DETAILED SYLLABUS

SemesterIII

Sl. No.	Category	Course Code	CourseTitle	Hoursper Week			TotalContact Hours/ Week	Credits
				L	T	P		
1.	Programmecore course-1	EEPC-301	IntroductiontoElectricGeneration Systems	3	0	0	3	3
2.	Programmecorecourse-2	EEPC-302	IntroductiontoElectricGenerationSy	0	0	2	2	1
3.	Programmecore course-3	EEPC-303	ElectricalCircuits	2	1	0	3	3
4.	Programmecore course-4	EEPC-304	ElectricalCircuits Laboratory	0	0	2	2	1
5.	Programmecorecourse-5	EEPC-305	ElectricalandElectronic Measurements	3	0	0	3	3
6.	Programmecore course-6	EEPC-306	Electrical and ElectronicMeasurements Laboratory	0	0	2	2	1
7.	Programmecore course-7	EEPC-307	ElectricMotorsandTransformers	2	1	0	3	3
8.	Programmecorecourse-8	EEPC-308	ElectricMotorsandTransformers Laboratory	0	0	2	2	1
9.	Programmecorecourse-9	EEPC-309	FundamentalofAnalog&DigitalElectronics	2	0	0	2	2
10.	SummerInternship-I (4weeks)after IInd Semester	EESI-310	SummerInternship – I	0	0	0	0	2
	Total			**12**	**2**	**8**	**22**	**20**

INTRODUCTIONTOELECTRICGENERATIONSYSTEMS

CourseCode	:	EEPC-301
CourseTitle	:	IntroductionToElectricGenerationSystems
NumberofCredits	:	3(L: 3,T:0, P:0)
Prerequisites	:	NIL
CourseCategory	:	PC

CourseOutcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taughtand implemented, so that the student demonstrates the following industry oriented COs associatedwiththeabovementionedcompetency:

a) Maintaintheoptimizedworkingofthethermalpowerplant.(K-2)

b) Maintaintheoptimizedworkingoflargeandmicro hydropowerplants.(K-2)

c) Maintaintheoptimizedworkingofsolarandbiomass-basedpowerplants.(K-2)

d) Maintaintheoptimizedworkingofwindpowerplants.(K-2)

e) Selecttheadequatemixofpower generationbasedoneconomicoperation.(K-3)

CourseContents:

Module– I: ThermalPowerPlants: Coal,Gas/ Diesel andNuclear-base.

Number of Class hours: 8

hoursSuggestiveLearningOutco

me:

Studentswould beable to -

1. Drawthelayoutofdifferentpower plants.
2. Knowthepropertiesofconventionalfuels.
3. Understandthe functionofdifferentpartsofathermalpowerplant.

Detailedcontentofthe unit: -

Layoutandworkingofatypicalthermalpowerplantwithsteamturbinesandelectricgenerators.Properties ofconventional fuelsusedin theenergyconversionequipmentusedinthermalpower plants: Coal, Gas/ diesel, Nuclear fuels –fusion and fission action Safe Practices andworkingofvariousthermalpowerplants:Coal-based,Gas-based,Diesel-basedandNuclear-based.

Functionsofthefollowingtypesofthermal powerplantsandtheirmajorauxiliaries:Coal firedboilers:fire tubeand watertube.

Gas/dieselbasedcombustionengines.

Typesofnuclearreactors:Disposalofnuclearwasteandnuclearshielding.Thermal powerplants inTripura.

Module– II:Large andMicro-HydroPowerPlants

Number of Class hours: 8

hoursSuggestiveLearningOutco

me:

Studentswould beable to-

1. Knowthe Energyconversion processof hydropowerplant.
2. KnowtheSafePracticesforhydropowerplants
3. Understanddifferent partsof aturbine

Detailedcontentofthe unit: -

Energyconversion processof hydro powerplant.Selection of sites for Hydro Power Plant.

Classificationofhydropower plant: High,mediumandlowhead.

Constructionandworkingofhydroturbinesusedindifferent typesofhydropowerplant:

a. Highhead–Peltonturbine
b. Mediumhead –Francisturbine
c. Lowhead–

Kaplanturbine.SafePracticesforhydropo

wer plants.

Differenttypesofmicro-hydroturbinesfordifferentheads:Pelton,FrancisandKaplanturbinesLocations of these different types of large and micro-hydro power plants in Maharashtra andTripura.Potentiallocationsofmicro-hydropower plantsinTripura.

Module –III:SolarandBiomassbasedPowerPlants

Number of Class hours: 8

hoursSuggestiveLearningOutco

me:

Studentswould beable to -

1. Knowthe Solar Map of India
2. Knowaboutdifferent typesofsolarpowerplants

Detailed contentoftheunit:-

SolarMapof India:Globalsolarpowerradiation.

SolarPower Technology

a. ConcentratedSolarPower(CSP)plants,constructionandworkingofPowerTower,ParabolicTrough, ParabolicDish, FresnelReflectors.
b. SolarPhotovoltaic(PV)powerplant:layout,construction,working.Bio

mass-basedPower Plants-

a. LayoutofaBio-chemicalbased(e.g.biogas)powerplant:
b. LayoutofaThermo-chemicalbased (e.g.Municipalwaste)powerplant
c. Layout of an Agro-chemical based (e.g. bio-diesel) power

plantFeaturesofthesolid,liquidandgasbiomassesasfuelforbiomasspowerplant.

Module – IV: Wind Power

Plants. Number of Class hours: 8

hoursSuggestive

LearningOutcome:

Studentswould beable to define

1. Knowthe wind Mapof India
2. Knowaboutdifferent typesofsolarpowerplants
3. Know about the Salient Features of electric generators used in large wind power plants:Constant

Detailedcontentofthe unit: -

Wind Map of India**:** Wind power density in watts per square meterLayout of Horizontal axis largewind powerplant:Gearedwindpower plant.Direct-drivewindpowerplant.

SalientFeaturesofelectricgeneratorsusedin largewindpowerplants:ConstantSpeedElectric Generators: Squirrel Cage Induction Generators (SCIG), Wound Rotor InductionGenerator(WRIG).

VariableSpeedElectricGenerators:Doubly-fedinductiongenerator(DFIG),woundrotorsynchronousgenerator (WRSG),permanentmagnet synchronous generator(PMSG).

Module–V:EconomicsofPowerGenerationandInterconnectedPowerSystem.

NumberofClasshours:8 hours

Suggestive Learning

Outcome:Studentswould

beableto

1. Definedifferent termsrelated toenergygeneration.
2. KnowThe causesand Impactand reasonsof Gridsystemfault

Detailedcontentofthe unit: -

Relatedterms:connectedload,firmpower,coldreserve,hotreserve,spinningreserve.Baseloadandpeakloadplants;Loadcurve,loaddurationcurve,integrated durationcurve.

Costofgeneration:Averagedemand,maximumdemand,demandfactor,plantcapacityfactor,plantusefactor,diversityfactor,loadfactorand plantloadfactor.

Choiceofsizeandnumberofgeneratorunits,combinedoperationofpowerstation.

CausesandImpactandreasonsofGridsystemfault:Stategrid,nationalgrid,brownoutandblackout;sample blackoutsatnational andinternationallevel.

References:

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3) Gupta,B.R.,GenerationofElectricalEnergy,S.Chand&Co.NewDelhi,
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10) Soni,Gupta,Bhatnagar,ACourse inElectricalPower.–DhanpatraiandSons
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INTRODUCTION TO ELECTRIC GENERATION SYSTEMSLABORATORY

CourseCode	:	EEPC-302
CourseTitle	:	IntroductiontoElectricGenerationSystemsLaboratory
NumberofCredits	:	1(L:0,T:0,P:2)
Prerequisites	:	NIL
CourseCategory	:	PC

CourseOutcomes:

Thetheory,practicalexperiencesandrelevantsoftskillsassociatedwiththiscoursearetobetaught and implemented, so that the student demonstrates the following industry orientedCOsassociated withthe abovementionedcompetency:

a) Maintaintheoptimisedworkingof thethermal powerplant.(K-2)
b) Maintaintheoptimisedworkingoflargeandmicro hydropowerplants.(K-2)
c) Maintaintheoptimisedworkingofsolarandbiomass-based powerplants.(K-2)
d) Maintainthe optimisedworkingofwind powerplants. (K-2)
e) Selecttheadequatemixofpower generationbasedoneconomicoperation. (K-3).

Practical:

1. Identifytheroutinemaintenancepartsofthecoalfiredthermalpowerplantafterwatchinga video program.
2. Identifytheroutinemaintenancepartsofthegasfiredthermalpowerplantafterwatchingavi deo program.
3. Assembleanddismantle asmalldieselgenerator powerplant.
4. Identifytheroutinemaintenancepartsofthenuclearfiredthermalpowerplantafterwatchin gavideoprogram.
5. Identifytheroutinemaintenancepartsofthelargehydropowerplantafterwatchingavideop rogram.
6. Identifytheroutinemaintenancepartsofthemicrohydropowerplantafterwatchingavideop rogram.
7. Assembleamicrohydropowerplantandthendismantleit.

8. Assembletheparabolictroughorparabolicdish ConcentratedSolarPower(CSP)plant.
9. Dismantletheparabolictroughor parabolicdishCSPplant.
10. Assemblethesolar PVplant toproduceelectricpower andthen dismantleit.
11. Assembleasmallbiogas planttogenerate electricpower.
12. Dismantlethebiogasplant.
13. Identifytheroutinemaintenancepartsofthelarge wind powerplantafterwatchingavideoprogramme.
14. Assembleahorizontal axissmall windturbinetoproduceelectricpower.
15. Dismantleahorizontalaxis smallwindturbine.
16. Assembleaverticalaxissmallwindturbinetoproduceelectricpowerandthendismantleit.
17. Identifytheroutinemaintenancepartsofthehorizontalaxissmallwindturbineafterwatchin gavideoprogramme.
18. Identifytheroutinemaintenancepartsoftheverticalaxissmallwindturbineafterwatching video programme.

ELECTRICCIRCUITS

CourseCode	:	EEPC-303
CourseTitle	:	ElectricCircuits
NumberofCredits	:	3 (L:2,T: 1,P:0)
Prerequisites	:	NIL
CourseCategory	:	PC

CourseOutcomes:

Thetheory,practical experiencesandrelevantsoftskillsassociatedwiththiscoursearetobe taught and implemented, so that the student demonstrates the following industryorientedCOs associatedwith theabovementionedcompetency:

a) Troubleshootproblemsrelatedtosinglephase A.Cseriescircuits.(K-3)

b) Troubleshootproblemsrelatedtosinglephase A.Cparallelcircuits.(K-3)

c) Troubleshootproblemsrelatedtothreephase circuits.(K-3)

d) Useprinciplesofcircuitanalysistotroubleshootelectriccircuits.(K-3)

e) Applynetworktheorems to troubleshoot electriccircuits. (K-4)

CourseContents:

Module–I:SinglePhaseA.CSeries Circuits

Number of Class hours: 7

hoursSuggestiveLearningOutco

me:

Studentswould beable to –

a) Defineimpedance,reactance,Powerfactor,activepower,reactivepower,apparentpower ,power triangleetcforan A.Cseries circuit.
b) SolvetheproblemsofA.CseriesR-L,R-CandR-L-C circuits
c) Drawthephasordiagramfordifferenttypes of A.C seriescircuit.

Detailedcontentofthe unit: -

Generationofalternatingvoltage,Phasorrepresentationofsinusoidalquantities R, L, C circuitelements its voltageandcurrent response.

R-L,R-C,R-L-CcombinationofA.Cseriescircuit,impedance, reactance,Powerfactor,activepower,reactivepower,apparentpower,powertriangleandvect ordiagram.

Resonance,Bandwidth,Qualityfactorandvoltagemagnificationinseries R-L, R-C, R-L-Ccircuit.

Module–II:SinglePhaseA.C ParallelCircuits

Number of Class hours: 7

hoursSuggestiveLearningOutco

me:

Studentswould beable to -

a) Defineimpedance,reactance,Powerfactor,activepower,reactivepower,apparentpow er, power triangleetc. foran A.C parallel circuit.
b) SolvetheproblemsofA.CparallelR-L,R-CandR-L-Ccircuits
c) Drawthephasordiagramfordifferenttypesof A.C parallelcircuit.

Detailedcontentofthe unit: -

R-L,R-CandR-L-

CparallelcombinationofA.C.circuits.Impedance,reactance,phasordiagram, impedancetriangle.

R-L,R-C,R-L-

CparallelA.C.circuitspowerfactor,activepower,apparentpower,reactivepower, power triangle.

ResonanceinparallelR-L,R-C,R-L-

Ccircuit,Bandwidth,Qualityfactorandvoltagemagnification.

Module–

III:ThreePhaseCircuits NumberofC

lass hours:6 hoursSuggestive

LearningOutcome:

Studentswould beable to -

a) Drawthephasordiagramfor threephasestarordeltaconnected circuits.
b) DefinePhaseandlinequantitiesinthreephasestaranddeltaconnectedsystemforbalance d and unbalanced load
c) Compute

threephaseactivepower,reactivepowerandapparentpowerinstaranddeltathree phasesystem.

Detailedcontentofthe unit: -

Phasorandcomplexrepresentationofthreephasesupply.Phasesequenceand polarity.Typesof three-phaseconnections,Phase andlinequantitiesinthree phasestar anddeltasystem.Balancedandunbalancedload,neutralshiftinunbalancedload.Threephasepower, active,reactiveandapparentpower instarand deltasystem.

Module – IV: Network Synthesis Number of Class hours:4 hoursSuggestive LearningOutcome:

Studentswould beableto define–

a) Networkreductiontechniques.
b) Howto do Mesh Analysis.
c) Howto do NodeAnalysis

Detailedcontentofthe unit: -

NetworkReductionandPrinciplesofCircuitAnalysis.Sourcetransformation. Star/deltaanddelta/startransformationMeshAnalysis, NodeAnalysis

Module– V:NetworkTheorems Number of Class hours: 6 hoursSuggestive LearningOutcome:

Studentswouldbeabletosolvedifferentcircuitsbyapplyingtheknowledgeofdifferentnetworktheorems like

a) TheveninandMaximumpowertransfertheorem.
b) SuperpositionandReciprocitytheorem.
c) Norton'stheorem

Detailedcontentofthe unit: -

Superpositiontheorem,Thevenin'stheorem,Norton'stheorem,Maximumpowertransferthe orem&Reciprocitytheorem

Dualityin electriccircuits

References:

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ELECTRICCIRCUITSLABORATORY

CourseCode:	:	EEPC-304
CourseTitle :	:	ElectricCircuits Laboratory
NumberofCredits	:	1 (L:0,T: 0,P:2)
Prerequisites	:	NIL
CourseCategory	:	PC

Courseoutcomes:

The theory, practical experiences and relevant soft skills associated with this course are to betaught and implemented, so that the student demonstrates the following industry oriented COsassociatedwith the abovementioned competency:

1. Troubleshootproblemsrelatedtosinglephase A.Cseriescircuits.(K-3)
2. Troubleshootproblemsrelatedtosinglephase A.Cparallelcircuits.(K-3)
3. Troubleshootproblemsrelatedtothreephase circuits.(K-3)
4. Useprinciplesof circuitanalysistotroubleshootelectriccircuits.(K-3)
5. Applynetworktheorems totroubleshootelectriccircuits.(K-4)

Practicals:

1. UsedualtraceoscilloscopetodetermineA.Cvoltageandcurrentresponseingiven R,L,C circuit.
2. Use voltmeter, ammeter, wattmeter to determine active, reactive and apparent powerconsumedin givenR-L,R-Cand R-L-Cseries circuit.Draw phasordiagram.
3. Use variable frequency supply to create resonance in given series/Parallel R-L-C circuitor byusingvariable inductor orvariable capacitor.
4. Use Voltmeter, Ammeter and Wattmeter to determine current, p.f., active, reactive andapparentpower in R-C parallel A.C. circuit.
5. Use voltmeter, ammeter, wattmeter, p.f meter to determine current, p.f., active, reactiveand apparent power for given R-L-C parallel circuit with series connection of resistorandinductorin parallel with capacitor.
6. Use voltmeter, ammeter to determine current through the given branch of a electricnetworkbyapplyingmeshand Nodal analysis.

7. Usevoltmeter,ammetertodeterminecurrentthroughthegivenbranchandvoltageacrossthegivenelementofcircuit byapplyingsuperposition theorem.
8. Usevoltmeter,ammetertodetermineequivalentcircuitparameterinagivencircuitbyapplying Thevenin's theorem
9. Usevoltmeter,ammetertodetermineequivalentcircuitparameterinagivencircuitbyapplying Norton'stheorem
10. Usevoltmeter,ammetertodetermineloadresistanceformaximumpowertransferforagiven circuit byapplying maximum power transfer theorem.

ListofEquipments:

1. BreadBoardTrainer&Functiongenerator.
2. Studycard forR-L-C series &parallel circuit.
3. Studycard forThevenin's&MaximumPower transfer theorem.
4. StudycardforReciprocity& SuperpositionTheorem.
5. Studycard forNorton Theorem.
6. TrainingPanelforACpower supplymeasurement.
7. ElectricaltrainingSystemkit.
8. TwochannelAnalogOscillator.
9. Transducer&InstrumentationTrainer.
10. DigitalMustimeter.
11. AnalogAmmeters.
12. ColorDigitalStorageOscilloscope.

ElectricalandElectronicMeasurements

CourseCode	:	EEPC-305
CourseTitle	:	ElectricalandElectronicMeasurements
NumberofCredits	:	3(L:3,T: 0,P:0)
Prerequisites	:	NIL
CourseCategory	:	PC

CourseOutcomes:-

Studentswillbeable:

1. Tounderstandtheworkingoftheelectrical measuringinstrument(K-3).
2. Tousedifferenttypesofmeasuringinstrumentsformeasuringvoltageandcurrent(K-4).
3. Tousedifferent typesofmeasuringinstrumentsfor measuringelectricpower(K-4).
4. Tousedifferenttypes ofmeasuringinstruments for measuringelectricenergy(K-4).
5. Tousedifferenttypesofelectricalinstrumentsformeasuringvariousrangesofelectricalparameters(K-4).

CourseContent:-

Module-1:FundamentalsofMeasurements

Number of class hours: 4

HoursSuggestiveLearningOutcomes:

1. Tobeable todescribethesignificanceof the givenmeasuringinstrument.
2. To beable to classifythegiven measuringinstruments.
3. Tobeabletodeterminestaticanddynamiccharacteristicsofthemeasuringinstrumentswiththe given data.
4. Tobeabletoexplaintheprocedureforcalibrationofgiven device.

Detailedcontentofthe unit: -

Measurement:Significance,units,fundamentalquantitiesandstandards.

ClassificationofInstrumentSystems,Nullanddeflectiontypeinstruments,Absoluteandsecondaryinstruments,

Analoganddigitalinstruments,

Staticanddynamiccharacteristics,typesoferrors,Cal
ibration:need and procedure,
Classification of measuring instruments: indicating, recording and integratinginstruments,Essential requirementsof an indicatinginstrument.

Module-2:Measurementofvoltageandcurrent

Numberofclasshours:05HoursSu
ggestiveLearningOutcomes:

1. Tobeabletoexplainwithsketchestheconstructionandworkingprincipleofthespecifiedinstrument.
2. TobeabletoconvertPMMCinstrumentintoDCammeterforthe given range.
3. TobeabletoconvertPMMCinstrumentintoDCvoltmeterforagivenrange.
4. Tobeable toexplain with sketches theworkingof giventypeof voltmeter.

Detailedcontentofthe unit: -

DCAmmeter:Basic,Multirange, Universalshunt,
DCVoltmeter:Basic,Multi-
range,Conceptofloadingeffectandsensitivity,ACvoltmeter: Rectifiertype(half wave and fullwave),
CT and PT: construction, working and
applications,Clamp-onmeter.

Module-3:MeasurementofElectricPower

Number of class hours: 5
HoursSuggestiveLearningOutc
omes:

1. Tobeable todescribewithsketches theconstruction ofthegivenwattmeter.
2. Tobeable todetermine multiplyingfactorfor thegivenmeter.
3. Tobeableto connectwattmeterfor powermeasurementofthe givencircuit.
4. Tobeabletodeterminetheelectricalpowerandpower factorofthe givencircuit.
5. Tobeabletodescribetheselectionprocedureofthemetersformeasuringthegivenparameter.

Detailedcontentofthe unit: -

Analogmeters:Permanentmagnetmovingcoil(PMMC)andPermanentmagnetmovingiron(P

MMI)meter,their construction, working,salientfeatures,meritsand demerits.

Dynamometertypewattmeter:Constructionand working.

Range:Multiplyingfactorand extensionofrangeusingCTandPT.

Errorsandcompensations;Activeandreactivepowermeasurement:One,twoandthreewattmeter method.

Effect of Power factor on wattmeter reading in two wattmeter method.MaximumDemandIndicator.

Module-4:Measurementof ElectricEnergy

Numberofclasshours:07HoursSuggestiveLearningOutcomes:

1. Tobeableto describewithsketches the constructionofthegivenenergymeter.
2. Tobeabletodescribewithsketchestheconnectionofthegivensinglephaseenergymeterforelectrical energymeasurements.
3. Tobeable to determinethe errors in the given energymeter.
4. Tobeableto selectenergymeter forthegiven applicationwithjustification.
5. Tobeableto calibratethegiventypeofmeter.

Detailedcontentofthe unit: -

Singleandthreephaseelectronicenergymeter:Constructionalfeaturesandworkingprinciple.

Errorsandtheircompensations.

Calibration ofsingle phaseelectronicenergymeter usingdirect loading.

Module-5:CircuitParameterMeasurement,CROandOtherMeters

Numberofclasshours:11HoursSuggestiveLearningOutcomes:

1. Tobeabletochoosemethodformeasurementsofresistancesforgivenapplicationwithjustification.
2. Tobeabletodescribewithsketchesthespecifiedblocksandworkingofthegiventypeofoscilloscope.
3. Tobeabletodescribewithsketchestheproceduretomeasurethegivenparameterusing CRO.
4. Tobeabletodescribewithsketchesthevariousblocksandworkingofthegiventypeofsignal/ functiongenerator.

Detailedcontentofthe unit: -

Measurement of resistance: Low resistance: Kelvin's double bridge, Medium Resistance:Voltmeter and ammeter method, High resistance: Megger and Ohm meter: Series andshunt;

Measurement of inductance using Anderson bridge (no derivation and phasor diagram);Measurement of capacitance using Schering bridge (no derivation and phasor diagram);Singlebeam/singletraceCRO,DigitalstorageOscilloscope**:**Basicblockdiagram,working,Cathoderaytube,electrostaticdeflection,verticalamplifier,timebasegenerator,horizontalamplifier,measurementofvoltage/amplitude/timeperiod/frequency/phase angle delayline, specifications;

Othermeters:Earthtester,DigitalMultimeter;L-C-Rmeter,Frequencymeter(ferromagnetic and Weston type), Phase sequence indicator, power factor meter (singlephaseand three phasedynamometertype), Synchro scope,Tri-vector meter

Signal generator:need,workingandbasicblockdiagram.

Function generator:need,workingandbasicblockdiagram,functionofsymmetry.

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ElectricalandElectronicMeasurementsLaboratory

CourseCode	:	EEPC-306
CourseTitle	:	ElectricalandElectronicMeasurements Laboratory
NumberofCredits	:	1(L:0,T: 0,P:2)
Prerequisites	:	NIL
CourseCategory	:	PC

CourseOutcomes:-

Willbe able:

1. Toidentifyelectricalmeasuringinstrument.(K-3)
2. Tousevoltmeterandammeterfor electricalmeasurements (K-4).
3. Tousewattmeterforelectricalpower measurement(K-4).
4. To useenergymeterforelectrical energymeasurement (K-4).
5. Tousedifferenttypesofelectricalinstrumentsformeasuringelectricalparametersofvariousranges.(K-4).

CourseContent:-

Practicals:

1. Identifymeasuringinstrumentsonthebasisofsymbolsondial,type,accuracy,classpositionand scale. (*)
2. Identifythe componentsof PMMC and MIinstruments.(*)
3. TroubleshootPMMC and MIinstruments.(*)
4. MeasureAC andDC quantities ina workingcircuit.
5. Extendrangeofammeterandvoltmeterbyusing(i)shuntandmultiplier(ii)CTandPT.
6. UseClamp-onmeterformeasurementof AC/DCcurrent,AC/DCvoltage.
7. Useelectro-dynamicwatt-meterformeasurementofpowerinasinglephasecircuit.(*)
8. Troubleshootelectrodynamicwatt-meterformeasurementofpowerinasinglephasecircuit.(*)
9. Usesinglewattmeterformeasurementofactiveandreactivepowerofthreephasebalancedload.
10. Usetwowatt-meters for measuringactivepowerofthree-phasebalancedload.

11. Calibratesinglephase electronicenergymeterbydirectloading.(*)
12. Troubleshootsingle phaseelectronicenergymeter.(*)
13. Usedigitalmulti-meterformeasurementofAC/DCcurrent,AC/DCvoltage.
14. UseKelvin'sdoublebridge formeasurementoflowresistance.(*)
15. Usevoltmeterandammetermethodformeasurement ofmediumresistance.
16. UseMeggerforinsulationresistancemeasurements.
17. Useearthtesterformeasurementofearthresistance.
18. UseCRO for theMeasurement ofsupplyfrequencyin single-phasecircuit.
19. UseTri-vector meterformeasuringkW,kVAr andkVAof apower line.

Note:

Aminimumof10(ten)ormorepracticalneedtobeperformed,outofwhichthepractical'smarkedas'*' arecompulsory.

ListofEquipment's/Instrumentsrequired:

Sl. No.	Equipmentnamewithbroadspecifications	Practical No.
1.	Modelof PMMC andMItypeinstrument (Upto 50A)	2
2.	VoltmeterRange(0-110V),Ammeter(0to 5A)	3
3.	VoltmeterRange (0-110V),Ammeter (0to5A),CT (15/5,25/5),PT(230/110, 440/110).	4
4.	VoltmeterRange(0-110/230V),Ammeter(0to5A),Wattmeter(5/10, 110/230V)	5
5.	VoltmeterRange(0-300/600V),Ammeter(0to5/10A),Wattmeter(5/10, 300/600V)	6
6.	VoltmeterRange(0-300/600V),Ammeter(0to5/10A),Wattmeter(5/10, 300/600V)	7
7.	VoltmeterRange(0-150/300V),Ammeter(0to5/10A),Wattmeter(5/10, 150/300V),Energymeter(Analog/ digital) (15A/230V)	8
8.	DigitalMultimeter,Rheostat(5A,100ohm),Autotransformer(0to 300V)	9
9.	Wheatstonebridge, Megaohm bridge	11
10.	Megger(Insualtiontestingupto1000Vand 100Gohm)	12

11.	Clampon Meter(Range40A, resolution100mA, 10Hzto 100Hz	13
12.	CRO(Upto 100Mhz)	15
13.	SignalGenerator (Upto100MHz)	15
14.	FunctionGenerator (Upto100MHz)	15
15.	Tri-VectorMeter(upto100A), 3phase3 wire410V(PhasetoPhase)	16

ELECTRICMOTORSANDTRANSFORMERS

CourseCode	:	EEPC-307
CourseTitle	:	ElectricMotorsAndTransformers
NumberofCredits	:	3 (L:2,T:1,P:0)
Prerequisites	:	NIL
CourseCategory	:	PC

CourseOutcomes:-

Aftercompletion ofthiscoursethe studentswill beable to:

1) UnderstanddifferenttypesofDCgenerators.(K-2)
2) Analyzesinglephasetransformer.(K-4)
3) Understandthreephasetransformers.(K-2)
4) Applydifferent typesofspecialpurposetransformersused indifferent applications.(K-3)

CourseContents:-

Module – 1: DC
GeneratorsNumberofclasshours
:04HoursSuggestiveLearningOut
comes:

Studentswill beable to:

1. Todefineanddiscussthe principleofoperationandconstructionofDCgenerators.
2. Todescribeanddemonstratethedifferenttypesofgenerators,theirapplicationbasedonspecification andadvantage-disadvantagebytype.

Detailedcontentofthe unit:-

DCgenerator:construction,parts,materialsandtheirfunctions.
PrincipleofoperationofDCgenerator:Fleming'srighthandrule,schematicdiagrams, e.m.f.equationofgenerator, Generator Characteristics(Basic circuits & curves), armaturereaction,commutationandapplicationsofDCgenerators.Simple numerical related to DC Generator.

Module – 2: D.C.

MotorsNumberofclasshours:06

HoursSuggestiveLearningOutco

mes:

Studentswill beable to:

1. Todefineanddiscusstheprincipleofoperationand constructionofDCmotors.
2. Todescribeanddemonstratethedifferenttypesofmotors,theirapplicationbasedonspecification andadvantage-disadvantagebytype.
3. Todeterminethetorque,speed,losses and efficiencyof aDC motor.
4. Todiscuss the speed control ofDC motors and thenecessityof astarter.
5. Todemonstrate thebrushless DCmotor.

Detailedcontentofthe unit:-

DC motor: Types of DC motors. Fleming's left hand rule, Principle of operation, Backe.m.f.and its significance, Voltage equation of DC motor. Torque and Speed; Armaturetorque,Shaft torque,BHP, Braketest, losses, efficiency. Simple numerical related to DC motor.

DC motor starters: Necessity, two point and three point starters. Speed control of DCshuntand series motor: Fluxand Armaturecontrol.

BrushlessDCMotor:Constructionandworking.

Module–

3:SinglePhaseTransformers Number of

class hours: 08 HoursSuggestive

LearningOutcomes:

Studentswill beable to:

1. Describeanddemonstratetheprincipleofoperationandconstructionof SinglePhaseTransformers.
2. Definespecificationsandtheirmeaningontransformernameplate.
3. Describe anddiscusstestingmethodsoftransformers.
4. Determinethevoltageregulation,efficiencyandall-dayefficiencyofSinglePhaseTransformers.

Detailedcontentofthe unit:-

Typesoftransformers:Shelltypeandcoretype;Construction:Partsandfunctions,materialsused

fordifferentparts:CRGO,CRNGO,HRGO,amorphouscores.Transformer: Principle of operation, EMF equation of transformer: Derivation, Voltagetransformation ratio. Significance of transformer ratings. Transformer No-load and on-load phasor diagram, Leakage reactance, Equivalent circuit of transformer: Equivalentresistanceandreactance.VoltageregulationandEfficiency:Directloading,OC/SC method,All dayefficiency.Simple numerical related to single phase transformer.

Module–

4:ThreePhaseTransformers Number of

class hours: 08 HoursSuggestive

LearningOutcomes:

Studentswill beable to:

1. DescribeanddemonstratetheconstructionofThreePhaseTransformersincludingDistribution and Power Transformers.
2. Definespecificationsof ThreePhase Transformers.
3. Describeanddiscussthe differenttypesofconnectionsofThreePhaseTransformers.
4. DiscussparalleloperationanddifferenttestsonThreePhaseTransformers.

Detailedcontentofthe unit:-

Bankofthreesinglephasetransformers,Singleunitofthreephasetransformer.Distributionand Power transformers. Construction,cooling.

Threephasetransformers connectionsasper IS:2026(partIV)-1977.

Three phase to two phase conversion (Scott Connection), Selection of transformer as perIS: 10028 (Part I)-1985, Criteria for selection of distribution transformer, and powertransformer, Amorphous Core type Distribution Transformer, Specifications of three-phasedistribution transformers as per IS:1180 (partI)-1989.

Need of parallel operation of three phase transformer, Conditions for parallel operation.Polarity tests on mutually inductive coils and single phase transformers; Polarity test,Phasingout test on Three-phasetransformer.

Module–5:SpecialPurposeTransformers

Number of class hours: 06

HoursSuggestiveLearningOutco

mes:

Studentswill beable to:

1. Describeanddemonstratetheconstructionandworkingof SingleandThreePhaseAutoTransformers.
2. Discusstheconstructionalfeaturesandapplicationsof InstrumentTransformers,IsolationTransformers, Single phaseweldingandPulseTransformers.
3. Describeanddiscussthe differenttypesofconnectionsofThreePhaseTransformers.
4. DiscusstheKfactorsof Transformers.

Detailedcontentofthe unit:-

Single phase and three phase auto transformers: Construction, working and applications.Instrument Transformers: Construction, working and applications of Current transformerandPotential transformer.
Isolationtransformer:ConstructionalFeaturesand applications.
Singlephaseweldingtransformer:
constructionalfeaturesandapplications.Pulsetransformer:
constructionalfeatures and applications.
'K'factor oftransformers:overheatingduetonon-linear loadsand harmonics.

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ELECTRICMOTORSANDTRANSFORMERSLABORATORY

CourseCode	:	EEPC-308
CourseTitle	:	ElectricMotorsAndTransformersLaboratory
NumberofCredits	:	1 (L:0,T:0,P:2)
Prerequisites	:	NIL
CourseCategory	:	PC

CourseOutcomes:-

Aftercompletion ofthiscoursethe studentswill beable to:

1) Identifydifferent typesof machines.(K-1)
2) Analyze andperformbraketest,speedcontrolonDC motors.(K-4)
3) Understand and demonstrate the various tests and operations on Single phasetransformers.(K-2)
4) analyzethefunctioningofAutotransformers,InstrumentTransformersandPulseTransformers .(K-4)

CourseContent:-

Practicals:

1. DismantleaDCmachine.
2. Reversethe direction ofrotation oftheDC shuntmotor.
3. Performbraketest onDC shunt motor.
4. Controlthespeed ofDCshuntmotor bydifferentmethods.
5. Controlthespeedof DCseriesmotor bydifferentmethods.
6. Performthebraketest onDCseriesmotor.
7. Checkthefunctioningof singlephasetransformer.
8. Determineregulationand efficiencyofsingle phasetransformerbydirectloading.

9. Performopencircuitandshortcircuittestonsinglephasetransformertodetermineequivalentcirc uit constants, voltageregulation and efficiency.
10. Performparalleloperationoftwosinglephasetransformerstodeterminetheloadcurrentsharing.
11. Performparalleloperationoftwosinglephasetransformersanddeterminetheapparentandreal power load sharing.
12. Performpolaritytest on asingle phasetransformerwhosepolaritymarkingsaremasked.
13. Performphasingouttest onathreephasetransformerwhosephasemarkingsaremasked.
14. Connecttheauto-transformerinstep-upandstep-downmodesnotingtheinput/outputreadings.
15. Checkthefunctioningof the CT,PTandisolationtransformer.
16. Testthepulsetransformer.

Note:

Aminimumof10(ten)ormorepracticalneedtobeperformed,outofwhichthepractical'smarked as'*'arecompulsory.

CourseCode:	:	ECPC-309
CourseTitle :	:	Fundamentalof AnalogandDigitalElectronics
NumberofCredits	:	2(L:2,T:0,P:0)
Prerequisites	:	NIL
CourseCategory	:	PC

Courseoutcomes:

Afterthe completion ofthecoursestudentwould beableto

1. Acquire basic knowledge of physical and electrical conducting properties ofsemiconductors(K-3).
2. UnderstandthedesignandworkingofBJT/FETandOperational amplifiers(K-2).
3. Understandandexaminethestructureofvariousnumbersystems anditsapplicationindigitaldesign (K-2).
4. Apply their knowledge to build, and troubleshoot digital logic gates, multiplexer and De-multiplexer(K-3).
5. Analyze and design various combinational and sequential digital electronic circuits andalsothe(K-4).

CourseContents:

Module–
1:SemiconductorDevices Numberof
Class hours:5 hoursSuggestive
LearningOutcome:

Studentswouldbeabletounderstand

1. Fundamentalpropertiesofsemiconductors.
2. Basicsof Diodes
3. Workingprincipleof rectifiers.

Detailedcontentofthe unit:-

Semiconductor and Diodes: Definition, Extrinsic/Intrinsic, N-type & p-typePNJunction Diode:Forward and ReverseBias Characteristics, ZenerDiode:Principle,characteristics,construction,workingDi odeRectifiers: Half WaveandFullWave rectifiers

Module–2:BipolarJunctionTransistor&Field EffectTransistors

Number of Class hours: 5

hoursSuggestiveLearningOutco

mes

Studentswouldbeableto understand

1. Fundamentalof BJT.
2. BasicsofFET/MOSFET
3. Basicsofoperationalamplifiers

Detailedcontentofthe unit:-

Bipolar Junction Transistor (BJT): NPN and PNP Transistor, Operation andcharacteristics

Common Base Configuration: characteristics and workingCommonEmitterConfiguration: characteristicsandworking

Common Base Configuration: characteristics and workingWorking Principle and Classification of FET and MOSFET,BasicsofOperational Amplifier.

Module–3:NumberSystems&BooleanAlgebra

Number of Class hours: 5

hoursSuggestiveLearningOutco

mes

Studentswould beable tounderstand -

1. Fundamentalnumbersystem
2. Boolean AlgebraandsimplificationofBooleanexpressions
3. Basicsof KarnaughMaps

Detailedcontentofthe unit:-

NumberSystems&BooleanAlgebraIntroductiontodifferentnumbersystems:Binary,Octal,DecimalandHexadecimal, Conversionfrom onenumber system toanother.

Booleanvariables:RulesandlawsofBooleanAlgebraDe-Morgan'sTheoremKarnaughMapsand theiruseforsimplification ofBooleanexpressions.

Module – 4: Logic

GatesNumber of Class hours: 5

hoursSuggestiveLearningOutco

mes

Studentswouldbeableto understand –

1. LogicGatesandtruthtable
2. Combinationallogiccircuits.
3. MultiplexerandDe-multiplexer.

Detailedcontentofthe unit:-

Logic Gates Logic Gates: AND, OR, NOT, NAND, NOR, XOR, XNOR: SymbolicrepresentationandtruthtableImplementationofBooleanexpressionsandLogicFunctionsusinggates Simplification ofexpressions.

CombinationalLogicCircuitsArithmeticCircuits:Addition,Subtraction,1's2'sComplement, Half Adder,Full Adder,Half Subtractor, FullSubtractor,

Multiplexer,2 to1 MUX, 4to 1MUX, 8to 1 MUX.

De-multiplexer:1to 2DEMUX, 1-4 DEMUX,1-8 DEMUX.

Module–5:SequentialLogicCircuits&basicsof Memory

Number of Class hours: 5

hoursSuggestiveLearningOutco

mes

Studentswouldbeableto understand

1. OperationsofFlipFlops, differenttypesofregisters,counters
2. Basicdesign fordifferent typesofregisters
3. ConceptsofCounters

Detailedcontentofthe unit:-

Sequential Logic Circuits Flip Flops: SR, JK, T, D, FF, JK-MS,TriggeringCounters:4 bitUp–Down Counters,

RingCounterRegisters:4bitShiftRegister:SerialInSerialOut,SerialinParallelOut,ParallelIn Serial Out, ParallelIn Parallel Out.

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Summer Internship-I

Course Code	EESI-310
Course Title	Summer Internship-I
Number of Credits	2 (L: 0, T: 0, P: 0)
Prerequisites	Nil
Course Category	Internship

Internships may be full-time or part-time; they are full-time in the summer vacation and part-time during the academic session.

Sl. no.	Schedule	Duration	Activities	Credits	Hours of Work
1	Summer Vacation after 2nd Semester	3-4 Weeks	Inter/ Intra Institutional Activities **	2	80 Hours

(** Students are required to be involved in Inter/ Intra Institutional Activities viz; Training with higher Institutions; Soft skill training organized by Training and Placement Cell of the respective Institutions; contribution at incubation/ innovation /entrepreneurship cell of the Institute; participation in conferences/ workshops/ competitions etc.; Learning at Departmental Lab/ Tinkering Lab/ Institutional workshop; Working for consultancy/ research project within the Institutes and Participation in all the activities of Institute's Innovation Council for e.g.: IPR workshop/Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.)

Benefits to Students:

1. An opportunity to get hired by the Industry/ organization.
2. Practical experience in an organizational setting.
3. Excellent opportunity to see how the theoretical aspects learned in classes are integrated into the practical world. On-floor experience provides much more professional experience which is often worth more than classroom teaching.
4. Helps them decide if the industry and the profession is the best career option to pursue.
5. Opportunity to learn new skills and supplement knowledge.
6. Opportunity to practice communication and teamwork skills.
7. Opportunity to learn strategies like time management, multi-tasking etc. in an industrial setup.
8. Opportunity to meet new people and learn networking skills.
9. Makes a valuable addition to their resume.
10. Enhances their candidacy for higher education.
11. Creating network and social circle and developing relationships with industry people.
12. Provides opportunity to evaluate the organization before committing to a full-time position.

Course Outcome:-

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

C.O.1: Explain the real life organizational and industrial environment situations (K2).

C.O.2: Develop organizational dynamics in terms of organizational behaviour, culture and professional ethics (K1).

C.O.3: Understand the importance of Team work (K2).

C.O.4: Explain invaluable knowledge and networking experience (K2).

C.O.5: Develop skill to build a relationship with a prospective employer (K3).

Course Content:-

Internships are educational and career development opportunities, providing practical experience in a field or discipline. The Summer Internship-I is a student centric activity that would expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated, non-compensated or some time may be paid. The internship has to be meaningful and mutually beneficial to the intern and the organization. It is important that the objectives and the activities of the internship program are clearly defined and understood. Following are the intended objectives of internship training:

1. Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
2. Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
3. Exposure to the current technological developments relevant to the subject area of training.
4. Experience gained from the 'Industrial Internship' in classroom will be used in classroom discussions.
5. Create conditions conducive to quest for knowledge and its applicability on the job.
6. Learn to apply the Technical knowledge in real industrial situations.
7. Gain experience in writing Technical reports/projects.
8. Expose students to the engineer's responsibilities and ethics.
9. Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
10. Promote academic, professional and/or personal development.
11. Expose the students to future employers.
12. Understand the social, economic and administrative considerations that influence the working environment of industrial organizations
13. Understand the psychology of the workers and their habits, attitudes and approach to problem solving.

Overall compilation of Internship Activities / Credit Framework:

Major Head of Activity	Credit	Schedule	Total Duration	Sub Activity Head	Proposed Document as Evidence	Evaluated by	Performance appraisal/ Maximum points/ activity
Inter/ Intra Institutional Activities	2	Summer Vacation after 2nd Semester	3-4 Weeks	Inter/ Intra Institutional Workshop/ Training	Certificate	Programme Head	Satisfactory/ Good/ Excellent
				Working for consultancy/ research project	Certificate	Programme Head	Satisfactory/ Good/ Excellent
				Festival (Technical / Business / Others) Events	Certificate	Programme Head	Satisfactory/ Good/ Excellent
				Contribution in Incubation/ Innovation/ Entrepreneurship Cell/ Institutional Innovation Council	Certificate	Cell In-charge	Satisfactory/ Good/ Excellent
				Learning at Departmental Lab/Tinkering Lab/ Institutional workshop	Certificate	Cell In-charge	Satisfactory/ Good/ Excellent

STUDENT'S DIARY/ DAILY LOG

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day-to-day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

The daily training diary should be signed at the end of each day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor visiting the industry from time to time and get ratified on the day of his visit.

Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. It will be evaluated on the basis of the following criteria:

a) Regularity in maintenance of the diary.
b) Adequacy & quality of information recorded.
c) Drawings, sketches and data recorded.
d) Thought process and recording techniques used.
e) Organization of the information.

INTERNSHIP REPORT

After completion of Internship, the student should prepare a comprehensive report to indicate what he has observed and learnt in the training period. The student may contact Industrial Supervisor/ Faculty Mentor/TPO for assigning special topics and problems and should prepare the final report on the assigned topics. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The training report should be signed by the Internship Supervisor, TPO and Faculty Mentor. The Internship report will be evaluated on the basis of following criteria:

a) Originality.
b) Adequacy and purposeful write-up.
c) Organization, format, drawings, sketches, style, language etc.
d) Variety and relevance of learning experience.
e) Practical applications, relationships with basic theory and concepts taught in the course.

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