B.E. (Part Time) Electrical & Electronics Engineering

BEPT 301-E. M. Theory

Subject code	Subject name	L	T	P
BEPT 301	E.M. Theory	3	1	-

COURSE OBJECTIVE-

To provide the basic knowledge of 3 dimensional figure and the use of different charge distribution, relation between electric and magnetic fields with various types.

COURSE CONTENT-

Cartesian,cylindrical&sphericalco-ordinatesystems,scalar&vectorfields,gradient,divergence&curlofavectorfield,Divergencetheorem&Stokes's theorem,conceptofvectors.Electrostatic Fields –Coulomb'slaw,electricfieldintensity duetodifferentchargedistributionviz.linecharge, sheet charge,Fieldduetocontinuous volume–electric potential,properties ofpotentialfunction,potentialgradientequipotentialsurfaces,lineofforce,Gauss law,applications ofGausslaw,Gauss lawinpointform,methodofimages.

Laplace's &Poisson's equations,solutionofLaplace's equation,Electric dipole,dipolemoment,potential&electric fieldintensity duetodipole,Behaviorofconductors inanelectric field. Conductor&insulator,electric fieldinsideadielectric,polarization,Boundaryvalueconditions forelectric Field,Capacitance&Capacitances ofvarioustypes ofcapacitors,Energystoredandenergydensityinstatic electric field,Current density, conduction&convectioncurrentdensityohmslawinpointform,equationofcontinuity.

Static Magnetic Field,Biot-Savart's law,Magnetic Fieldintensityduetostraightcurrentcarryingfilament,circular,squareandsolenoidalcurrentcarryingwire,Relationshipbetweenmagnetic flux,flux density&magneticFieldintensity;Ampere's circuitallawandits applications,magneticFieldintensity duetoinfinitesheetandvarious otherconfigurations,Ampere's circuitallawinpointform,Magnetic force,movingchargeinamagnetic field, Lorentz Forceonstraight andlongcurrentcarryingconductors inmagneticfield,forcebetweentwolong&parallelcurrentcarryingconductors.Magnetic dipole&dipolemoment,adifferentialcurrent loopas dipole,torqueonacurrentcarryingloopinmagneticfield,Magnetic Boundaryconditions.

Scalarmagnetic potentialanditslimitations, Vectormagnetic potentialanditsproperties,vectormagnetic potentialduetodifferentsimpleconfigurations;SelfandMutualinductances,determinationofself&mutualinductances,selfinductanceofsolenoid,toroidcoils,mutualinductancebetweenastraightlongwire&asquareloop.Energystoredinmagnetic Field&energydensity,Faraday's Law,transformer&motionalEMFs,Displacementcurrent,Maxwell'sequations as Generalizationof circuitequations,Maxwell's equationinfreespace,Maxwell'sequationforharmonicallyvaryingField,static andsteady fields,Maxwell'sequationsindifferential&integralform.

ElectroMagneticWaves:Uniformplanewaveintimedomaininfreespace,Sinusoidally timevaryinguniformplanewaveinfreespace,Waveequationandsolutionformaterialmedium,Uniformplanewaveindielectrics andconductors,PointingVectortheorem,instantaneous,averageandcomplexpoyntingvector,powerloss

inaplaneconductor,energystorage,Polarizationofwaves,Reflectionbyconductors anddielectric–Normal &Obliqueincidence,Reflectionatsurfaceofaconductingmedium,surfaceimpedance, transmissionlineanalogy.

COURSE OUTCOME-

Students learn different types of co ordinate system and their applications, relates both the fields with different conditions.

EVALUATION

Evaluation will be continuous an integral part of the class as well through external assessment.

Text Books:

1. William H. Hayt, Jr. &John A. Buck; Engineering Electromagnetics; McGraw Hill.
2. Matthew N.O. Sadiku; Elements of Electromagnetics; Oxford.
3. David Jeffery Griffiths; Introduction to Electrodynamics; Prentice Hall.

Reference Books:

1. John D. Kraus & Keith R. Carver; Electromagnetics; McGraw Hill.
2. Ulaby, Michielssen&Ravaioli; Fundamentals of Applied Electromagnetics; Prentice Hall.
3. David K. Cheng; Fields and Wave Electromagnetic; Addison Wesley.

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BEPT-302 (Power System)

Subject code	Subject name	L	T	P
BEPT 302	Power System	3	1	2

COURSE OBJECTIVE-

The objective of this course is to get an overview of the power systems and its changing landscape. It covers the characteristics of various power system loads, analysis of transmission line along with its performance.

COURSE CONTENT-

An overview of Electrical Energy Generation General background, structure and components of power network. Power generation – Introduction to conventional, non-conventional & distributed generation, Effect of transmission voltage on power system economy. Selection of size of feeder.Comparison of isolated versus interconnected power system. Problems associated with modernlarge interconnected power system. Power Plant Economics - Load curves, base load, peak load,load factor, demand factor, diversity factor, capacity factor, utilization factor, cost of electricity,capital cost, fuel and operation cost.

Transmission Line Components & Under Ground Cabling:

Inductance resistance and capacitance of transmission line, Calculation of inductance for 1-Φand 3- Φ, Single and double circuit line, Concept of GMR and GMD, Symmetrical &asymmetrical conduction configuration, Calculation of capacitance for 2 wire and 3 wiresystems, Effect of ground or capacitance, Capacitance calculation for symmetrical andasymmetrical 1-phase and three phase, Single and double circuit line, Charging current,Transposition of line, Composite conductor, Skin and proximity effect, bundle conductor.Underground Cable Comparison of cables and overhead transmission lines, Classification ofcables, requirement of cable construction, capacitance of single and multi-core cable, economiccore diameter, dielectric stress in cable, Grading of cables, ionization of Heating of cables,Phenomena of dielectric losses and sheath loss in cables, Thermal resistance of cables.

Transmission systems & performance of transmission line:

Various systems of transmission, effect of system voltage, comparison of conductor materialsrequired for various overhead systems. Short, Medium & long transmission line and theirrepresentation, Nominal T, Nominal Л, Equivalent T and equivalent Л, network models, ABCDconstants for symmetrical &asymmetrical network, Mathematical solution to estimate regulation& efficiency of all types of lines. Surge Impedance, loading, Interpretation of long line equationand its equivalent equation. Tuned power lines. Power flow through transmission line, Circlediagram, Method of voltage control, Static & rotating VAR generator, transformer control.Insulator & Mechanical design, types of conductors used in overhead transmission line, Types ofline supports and towers, Distribution of conductors over transmission towers, Spacing betweenconductors, Length of span and sag tension calculation for transmission line, Wind & iceloading, support of line at two different levels, string chart, Sag template, Stringing of conductor,Vibration and Vibration dampers. Insulator Materials used for transmission line insulations,Types of insulator for overhead transmission line failure of insulator, Voltage distribution ofsuspension insulator, String efficiency, Shielding and grading.

Voltage control & Distribution system:

AC single phase, 3 phase, 3wire & 4 wire distribution, Kelvin's law for most economical size ofconductor Substation layout showing substation equipment, bus bar single bus bar andsectionalized bus bar, main and transfer for bus bar system, sectionalized double bus bar system,
ring mains.

COURSE OUTCOME-

Student after successful completion of course must possess an understanding of Power generation, Transmission Line Components, Underground Cables, transmission lines and their representation, conductors and insulators.

EVALUATION

Evaluation will be continuous an integral part of the class as well through external assessment.

REFERENCES

1. John Grainger and William Stevenson, Power system Analysis, McGraw Hill.
2. C.L. Wadhwa, Electrical Power System Analysis, New Age International.
3. D.P. Kothari, I.J. Nagrath, Power System Engineering TMH II Ed. Reprint 2009.

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BEPT - 303 (Electrical Engineering Drawing)

Subject code	Subject name	L	T	P
BEPT 303	**Electrical Engineering Drawing**	**3**	**1**	**-**

COURSE OBJECTIVE

The students should be able to read and interpret electrical engineering drawings to communicate and correlate through sketches and drawing of actual machines. They should be able to prepare working drawing of electrical machines, panel, transmission and distribution systems etc.

COURSE CONTENT-

To draw from sketches the fully dimensioned orthographic views of the following:
Different views of different types of nuts and bolts including foundation bolts with threads. Different types of welded joints, riveted joints, keys and cotters. Different types of solid and flexible couplings Pulleys flat and V-belt drive and gears used in Electrical Machine Drive.

Knifes switches: Single, Double and Triple pole types, Main Switches, Energy meters. Pin insulators, Sackless Insulators and Disc type Insulators for L.T. and H.T. Lines. String Insulators and Guard Ring for String Insulators. Cable supports and Holders. Sketches of C.T., P.T. and other Relays with feeders and distributors.

D.C. pole windings. D.C. Lap winding/Single and Double layer. D.C. wave winding: Single and Double layer. Placing of carbon brushes on the commutator segments showing the direction of current.
Different Industrial Electrical symbols. Pole of Machine: Different views. Armature of D.C. Machine: Different views. Commutator of D. C. Machine: Different views. D.C. Machine brush and brush holder.
Single-phase Transformer. Three-phase transformer. Cross arms and their arrangement with various Insulators.

Different types of poles and Towers with feeders and Distributors and Lightning Arrestors. Stay Arrangement and guard wires arrangement for roads and rail lines crossing. Battery Charging Circuit with Battery. Earthing - different types.

EVALUATION

Evaluation will be continuous an integral part of the class as well through external assessment.

REFERENCES

Narang'Electrical Drawing"
Pal and Lal "Electrical Engineering Drawing", Vol. I and II
J.T.T.I. Madras "Manthial in Electrical Engineering Drawing"
Surjeet Singh "Electrical Drawing "

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BEPT- 304 (E.M.E.C. – II)

Subject code	Subject name	L	T	P
BEPT 304	E.M.E.C. - II	3	1	2

COURSE OBJECTIVE-To impart fundamentals, constructional and operating details of DC and synchronous machines so as to develop skill set providing competency in production, operation and power sectors.

COURSE CONTENT-

D.C. Machine-I

BasicconstructionofDCmachines;typesofDCmachinesandmethodofexcitation;lapandwavewindings;Emfequation;armaturereactionandmethodsoflimitingarmaturereaction;Commutationprocessandmethodsforimprovingcommutation;BasicperformanceofDCgeneratorsandtheirperformancecharacteristics;MetadyneandAmplidyne;permanentmagnetDC motors; Brush less dcmotors,

D.C. Machine-II

BasicoperationofDCmotors;Torqueequation;OperatingcharacteristicsofDCmotors,StartingofDCmotors-2point,3pointand4pointstarters;speedcontrolofDCmotors;lossesandefficiencyofDCmachines;testingofDCmachines,directtesting,Swinburne'stestandHopkinson's test. Application of DC machines

Synchronous Machine-I

Construction;typesofprimemovers;excitationsystemincludingbrushlessexcitation;poly-phasedistributivewinding,integralslotandfractionalslotwindings;emfequation,generationofharmonicsandtheirelimination;armaturereaction;synchronousreactanceandimpedance,equivalentcircuitofalternator,relationbetweengeneratedvoltageandterminalvoltage,voltageregulation of alternators using synchronousimpedance,mmf, zpf and new A.S.A method.

Synchronous Machine-II

Salientpolemachines;tworeactiontheoryequivalentcircuitmodelandphasordiagram;determinationof$X_d$and$X_q$bysliptest;SCRanditssignificance;regulationofsalientpolealternator,powerangleequationandcharacteristics;synchronizingofalternatorwithinfinitebusbar,;paralleloperationandloadsharing;synchronizingcurrent,synchronizingpowerandsynchronisingtorquecoefficient;synchroscopesandphasesequenceindicator;effectofvarying excitationandmechanical torque,.

Synchronous machine-III

Synchronousmotoroperation,startingandstoppingofsynchronousmotor,pullintorque,motorunderloadpowerandtorque,reluctancetorque,effectofexcitation,effectofarmaturereaction,powerfactoradjustment,Vcurves,invertedVcurves,synchronousmotorsaspowerfactorcorrectingdevice,supersynchronousandsubsynchronousmotors,huntinganddamperwindingefficiency and losses.Analysisofshortcircuitoscillogram,determinationofvarioustransient,subtransientandsteadyreactancesandtimeconstants,expressionoftransientandsubtransientreactancesintermsofselfandmutualinductancesofvariouswinding,shortcircuitcurrent,equivalentcircuit.Singlephase synchronous motors-hysteresismotor, reluctance motor. Repulsion motor, stepper motor, switched reluctance.

COURSE OUTCOME-

The student shall develop practical and theoretical skill required for operating and controlling motors and generators for an efficient power generation and operation.

EVALUATION-

Evaluation will be continuous an integral part of the class as well through external assessment.

TEXT BOOKS

1. Electrical Machines by Nagrath and Kothari, McGraw-Hill
2. P.S.Bhimbra, Electrical Machines,Khanna Publishers

REFERENCES

1. V.Del Toro, "Electrical Machines & Power Systems", 1985, Prentice-Hall, Inc., Englewood Cliffs
2. S K Bhattacharya, Electrical Machines, McGraw-Hill
3. Ashfaq Hussain, Electrical Machines, Dhanpat Rai & Co
4. Langsdorf , A.C. Machines, McGraw-Hill
5. Samarajit Ghosh, Electrical Machines, Pearson

List of Experiments (expandable)

Experiments cancoveranyoftheabovetopics, following is a suggestive list:

1. Toplotmagnetisation characteristic of a separately excited DC generator
2. To performload test on DC generators.
3. ToperformloadtestonDCseriesandshunt motor
4. To performSwinburn's test on a DC machine and find outits efficiency under fullload condition.
5. ToconductHopkinson'stestonapairofDCshunt machine.
6. To performOCC and SCC test on an alternator and determine its regulation.
7. To determine regulationof alternatorusingmmfandzpfmethods.
8. To synchronise alternator with infinite bus bar.
9. To plot V and inverted V curves for a synchronous motor
10. Tofind $X_d$and $X_q$ofsalientpolesynchronousmachinebysliptest.
11. ToDeterminenegativesequenceandzero sequence reactance of an alternator.
12. To determinesubtransient direct axis and quadrature axis synchronous reactances ofsalientpole machine.

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BEPT – 305 (Computer Programming- III

Subject code	Subject name	L	T	P
BEPT 305	**Computer Programming- III**	**-**	**-**	**2**

COURSE CONTENT-

Generation and Classification of Computers- Basic Organization of a computer- Number system- binary-decimal-conversion problems. Need for logical analysis and thinking algorithm pseudo code Flow chart.

Introduction to MS-Windows and MS-Office Principles of Object-Oriented Programming Procedure-Oriented Programming vs. Object-Oriented Programming, Object Oriented Languages. Beginning with C++ What is C++, Structure of C++ program, Creating, Compiling, Linking, and Executing a C++ program.

Token, Expressions and Control Structures Tokens, Keywords, Identifiers, Basic Data Types, User-Defined Data Types, Derived Data Types, Symbolic Constants, Type Compatibility,

Functions in C++ Main Function, Function Prototyping, Call by reference vs. Call by 'Value, Inline Functions, Default Arguments, const Arguments, Function Overloading, Friend and Virtual Functions.

Classes and Objects Specifying a Class, Defining Member Functions, Making a Outside Function Inline, Nesting of Member Functions, Private Member Functions, Arrays within a Class, Memory Allocation for Objects, Static Data Members, Static Member Functions, Array of Objects, Objects as Function Arguments, Returning Objects, Pointers to Members.

‘

EVALUATION-

Evaluation will be continuous an integral part of the class as well through external assessment.

Reference:

1. E. Balagurusamy“Object Oriented Programming with C++ “THM
2. Robert Lafore“Programming in C++ “
3. Yashvant P. Kanetkar. “Let Us C” BPB Publication 2011.
4. ISRD- “Object Oriented Programming with C++ “TMH