-separation of losses test- paralleloperation 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, Scott connection and Applications.

TEXTBOOKS:

1. P.S.Bimbhra,"ElectricalMachinery",KhannaPublishers,2011.
2. I.J.NagrathandD.P.Kothari,"ElectricMachines",McGrawHillEducation,2010.

REFERENCEBOOKS:

1. PrithwirajPurkait,IndrayudhBandyopadhyay, "ElectricalMachines",Oxford,2017.
2. M. G.Say,"PerformanceanddesignofACmachines",CBSPublishers,2002.
3. A.E.FitzgeraldandC.Kingsley,"ElectricMachinery",NewYork,McGrawHillEducation,2013.
4. A.E.ClaytonandN.N.Hancock,"PerformanceanddesignofDCmachines",CBSPublishers,2004.

ELECTROMAGNETICFIELDS

B.Tech.IIYearISem. **LT PC**
3 0 03

Prerequisites:Mathematics&AppliedPhysics

CourseObjectives:

- Tointroducetheconceptsofelectricfieldandmagneticfield.
- ToknowApplicationsofelectricandmagneticfieldsinthedevelopmentofthetheoryforpowertransmi ssionlinesandelectricalmachines.
- Tostudyaboutelectromagneticwaves.

CourseOutcomes: Afterlearningthecontentsofthispaper thestudentmustbeableto

- Understandthebasiclawsofelectromagnetismandtheirapplications.
- Analyzetimevaryingelectricandmagneticfields.
- UnderstandthepropagationofEMwaves.

CourseObjectives	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Tointroducetheconcepts of electricfieldandmagneti c field	3	1	1	1	3	3	3	1	1	1	0	3
ToknowApplicationsofe lectricand magneticfields in thedevelop mentofthetheoryforpow er transmissionlinesandele ctrical machines.	3	3	2	2	2	3	0	1	1	1	0	2
To study aboutelectroma gneticwaves	3	3	1	2	2	2	0	1	1	1	1	2

CourseOutcomes	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Understandthebasiclaws of electromagnetismandt heirapplications	3	3	3	3	3	3	3	3	1	1	1	2
Analyzetimevarying electricandmagneticfi elds.	3	3	3	1	1	3	2	3	1	1	3	0
Understand the propagationofEM waves	3	2	2	2	3	3	3	2	1	3	3	1

UNIT-I:

STATIC ELECTRIC FIELD: Review of conversionof a vectorfrom one coordinate system to anothercoordinate system, Coulomb's law, Electricfield intensity, Electrical field due to point charges. Line,SurfaceandVolumechargedistributions.Gausslawanditsapplications.AbsoluteElectricpotential,potentialdiffe rence, Calculation of potential differences for different configurations. Electric dipole, Electrostatic EnergyandEnergydensity.

UNIT-II:

CONDUCTORS, DIELECTRICS AND CAPACITANCE: Current and current density, Ohms Law in Pointform,Continuityequation,Boundaryconditionsofconductorsanddielectricmaterials.Capacitance,Capacitance of a two-wire line, Poisson's equation, Laplace's equation, Solution of Laplace and Poisson'sequation.

UNIT-III:

STATIC MAGNETIC FIELDS AND MAGNETIC FORCES: Biot-Savart Law, Ampere Law, Magnetic fluxand magnetic flux density, Scalar and Vector Magnetic potentials. Steady magnetic fields produced by current carrying conductors.

Force on a moving charge, Force on a differential current element, Force between differential current elements,Magneticboundaryconditions, Magneticcircuits,Self-inductancesandmutualinductances.

UNIT-IV:

TIMEVARYINGFIELDSANDMAXWELL'SEQUATIONS: Faraday'slawforElectromagneticinduction, Displacement current,Point form of Maxwell's equation, Integral form of Maxwell's equations,MotionalElectromotiveforces.

UNIT-V:

ELECTROMAGNETIC WAVES: Derivation of Wave Equation, Uniform Plane Waves, Maxwell's equationin Phasor form, Wave equation in Phasor form, Plane wave in free space and in a homogenous material. Waveequation for a conducting medium, Plane waves in lossy dielectrics, Propagation in good conductors. Poyntingtheorem.

TEXTBOOKS:

1. M.N.O. Sadiku,"ElementsofElectromagnetics",OxfordUniversityPublication,2014.
2. W.Hayt,"EngineeringElectromagnetics",McGrawHillEducation,2012.

REFERENCEBOOKS:

1. A.Pramanik,"Electromagnetism-Problemswithsolution",PrenticeHallIndia,2012.
2. G.W.Carter,"Theelectromagneticfieldinitsengineeringaspects",Longmans,1954.
3. W.J.Duffin,"ElectricityandMagnetism",McGrawHillPublication,1980.
4. W.J.Duffin,"AdvancedElectricityandMagnetism",McGrawHill,1968.
5. E.G.Cullwick,"TheFundamentalsofElectromagnetism",CambridgeUniversityPress,1966.
6. B.D.Popovic,"IntroductoryEngineeringElectromagnetics",Addison-WesleyEducationalPublishers,InternationalEdition,1971.
7. A.Pramanik,"Electromagnetism-Theoryandapplications", PHILearningPvt. Ltd,NewDelhi,2009.

ELECTRICALMACHINESLABORATORY–I

B.Tech.IIYearISem. **LT PC**
0 0 21

Prerequisites:ElectricalMachines- I

CourseObjectives:

- Toexpose thestudentstotheoperationofDCGenerators.
- Toknowtheoperation ofvarioustypes of DCMotors.
- ToexaminetheperformanceofSingleandThreePhase Transformers.

CourseOutcomes: Afterlearningthecontentsofthispaper thestudentmustbeableto

- StartandcontroltheDifferentDCMachines.
- Assesstheperformanceofdifferentmachinesusingdifferenttestingmethods
- EvaluatetheperformanceofdifferentTransformersusingdifferenttestingmethods

CourseObjectives	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Toexposethestudentsto theoperationofDCGenerators	3	3	3	3	3	3	1	1	2	2	1	3
To know theoperationof various typesofDCMotors.	3	2	3	2	3	3	2	2	2	3	2	3
ToexaminetheperformanceofSingleandThreePhase Transformers	3	2	3	1	3	3	1	1	2	2	2	3

CourseOutcomes	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Startandcontrolthe Different DC Machines	3	3	3	3	3	3	3	1	2	1	1	2
Assess the performance ofdiffe rent machinesusingdifferent testing methods	3	3	3	3	3	3	3	3	3	3	2	3
Evaluate the performance of differentTransformers using different testing methods	3	2	2	2	3	3	3	2	1	3	3	2

Thefollowingexperimentsarerequiredtobeconductedcompulsoryexperiments:

1. MagnetizationcharacteristicsofDCshuntgenerator(Determinationofcriticalfieldresistanceandcritical speed)
2. LoadtestonDCshuntgenerator(Determinationofcharacteristics)
3. LoadtestonDCseriesgenerator(Determinationofcharacteristics)
4. Hopkinson'stestonDC shuntmachines(Predetermination ofefficiency)
5. Swinburne'stestandspeedcontrol ofDCshuntmotor(Predeterminationofefficiencies)
6. BraketestonDCcompoundmotor(Determinationofperformancecurves)
7. OCandSCTestonSinglePhaseTransformer
8. ThreePhaseTransformer:VerificationofRelationshipbetweenVoltagesandCurrents(Star-Delta,Delta-Delta, Delta-star,Star-Star)

Inadditiontotheaboveeightexperiments,atleastanytwooftheexperimentsfromthefollowinglistarerequiredtobeconducted:

1. Braketest onDCshuntmotor(Determinationofperformancecurves)
2. Loadteston DCcompound generator(Determination ofcharacteristics.
3. FieldstestonDCseriesmachines(Determinationofefficiency)
4. Retardationtest onDCshuntmotor(Determinationoflossesatratedspeed)
5. Separationoflossesin DCshuntmotor.
6. MeasurementofVoltage,CurrentandRealPowerinprimaryandSecondaryCircuitsofaSingle-PhaseTransformer
7. LoadTestonSinglePhaseTransformer(CalculateEfficiencyandRegulation)

TEXTBOOKS:

1. P.S.Bimbhra,"ElectricalMachinery",KhannaPublishers,2011.
2. I.J.NagrathandD.P.Kothari,"ElectricMachines",McGrawHillEducation,2010.

REFERENCEBOOKS:

1. PrithwirajPurkait,IndrayudhBandyopadhyay, "ElectricalMachines",Oxford,2017.
2. M. G.Say,"PerformanceanddesignofACmachines",CBSPublishers,2002.
3. A.E.FitzgeraldandC.Kingsley,"ElectricMachinery",NewYork,McGrawHillEducation,2013.
4. A.E.ClaytonandN.N.Hancock,"PerformanceanddesignofDCmachines",CBSPublishers,2004.

ELECTRICALSIMULATIONTOOLSLABORATORY

B.Tech.IIYearISem. **L T P C**
0 0 2 1

CourseObjectives:

- Tounderstandbasicblocksetsofdifferentsimulationplatformusedinelectrical/electroniccircuitdesign.
- Tounderstanduseandcodingindifferentsoftwaretoolsusedinelectrical/electroniccircuitdesign.
- Tounderstandthesimulation ofelectricmachines/circuitsforperformanceanalysis.

CourseOutcomes: Afterlearningthecontentsofthispaper thestudentmustbeableto

- Developknowledgeofsoftwarepackagestomodelandprogramelectricalandelectronicssystems.
- Modeldifferentelectricaland electronicsystemsandanalyzetheresults.
- Articulate importance of software packages used for simulation in laboratory experimentationbyanalyzingthesimulationresults.

CourseObjectives	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Tounderstandbasicblock setsofdifferentsimulation platform used in electrical/electroniccircui tdesign	3	3	3	3	3	3	2	2	1	2	2	1
Tounderstanduseandcodi ngindifferentsoftwaretoo lsusedin electrical/ electroniccircuitdesi gn	3	3	3	1	1	3	1	2	1	2	2	1
To understand thesimulationofel ectricmachines/circuitsfo rperformanceanalysis	3	3	2	1	2	3	2	1	2	1	2	3

CourseOutcomes	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Developknowledgeofsof twarepackagestomodela ndprogramelectrical and electronicssystems	3	3	1	3	2	3	2	3	1	2	2	3
Model different electrical and electronicsystems andanalysethe results	3	2	2	1	2	1	2	1	2	2	2	3
Articulateimportanceofs oftwarepackagesusedfor simulation inlaboratoryexperiment ation by analysing the simulationresults	3	2	0	0	2	0	1	0	2	0	2	3

Students should be encouraged to use open-source software's such as **SCILAB, ORCAD, LTSPICE, Ngspice,Octave,SolveElec,Simulide,CircuitLab,QElectroTech,CircuitSims,DcAcLab,Every Circuit,DoCircuits**etc.forcarryingout thelabsimulationlistedbelow.

UseofProfessionalLicensedversionsofsoftwares**likeMATLAB,LabVIEW,NIMultisim,PSpice,PowerSim,TINA**etc. isalsoallowed.

Useof**'Python'** platformforsimulatingcomponents/circuitbehaviour.

SuggestedListofLaboratoryExperiments:

Thefollowing experimentsneedtobeperformedfromvarioussubjectdomains.

1. Introductiontobasicblocksetsofsimulationplatforms.Basicmatrixoperations,Generationofstandardtestsignals
2. Solvingthelinearandnonlineardifferentialequations
3. MeasurementofVoltage, CurrentandPowerinDCcircuits.
4. Verificationofdifferentnetworktheoremswithdependentandindependentsourcesusingsuitablesimulationtools.
5. VerificationofperformancecharacteristicsofbasicElectronicDevicesusingsuitablesimulationtools.
6. Analysisof seriesandparallelresonancecircuitsusingsuitablesimulationtools
7. Obtainingtheresponseofelectricalnetworkforstandardtestsignalsusingsuitablesimulationtools.
8. Modelingand AnalysisofLowpassandHighpassFiltersusingsuitablesimulationtools
9. PerformanceanalysisofDCmotor usingsuitablesimulationtools
10. ModelingandanalysisofEquivalentcircuitoftransformerusingsuitablesimulationtools.
11. Analysisofsingle-phasebridgerectifierwithandwithoutfilterusingsuitableSimulationtools.
12. ModelingandVerificationofVoltageRegulatorusingsuitablesimulationtools.
13. Modelingoftransmissionlineusingsimulationtools.
14. PerformanceanalysisofSolar PVmodelusingsuitablesimulationtools

MEASUREMENTSANDINSTRUMENTATION

B.Tech.IIYearIISem. **LT PC**
3 0 03

Prerequisites: Electrical Circuit Analysis-1 & Electrical Circuit Analysis-2, Analog ElectronicsElectroMagneticFields.

CourseObjectives:

- Tointroducethebasicprinciplesofallmeasuringinstruments.
- Todealwiththemeasurementofvoltage,current,Powerfactor,power,energyandmagnetic measurements.
- Tounderstandthebasicconceptsofsmartanddigitalmetering.

CourseOutcomes: After learningthecontentsofthispaper thestudentmustbeableto

- Understanddifferenttypesofmeasuringinstruments,theirconstruction,operationandcharacteristicsandide ntifytheinstrumentssuitablefortypicalmeasurements.
- Applytheknowledgeabouttransducersandinstrumenttransformerstousethemeffectively.
- Applytheknowledgeofsmart anddigitalmeteringforindustrialapplications.

CourseObjectives	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
To introducethebasicprinciplesofallmeasuring instruments	3	3	3	3	3	3	1	1	2	2	1	3
Todealwiththemeasurement of voltage,current, Powerfactor,power,energy and magneticmeasurements.	2	1	2	2	2	2	2	1	1	1	2	3
To understand the basicconceptsofsmartanddigital metering	2	1	2	2	2	2	2	1	1	1	2	3

CourseOutcomes	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Understanddifferenttypesofmeasuringinstruments, their construction,operation and characteristics and identify the instrumentssuitablefor typical measurements	2	1	2	2	2	2	2	1	2	1	2	3
Applytheknowledgeabout transducers and instrument transformerstousethemeffectively	2	1	2	2	2	2	2	1	2	1	2	3
Applytheknowledgeofsmart and digital metering for industrialapplications	2	1	2	2	2	2	2	1	2	1	2	3

UNIT-I:

INTRODUCTION TO MEASURING INSTRUMENTS: Classification – deflecting, control and dampingtorques – Ammeters and Voltmeters – PMMC, moving iron type instruments – expression for the deflectingtorque and control torque – Errors and compensations, extension of rangeusing shunts and series resistance.ElectrostaticVoltmeters-electrometertypeandattracteddisctype.

UNIT-II:

POTENTIOMETERS & INSTRUMENT TRANSFORMERS: Principle and operation of D.C. Crompton'spotentiometer – standardization – Measurement of unknown resistance, current, voltage. A.C. Potentiometers:polarandcoordinatetype's standardization–applications.CTandPT–Ratioandphaseangleerrors

UNIT-III:

MEASUREMENT OF POWER & ENERGY: Single phase dynamometer wattmeter, LPF and UPF, Doubleelement and three element dynamometer wattmeter, expression for deflecting and control torques – Extension ofrange of wattmeter using instrument transformers – Measurement of active andreactive powers in balanced andunbalancedsystems.

Single phase induction type energy meter – driving and braking torques – errors and compensations –testing byphantomloadingusingR.S.S.meter.Threephaseenergymeter–tri-vectormeter,maximumdemandmeters.

UNIT-IV:

DC & AC BRIDGES: Method of measuring low, medium and high resistance – sensitivity of Wheat-stone'sbridge – Carey Foster's bridge, Kelvin's double bridge for measuring low resistance, measurement of high resistance –loss of charge method. Measurement of inductance- Maxwell's bridge, Hay's bridge, Anderson's bridge - Owen's bridge. Measurement of capacitance and loss angle– Desaunty's Bridge - Wien'sbridge –Schering Bridge- Megger.

UNIT-V:

TRANSDUCERS: Definition of transducers, Classification of transducers, Advantages of Electrical transducers, Characteristics and choice of transducers; Principal operation of LVDT and capacitor transducers; LVDT Applications, Strain gauge and its principle of operation, gauge factor.

INTRODUCTIONTOSMARTANDDIGITALMETERING: DigitalMulti-meter,TrueRMSmeters,Clamp-onmeters,DigitalEnergyMeter,CathodeRayOscilloscope,DigitalStorage Oscilloscope.

TEXTBOOKS:

1. A.K.Sawhney,"Electrical&ElectronicMeasurement&Instruments",DhanpatRai&Co.Publications, 2005.
2. Dr.Rajendra Prasad, "Electrical Measurements&MeasuringInstruments",KhannaPublishers1989.

REFERENCEBOOKS:

1. G.K.Banerjee,"ElectricalandElectronicMeasurements",PHILearningPvt.Ltd.,2nd Edition,2016.
2. R.K.Rajput,"Electrical&ElectronicMeasurement&Instrumentation",S.ChandandCompanyLtd.,2007.
3. S.C.Bhargava,"ElectricalMeasuringInstrumentsandMeasurements",BSPublications,2012.
4. BuckinghamandPrice,"ElectricalMeasurements",Prentice–Hall,1988.
5. Reissland,M.U, "ElectricalMeasurements:Fundamentals,Concepts,Applications",NewAgeInternational(P)LimitedPublishers,1st Edition2010.
6. E.W.GoldingandF.C.Widdis,"ElectricalMeasurementsandmeasuringInstruments",fifthEdition, WheelerPublishing,2011.

ELECTRICALMACHINES–II

B.Tech.IIYearIISem. **LT PC**
3 0 03

Prerequisites:ElectricalCircuitAnalysis-1&ElectricalCircuitAnalysis-2&ElectricalMachines-I

CourseObjectives:

- Todealwiththedetailedanalysisofpoly-phaseinductionmotors&Alternators.
- Tounderstandoperation,constructionandtypesofsingle-phasemotorsandtheirapplicationsinhouseholdappliancesandcontrolsystems.
- Tointroducetheconceptof parallel operationofalternators.

CourseOutcomes: Afterlearningthecontentsofthispaper thestudentmustbeableto

- Understand theconceptsofrotatingmagneticfields.
- Examinetheoperationofacmachines.
- Analyzeperformancecharacteristicsofacmachines.

CourseObjectives	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Todeal withthedet ailedanalysisof poly-phaseinductionmotors &Alternators	2	1	2	1	1	2	2	1	1	1	2	3
To understand operation,construction andt ypesofsingle-phasemotors and theirapplicat ions in householdappliancesa ndcontrolsystems	2	1	2	1	1	2	2	1	2	1	2	3
To introduce theconceptof parallel operation of alternators	2	1	2	1	1	3	2	1	2	2	3	3

CourseOutcomes	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Understand the conceptsofrotatingm agneticfields	2	1	1	2	1	1	1	1	1	1	1	3
Examine the operation of acmachi nes	2	1	1	2	2	1	1	1	1	1	2	3
Analyseperformance characteristicsof acmachines	2	1	2	1	3	3	3	1	1	1	3	3

UNIT-I:

POLY-PHASE INDUCTION MACHINES: Constructional details of cage and wound rotor machines-production of a rotating magnetic field-principle of operation- rotorEMF and rotorfrequency -rotorreactance, rotor current and Power factor at standstill and during operation. Rotor power input, rotor copper lossandmechanicalpowerdevelopedandtheirinterrelation.

UNIT-II:

CHARACTERISTICS OF INDUCTION MACHINES: Torque equation-expressions for maximum torque and starting torque - torque slip characteristic - equivalent circuit - phasor diagram - crawling and cogging, No-loadTest and Blocked rotor test –Predetermination of performance-Methods of starting and starting current andTorquecalculations,Applications.

SPEED CONTROL METHODS: Change of voltage, change of frequency,voltage/frequency, injection of anEMFintorotorcircuit(qualitativetreatmentonly)-inductiongenerator-principleofoperation.

UNIT-III:

SYNCHRONOUS MACHINES: Constructional Features of round rotor and salient pole machines – Armaturewindings – Integral slot and fractional slot windings; Distributed and concentrated windings – distribution, pitchand winding factors – E.M.F Equation. Harmonics in generated e.m.f. – suppression of harmonics – armaturereaction - leakage reactance – synchronous reactance and impedance – experimental determination - phasordiagram–loadcharacteristics.

Regulation by synchronous impedance method, M.M.F. method, Z.P.F. method and A.S.A. methods – salientpole alternators – two reaction analysis – experimental determination of X_d and X_q (Slip test) Phasor diagrams –Regulationofsalient polealternators.

UNIT-IV:

PARALLEL OPERATION OF SYNCHRONOUS MACHINES: Synchronizing alternators with infinite busbars – synchronizing power torque – parallel operation and load sharing -Effect of change of excitation andmechanical power input. Analysis of short circuit current wave form – determination of sub-transient, transientandsteadystatereactance'sandApplications.

SYNCHRONOUS MOTORS: Theory of operation – phasor diagram – Variation of current and power factorwithexcitation – synchronous condenser – Mathematical analysis for powerdeveloped. - Hunting anditssuppression–Methodsofstarting–synchronousinductionmotor.

UNIT-V:

SINGLE PHASE MACHINES: Single phase induction motor– Constructional Features-Double revolvingfieldtheory–split-phasemotors–ACseriesmotor-UniversalMotor--ShadedpolemotorandApplications.

TEXTBOOKS:

1. P.S.Bimbhra,"ElectricalMachinery",KhannaPublishers,2011.
2. I.J.NagrathandD.P.Kothari,"ElectricMachines",McGrawHillEducation,2010.

REFERENCEBOOKS:

1. PrithwirajPurkait,IndrayudhBandyopadhyay, "ElectricalMachines",Oxford,2017.
2. M. G.Say,"PerformanceanddesignofACmachines",CBSPublishers,2002.
3. A.E.FitzgeraldandC.Kingsley,"ElectricMachinery",NewYork,McGrawHillEducation,2013.
4. A.E.ClaytonandN.N.Hancock,"PerformanceanddesignofDCmachines",CBSPublishers,2004.

POWER SYSTEMS-II

B.Tech.IIYearIISem. **LT PC**
3 0 03

Prerequisites:PowerSystems–I &ElectroMagneticFields

CourseObjectives:

- Tostudytheperformanceoftransmissionlinesandtravellingwaves.
- Tounderstandtheconceptofvoltagecontrol,compensationmethodsandperunitrepresentationofpowersystems.
- To know themethods ofovervoltageprotection,Insulationcoordination,Symmetricalcomponentsandfaultcalculationanalysis.

CourseOutcomes: Afterlearningthecontentsofthispaper thestudentmustbeableto

- AnalyzetransmissionlineperformanceandApplyloadcompensationtechniquestocontrolreactivepower.
- Understandtheapplication ofperunitquantitiesinpowersystems.
- Designovervoltageprotection,insulationcoordinationanddeterminethefaultcurrentsforsymmetrical andunbalancedfaults.

CourseObjectives	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
To study the performance of transmission lines andtravellingwaves	3	3	3	1	1	3	2	3	1	1	2	2
Tounderstandtheconceptofvoltagecontrol, compensationmethodsandperunitrepresentation of powersystems.	3	3	2	1	1	3	2	2	1	1	2	1
To knowthemethodsof overvoltage protection,Insulationcoordination,Symmetrical componentsand faultcalculationanalysis.	3	3	2	1	1	3	2	3	1	1	1	1

CourseOutcomes	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
AnalysetransmissionlineperformanceandApply load compensation techniquestocontrolreactivepower.	3	3	3	3	3	3	3	3	3	1	3	2
Understand the applicationofperunit quantitiesinpowersystems	3	3	3	1	1	2	2	3	3	1	2	2
Designovervoltageprotection,insulationcoordination and determinethefaultcurrents for symmetrical and unbalanced faults	3	3	2	1	1	3	2	2	2	1	2	1

UNIT-I:

PERFORMANCEOF LINES: Representationof lines,shorttransmission lines, mediumlength lines,nominal T andPI-representations, long transmission lines. The equivalent circuit representation of long Line, A, B, C, D constants,FerrantiEffect.

Corona: Introduction, disruptive critical voltage, corona loss, Factors affecting corona loss and methods ofreducingcoronaloss,Disadvantages ofcorona,interferencebetweenpowerandCommunicationlines.

UNIT-II:

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 travellingwaves.

UNIT-III:

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

UNIT-IV:

SYMMETRICAL COMPONENTS AND FAULT CALCULATIONS: Significance of positive, negative andzero sequence components, Average 3-phase power in terms of symmetrical components, sequence impedancesand sequence networks, fault calculations, sequence network equations, singleline to ground fault, line to linefault, double line to ground fault, three phase fault, faults on powersystems, faults with fault impedance,reactorsandtheirlocation,short circuitcapacityofabus.

UNIT-V:

VOLTAGECONTROL&POWERFACTORIMPROVEMENT: Introduction–methodsofvoltagecontrol, shunt and series capacitors / Inductors, tap changing transformers, synchronous phase modifiers, powerfactorimprovementmethods.

COMPENSATION IN POWER SYSTEMS: Introduction - Concepts of Load compensation – Load abilitycharacteristics of overhead lines – Uncompensated transmission line – Symmetrical line – Radial line withasynchronousload–Compensationoflines.

TEXTBOOKS:

1. C.L.Wadhwa,"ElectricalPowerSystems",NewAgeInternationalPub.Co,ThirdEdition,2001.
2. D.P.KothariandI.J.Nagrath,"ModernPowerSystemAnalysis",TataMc GrawHillPub.Co.,NewDelhi,Fourthedition,2011.

REFERENCEBOOKS:

1. A.Chakrabarti,M.L.Soni,P.V.Gupta,U.S.Bhatnagar, "ATextbookonPowerSystemEngineering",DhanpatRaiPublishingCompany(P)Ltd, 2008.
2. JohnJ.Grainger&W.D.Stevenson,"PowerSystem Analysis",McGrawHillInternational,1994.
3. HadiScadat,"PowerSystemAnalysis",TataMcGrawHillPub.Co. 2002.
4. W.D.Stevenson,"ElementsofPowersystem Analysis",McGrawHillInternationalStudentEdition.

MEASUREMENTS ANDINSTRUMENTATIONLABORATORY

B.Tech.IIYearIISem. **LT PC**
0 0 21

Prerequisites:MeasurementsandInstrumentation

CourseObjectives:

- TocalibrateWatt,EnergyandPFMeteranddeterminationofthreephaseactive&reactivepowers.
- Todetermineunknown inductance,resistance,capacitancebyperformingexperimentsonD.CBridges& A. CBridges.
- TodeterminetheratioandphaseangleerrorsofInstrumenttransformers.

CourseOutcomes: Afterlearningthecontentsofthispaper thestudentmustbeableto

- Chooseandtestanymeasuringinstruments.
- Findtheaccuracyofanyinstrumentbyperformingexperiments.
- Calculatethevariousparametersusingdifferenttypesofmeasuringinstruments.

CourseObjectives	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
To calibrate Watt,EnergyandPFMeteranddeterminationofthreephaseactive&reactivepowers.	3	3	3	3	3	3	1	1	2	2	1	3
To determine unknowninductance,resistance,capacitance byperformingexperimentsonD. C Bridges &A. CBridges.	3	2	3	2	3	3	2	2	2	3	2	3
TodeterminetheratioandphaseangleerrorsofInstrumenttransformers	3	2	3	1	3	3	1	1	2	2	2	3

CourseOutcomes	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Choose andtestanymeasuringinstruments	3	3	3	3	3	3	3	1	2	1	1	2
Findtheaccuracyofany instrument by performingexperiments	3	3	3	3	3	3	3	3	3	3	2	3
Calculatethevariousparameters using differenttypesofmeasuring instruments	3	2	2	2	3	3	3	2	1	3	3	2

Thefollowing experimentsarerequiredtobeconductedascompulsoryexperiments:

1. CalibrationandTestingofsingle-phaseenergyMeter.
2. Calibrationofdynamometerpowerfactormeter.
3. CromptonD.C.Potentiometer–CalibrationofPMMC ammeterandPMMCvoltmeter.
4. Kelvin'sdoubleBridge–Measurementofresistance–DeterminationofTolerance.
5. DielectricoiltestingusingH.T.testingKit.
6. ScheringBridge&Anderson Bridge.
7. Measurementof 3-Phasereactivepowerwithsingle-phasewattmeter.
8. MeasurementofdisplacementwiththehelpofLVDT.

Inadditiontotheaboveeightexperiments,atleastanytwooftheexperimentsfromthefollowinglistarerequiredtobe conducted:

1. CalibrationLPFwattmeter–byPhantomtesting.
2. Measurementof 3-phasepowerwithsinglewattmeterandtwoCTs.
3. C.T.testingusingmutualInductor– Measurementof%ratioerrorandphaseangleofgivenCTbyNullmethod.
4. PT testing by comparison– V.G.as Null detector– Measurement of % ratio error and phase angle of the given PT
5. Resistancestrain gauge–strainmeasurementsandCalibration.
6. TransformerturnsratiomeasurementusingACbridges.
7. Measurementof%ratioerrorandphaseangleofgivenCTbycomparison.

TEXTBOOKS:

1. A.K.Sawhney,"Electrical&ElectronicMeasurement&Instruments",DhanpatRai&Co.Publications, 2005.
2. Dr.Rajendra Prasad, "Electrical Measurements&MeasuringInstruments",KhannaPublishers1989.

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1. G.K.Banerjee,"ElectricalandElectronicMeasurements",PHILearningPvt.Ltd.,2nd Edition,2016.
2. R.K.Rajput,"Electrical&ElectronicMeasurement&Instrumentation",S.ChandandCompanyLtd.,200 7.
3. S.C.Bhargava,"ElectricalMeasuringInstrumentsandMeasurements",BSPublications,2012.
4. BuckinghamandPrice,"ElectricalMeasurements",Prentice–Hall,1988.
5. Reissland,M.U, "ElectricalMeasurements:Fundamentals,Concepts,Applications",NewAgeInternational(P)Limi tedPublishers,1st Edition2010.
6. E.W.GoldingandF.C.Widdis,"ElectricalMeasurementsandmeasuringInstruments",fifthEdition, WheelerPublishing,2011.

ELECTRICALMACHINESLABORATORY–II

B.Tech. II YearIISem. **LT PC**
0 0 21

Prerequisites:Electrical Machines-I&ElectricalMachines-II

CourseObjectives:

- TounderstandtheoperationofInduction,SynchronousmachinesandTransformers.
- TostudytheperformanceanalysisofInductionandSynchronousMachinesthroughvarioustestingmethods.
- Toanalyzetheperformanceofsingleand3-phasephasetransformerwithexperiments.

CourseOutcomes: Afterlearningthecontentsofthispaper thestudentmustbeableto

- AssesstheperformanceofdifferenttypesofACmachinesusingdifferenttestingmethods.
- AnalyzethesuitabilityofACmachinesandTransformersforrealwordapplications.
- Design themachinemodelsbasedon theapplicationrequirements.

CourseObjectives	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Tounderstandtheoperationof Induction, Synchronousmachines and Transformers	3	3	3	1	1	3	2	3	2	1	3	1
To study theperformance analysisofInductionand SynchronousMachines through various testing methods	3	3	3	1	1	3	2	3	1	2	3	1
Toanalysetheperformanceofsingleand3-phasephasetransformer with experiments	3	3	3	2	1	2	1	3	1	1	3	1

CourseOutcomes	ProgramOutcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Assess the performance ofdifferenttypesofACmachines using different testing methods	3	3	3	2	1	3	2	1	1	1	3	2
AnalysethesuitabilityofACmachinesandTransformersforreal wordapplications	3	3	3	1	3	2	2	2	1	1	1	3
Designthemachinemodelsbasedontheapplication requirements	3	3	3	2	1	3	2	2	1	2	1	3

Thefollowingexperimentsarerequiredtobeconductedascompulsoryexperiments:

1. Sumpner's test on a pair of single-phase transformers
2. No-load&BlockedrotortestsonthreephaseInductionmotor
3. Regulation of a three–phase alternator by synchronous impedance & m.m.f. methods

4. ‘V’and‘InvertedV’curvesofathree—phasesynchronousmotor.
5. EquivalentCircuitofasingle-phaseinductionmotor
6. Determination of Xd and Xq of a salient pole synchronous machine
7. LoadtestonthreephaseInductionMotor
8. Regulation ofthree-phase alternatorbyZ.P.F. andA.S.Amethods

Inadditiontotheaboveexperiments,atleastanytwoofthefollowingexperimentsarerequiredtobeconductedfromthefollowinglist:

1. Separationofcorelossesofasingle-phasetransformer
2. Efficiencyofathree-phasealternator
3. ParalleloperationofSingle-phaseTransformers
4. Heatruntestonabankof3Nos.ofsingle-phaseDeltaconnectedtransformers
5. Measurementofsequenceimpedanceofathree-phasealternator.
6. VectorgroupingofThreeTransformer
7. ScottConnectionoftransformer

TEXTBOOKS:

1. P.S.Bimbhra,“ElectricalMachinery”,KhannaPublishers,2011.
2. I.J.NagrathandD.P.Kothari,“ElectricMachines”,McGrawHillEducation,2010.

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1. PrithwirajPurkait,IndrayudhBandyopadhyay, “ElectricalMachines”,Oxford,2017.
2. M. G.Say,“PerformanceanddesignofACmachines”,CBSPublishers,2002.
3. A.E.FitzgeraldandC.Kingsley,"ElectricMachinery”,NewYork,McGrawHillEducation,2013.
4. A.E.ClaytonandN.N.Hancock,“PerformanceanddesignofDCmachines”,CBSPublishers,2004