PEOPLE'S UNIVERSITY, BHOPAL

Programme: **B. Tech. (Electrical Engineering)**

Semester: **III**

Subject Title	Subject Code	Credits			Theory		
		L	T	P	Externals (70)	Internals (30)	Total (100)
Engineering Mathematics-II	**BT-301**	3	1	-	Min:	Min: Nil	Min: 40 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal - Max Marks: 30

Best of Two Mid Semester Test –Max Marks: 20
Assignment / Quiz – Max. Marks: 10

Unit	Contents (Theory)
I	**FOURIER SERIES:** Introduction of Fourier series, Fourier series for Discontinues Functions, Fourier series for even and odd function, half range series and method of Least Squares.
II	**LAPLACE TRANSFORMATIONS :** Introduction of Laplace Transform of elementary functions, Properties of Laplce transform ,Change of scale property, second shifting property, Laplace transform of the derivative, Inverse Laplace transform and its properties, Convolution theorem and Applications of Laplace Transformation to solve the ordinary differential equations
III	**SECOND ORDER LINEAR DIFFERENTIAL EQUATIONS with VARIABLE COEFFICIENTS:** Methods one integral is known, removal of first derivative, changing of independent variable and variation of parameter,Solution by Series Method.
IV	**LINEAR & NON – LINEAR DIFFERENTIAL EQUATIONS of FIRST ORDER :** Formulation of partial differential equations, solution of equation by direct integration, lagrange's Linear equation, charpit's method, Linear partial differential equation of second and higher order, Linear homogeneous and Non-homogeneous partial differential equation of nth order with constant coefficients.
V	**VECTOR CALCULUS :** Differentiation of vectors, scalar and vector point function, geometrical meaning of Gradient, Unit Normal vector and directional derivative, physical interpretation of divergence and curl, line integral, surface integral and volume integral, Green's Stroke's and gauss divergence theorem.

TEXT BOOKS:

1. D.C. Aggarwal "Engg. Mathematics – 2"
2. Higher Engineering Mathematics by BS Grewal, Khanna Publication
3. Mathematics for Engineers by S.Arumungam, SCITECH Publications

REFERENCES:

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India
2. Advance Engineering Mathematics by D.G.Guffy
3. Engineering Mathematics by S S Sastri. P.H.I.
4. Advanced Engineering Mathematics by Peter V.O'Neil, Thomson Learning
5. Higher Engineering Mathematics by John Bird, Elsevier

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Subject Title	Subject Code	Credits			Theory		
		L	**T**	**P**	**Externals (70)**	**Internals (30)**	**Total (100)**
Electrical Engineering Material	**EET-302**	3	1	-	Min: (D Grade)	Min: Nil	Min: 40 (D Grade)

Duration of Theory (Externals): 3 Hours
Theory Internal - Max Marks: 30
Best of Two Mid Semester Test – Max Marks: 20
Assignment / Quiz – Max. Marks: 10

Unit	Contents (Theory)
I	**Conducting Material:** Classification and main properties, High receptivity alloy: Constant Mangann, Nichrome, Electrochemical properties of copper, Aluminum, steel tungsten, Molybdenum, Platinum, Tantalum, Niobium, Mercury, Nickel, Titanium, Carbon, Lead, thermal, thermocouple, materials, specific resistance, conductance, variation of resistance with temperature, super conductors.
II	**Semi Conductor Materials:** General conception, variation of electrical conductivity, Elements having semiconductor properties, general application, hall effect, energy levels, conduction in semiconductors, Intrinsic conduction, impurity conduction, P and N type impurities, electrical change, Neutrality, Drift, Mobility current flow in semi conductors P-N junction formation by alloying, Biasing (forward and reverse) of P-n junction, Reverse separation current, Zener effect, Junction, capacitance, hall defects and hall coefficient.
III	**Magnetic Materials:** Details of magnetic materials, reduction B.Techtween B.H. and μ, soft and hard magnetic materials. Di-magnetic, Para magnetic and Ferromagnetic materials, electrical sheet steel, cast iron. Permanent magnetic materials. Dynamic and static hysteresis loop. Hysterisis loss, eddy current loss, Magnetization, magnetic susceptibility, coercive force, core temperature, rectangular hysteresis loop, Magnet rest square loop core materials, iron silicon, Iron alloys.
IV	**Insulating Materials:** General Electrical Mechanical and chemical properties of insulating materials, Electrical characteristics volume and surface resistivity complex permittivity loss and dielectric loss equivalent circuits of an imperfect dielectric polarization and polarisability classification of dielectric
V	**Mechanical Properties:** Classification of insulating materials on the basis of temperature rise. General properties of transformer oil, commonly used varnishes, solidifying insulating materials, resins, bituminous waxes, drying oils, Fibrous insulating materials, wood, paper and cardboard, insulating textiles, varnished adhesive tapes, inorganic fibrous material and other insulating materials, such as mica, ceramic, bakelite, ebonite, glass, PVC, rubber, other plastic molded materials.

REFERENCES:

1. TTTI Madras; Electrical Engineering Materials; TMH.Electrical Engineering Material s & Devices; John Allison; TMH
2. Materials for Electrical Engineering: B.M. Tareev
3. Anderson; Di-Electrics:
4. Kortisky; Electrical Engineering Materials:

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Subject Title	Subject Code	Credits			Theory			Practical		
		L	T	P	Externals (70)	Internals (30)	Total (100)	Externals (35)	Internals (15)	Total (50)
Electrical Machine I	EET-303	3	1	2	Min:	Min: Nil	Min: 40 (D Grade)	Min:	Min: Nil	Min: 20 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal - Max Marks: 30

Best of Two Mid Semester Test – Max Marks: 20
Assignment / Quiz – Max. Marks: 10

Practical Internal - Max Marks: 15

Lab work & Sessional –Max Marks: 10
Assignment / Quiz – Max. Marks: 05

Unit	Contents (Theory)
I	**Transformer-I** Working principle, e.mf. Equation, construction, phasor diagrams, equivalent circuit, voltage regulation, losses, separation of hysteresis and eddy current losses, efficiency, tests: open circuit and short circuit, load, Sumpner's test, Condition for maximum efficiency and regulation, Power and distribution transformer, all day efficiency, Excitation phenomenon, Autotransformer: working, advantages, its equivalent circuit and phasor diagram, Harmonics.
II	**Transformer-II** Three phase transformer: its construction, groups and connections, their working and applications; Phase conversion: 3 to 6 phase and 3 to 2 phase conversions Scott connection; Parallel operation of Transformers: application, advantages, requirement and load sharing; Tap changers, cooling, conservator and breather. Pulse and high frequency transformers. Switching currents in transformers, separation of losses. Harmonics
III	**DC generators**: Principle, Construction, Types of DC generators, emf equation, lap & wave windings, Armature reaction, commutation, methods of improving commutations, Demagnetizing and cross magnetizing mmf, interlopes, characteristics, parallel operation. Harmonics
IV	**DC Motors:** Principle, back emf, types, production of torque, armature reaction & interlopes, Characteristics of shunt, series & compound motor, Harmonics.
V	**DC motor** starting. Speed Control of DC Motor: Armature voltage and field current control methods, Ward Leonard method. Braking, losses and efficiency, direct & indirect test, Swinburne's test, Hopkinsion test, field & retardation test, single-phase series motor.

REFERENCE :

1. M. G. Say, Alternating Current Machines', (5th Ed.) ELBS, 1986.
2. V.Del Toro, "Electrical Machines & Power Systems", 1985, Prentice-Hall, Inc., Englewood Cliffs.
3. V.Del Toro, "Electromechanical Devices for Energy Conversion & Control Systems", PHI Pvt.Ltd. 1975.

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4. Electrical Machines by Nagrath and Kothari (TMH).
5. A.C. Machines by Langs dorf (McGraw-Hill)
6. Electrical Machines by Dr.P.S.Bimbhra (Khanna).
7. Electrical Machines by Ashfaq Hussain. (Dhanpat Rai).

Semester: **III**

PRACTICALS:

1. To perform O.C. and S.C. test on a 1-phase transformer and to determine the parameters of its equivalent circuit its voltage regulation and efficiency.
2. To perform back-to-back test on two identical 1-phase transformers and find their efficiency & parameters of the equivalent circuit.
3. To perform OC & SC test on a 3-phase transformer & find its efficiency and parameters of its equivalent circuit.
4. To determine the efficiency and voltage regulation of a single-phase transformer by direct loading.
5. To perform parallel operation of two 3-phase transformers and determine their load sharing.
6. To study the performance of 3-phase transformer for its various connections, i.e. star/star star/delta, delta/star and delta/delta and find the magnitude of 3rd harmonic current.
7. To perform parallel operation of two 1-phase transformers and determine their load sharing.
8. Speed control of D.C. shunt motor by:

(a) Field current control method & plot the curve for speed vs. field current.

(b) Armature voltage control method & plot the curve for speed vs. armature voltage.

9. Speed control of a D.C. Motor by Ward Leonard method and to plot the curve for speed vs. applied armature voltage.
10. To determine the efficiency of D.C. Shunt motor by loss summation (Swinburne's) method.
11. To determine the efficiency of two identical D.C. Machine by Hopkinson's regenerative test.

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Semester: **III**

Subject Title	Subject Code	Credits			Theory			Practical		
		L	T	P	Externals (70)	Internals (30)	Total (100)	Externals (35)	Internals (15)	Total (50)
Electrical Measurement & Instrumentation	**EET-304**	3	1	2	Min:	Min: Nil	Min: 40 (D Grade)	Min:	Min: Nil	Min: 20 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal - Max Marks: 30

Best of two MSTest – Max Marks: 20
Assignment / Quiz – Max. Marks: 10

Practical Internal - Max Marks: 15

Lab work & Sessional –Max Marks: 10
Assignment / Quiz – Max. Marks: 05

Unit	Contents (Theory)
I	**Measurement** and error, Accuracy and precision, sensitivity resolution, Error & Error analysis, Effect of temperature, Internal friction, Stray field, Hysterisis and Frequency variation & method of minimizing them, Loading effects, due to shunt connected and series connect ed instruments, calibration curve, Testing & calibration of instruments. **Galvanometers** – Theory & operation of ballistic galvanometer, D'arsonal galvanometer, Galvanometer motion & damping, Sensitivity, Flux meter, Vibration galvanometer, Spot deflection galvanometer. Definition of analog & digital instruments, Classification of analog instruments, their operating principle, Operating force, Types of supports, Damping, Controlling.
II	**Different types of Ammeter & Voltmeter** – PMMC, MI, Electrodynamometer, Hotwire, Electrostatic, Induction, Rectifier, Ferro dynamic & Electro-thermic, Expression for control & deflection torque, their advantages, disadvantages & error, Extension of range of instruments using shunt & multiplier.
III	**Instrument transformers**: Potential and current transformers, ratio and phase angle errors, testing of instrument transformers, Difference B.Techtween CT and PT, errors and reduction of errors. **Measurement of power:** Power in AC and DC Circuit, Electrodynamometer type of wattmeter, Construction, theory, operation & error, Low power factor & UPF wattmeter, Double element and three element dynamometer wattmeter, Measurement of power in three phase circuit, one, two & three wattmeter method, Measurement of reactive power by single wattmeter, Measurement of power using CTs & PTs
IV	**Measurement of Energy**: Single phase induction type energy meter- construction & operation- driving and braking torques- errors & compensations- Testing by phantom loading and using R.S.S. Meter- Three phase energy meter- Tri-vector meter- Maximum demand meter, Ampere hour meter. Potentiometer- DC potentiometer standardization- Lab type Crampon's potentiometer, application of DC potentiometer, AC polar type and coordinate type potentiometer, their construction and Applications.

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V	**Miscellaneous Instruments & Measurements:** Power factor meter, Single phase and three phase Electro- dynamometer type & moving iron type. **Frequency meter**- Vibrating reed, Resonance type & Weston type, Synchronoscope, Ohmmeter- series & stunt type, Multi-meter, Megger & Ratio meter. **Resistance Measurement -** Classification of low, medium & high resistance- Voltmeter, Ammeter, Wheatstone Bridge, Kelvin's double bridge & loss of charge methods for resistance measurement, Earth resistance measurement. **Magnetic Measurement-** B-H Curve, Hysterisis Loop determination, Power loss in sheet metal- Lloyd Fischer square for measurement of power loss.

References:

1. E W Golding & F C Widdis; Electrical Measurement & Measuring Instruments; Wheeler Pub.
2. A.K. Sawhney; Electrical & Electronic Measurements & Instrument; Dhanpat Rai & Sons Pub.
3. Buckingham & Price; Electrical Measurements; Prentice Hall

PRACTICALS:

1. Study working and applications of Meggar, Tong-tester, P.F. Meter and Phase Shifter.
2. Measure power and power factor in 3-phase load by:
3. two-wattmeter method and
4. One wattmeter method.
5. Calibrate a voltmeter using Crompton potentiometer.
6. Measure low resistance by Crompton potentiometer.
7. Measure Low resistance by Kelvin's double bridge.
8. Measure earth resistance using fall of potential method.
9. Calibrate a single-phase energy meter by phantom loading at different power factors.

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Semester: **III**

Subject Title	Subject Code	Credits			Theory			Practical		
		L	T	P	Externals (70)	Internals (30)	Total (100)	Externals (35)	Internals (15	Total (50)
Network Analysis	BT-325	3	1	2	Min:	Min: Nil	Min: 40 (D Grade)	Min: 14	Min: Nil	Min: 20 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal - Max Marks: 30

Best of Two Mid Semester Test – Max Marks: 20
Assignment / Quiz – Max. Marks: 10

Practical Internal - Max Marks: 15

Lab work & Sessional –Max Marks: 10
Assignment / Quiz – Max. Marks: 05

Unit	Contents (Theory)
I	Introduction to circuit elements R,L,C and their characteristics in terms of linearity & time dependant nature, voltage & current sources controlled & uncontrolled sources KCL and KVL analysis, Nodal & mesh analysis, analysis of magnetically coupled circuits, Transient analysis :- Transients in RL, RC&RLC Circuits, initial conditions, time constants. Steady state analysis- Concept of phasor & vector, impedance & admittance, Network topology, concept of Network graph, Tree, Tree branch & link, Incidence matrix, cut set and tie set matrices, dual networks, Dot convention, coupling co-efficient, tuned circuits, Series & parallel resonance.
II	Network Theorems for AC & DC circuits- Thevenins & Norton's, Superposition's, Reciprocity, Compensation, Substitution, Maximum power transfer, and Millman's theorem, Tellegen's theorem, problems with dependent & independent sources.
III	Frequency domain analysis – Laplace transform solution of Integro-differential equations, transform of waveform synthesized with step ramp, Gate and sinusoidal functions, Initial & final value theorem, Network Theorems in transform domain.
IV	Concept of signal spectra, Fourier series co-efficient of a periodic waveform, symmetries as related to Fourier coefficients, Trigonometric & Exponential form of Fourier series.
V	Network function & Two port networks – concept of complex frequency, Network & Transfer functions for one port & two ports, poles and zeros, Necessary condition for driving point & transfer function. Two port parameters – Z,Y, ABCD, Hybrid parameters, their inverse & image parameters, relationship between parameters, Interconnection of two ports networks, Terminated two port network.

References:

1. M.E. Van Valkenburg, Network Analysis, (PHI)
2. F.F.Kuo, Network Analysis.
3. Mittal GK; Network Analysis; Khanna Publisher
4. Mesereau and Jackson; Circuit Analysis- A system Approach; Pearson.
5. Sudhakar & Pillai; Circuit & Networks- Analysis and Synthesis; TMH
6. Hayt W.H. & J.E. Kemmerly; Engineering Circuit Analysis; TMH
7. Decarlo lin; Linear circuit Analysis; Oxford
8. William D Stanley : Network Analysis with Applications, Pearson Education

9. Roy Choudhary D; Network and systems; New Age Pub
10. Charles K. Alexander & Matthew N.O. Sadiku: Electrical Circuits :TMH
11. Chakraborti :Circuit theory: Dhanpat Rai
12. B.Chattopadhyay & P.C.Rakshit; Fundamental of Electrical circuit theory; S Chand
13. Nilson & Riedel , Electric circuits ;Pearson

PRACTICALS:

All experiments (wherever applicable) should be performed through the following steps.
Step 1: Circuit should be designed/ drafted on paper.
Step 2: The designed/drafted circuit should be simulated using Simulation S/W (TINA-V7/ PSPICE/ Labview/ CIRCUIT MAKER).
Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.
Step 4: The bread board circuit should be fabricated on PCB prepared on PCB machine.

1. To Verify Thevenin Theorem.
2. To Verify Superposition Theorem.
3. To Verify Reciprocity Theorem.
4. To Verify Maximum Power Transfer Theorem.
5. To Verify Millman's Theorem.
6. To Determine Open Circuit parameters of a Two Port Network.
7. To Determine Short Circuit parameters of a Two Port Network.
8. To Determine A,B, C, D parameters of a Two Port Network
9. To Determine h parameters of a Two Port Network
10. To Find Frequency Response of RLC Series Circuit.
11. To Find Frequency Response of RLC parallel Circuit.

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Semester: III

Subject Title	Subject Code	Credits			Practical		
C++ Programming	BT-306	L	T	P	Externals (35)	Internals (15)	Total (50)
		-	-	2	Min: 12	Min: Nil	Min: 20 (D Grade)

Practical External - Max Marks: 30
Practical Internal - Max Marks: 15
Lab work & Sessional – Max Marks: 10
Assignment / Quiz – Max. Marks: 05

Contents (Practical)
C++ Programming
C++ Basics: Structure of a C++ program, Data types, Declaration of variables, Expressions, Operators, Operator Precedence, Evaluation of expressions, Type conversions, Pointers, Arrays, Strings, Structures, conditional statement, control structure, switch-case, break, go to statements.
OOPS : Introduction to OOPS, differences Between OOP and Procedure Oriented Programming, Overview of OOP principles.
FUNCTIONS & CLASSES : Functions: Scope of variables, Parameter passing, Default arguments, inline function, Recursive function, Dynamic memory allocation and reallocation, operators-new and delete, Preprocessor directives, **Classes:** Class Definition, Class Structure, Class Scope,object, Friends to a class, Static class members, Constructors and Destructors, Dynamic creation and destruction of objects, Data Abstraction.
INHERITANCE: Inheritance: Defining a class hierarchy, Different forms of inheritance, Defining the Base and Derived classes, Access to the base class member.
POLYMORPHISM : Function overloading, Operator Overloading , Virtual Function Polymorphism: Static and Dynamic binding, Base and Derived class virtual functions, Pure virtual functions, Abstract classes, C++ Exception Handling and File Handling, Comparison of C++ with C, Java and C#.

REFERENCES

1. "Object Oriented programming with C++", E. Balaguruswamy, TMH, 2001
2. Let us C++ by Yashwant Kanitkar
3. **"**Object Oriented Programming with C++", Radha Ganesan**,** Scitech Publication PVT.LTD. Chennai.
4. ERIC NAGLER "Learning C++" JAICO Pub.

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PRACTICALS:

1) Program to print any Message
2) Program for Conditional Statements, Looping Statements and Switch Case
3) Program to implement Arrays, Strings and Pointers
4) Program to implement Functions and Dynamic Memory Allocation
5) Program to implement Class and Objects
6) Program to implement Friend Functions and Constructors
7) Program for Inheritance
8) Program for Polymorphism
9) Program for File Handling
10) Program for Exception Handling

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Semester: III

Subject Title	Subject Code	Credits			Practical		
Professional Skills I	BT-307	L	T	P	Externals	Internals (50)	Total (50)
		-	-	2	Min: nil	Min: Nil	Min: 20 (D Grade)

Practical Internal - Max Marks: 50

Assignment / Quiz – Max. Marks: 50

Contents (Practical)
Professional Skills I
Working in Teams Understand and work within the dynamics of a groups. Tips to work effectively in teams, Establish good rapport, interest with others and work effectively with them to meet common objectives, Tips to provide and accept feedback in a constructive and considerate way, Leadership in teams, handling frustrations in group. **Task Management** Introduction to Task identification Task planning, organizing and execution, closing the task. **Business communication** Business communication covering, Role of communication in information age; concept and meaning of communication; skills necessary for technical communication; Communications in a technical organization; Barriers to the process of communication; Style and organization in technical communication covering, Listening, speaking, reading and writing as skills; Objectivity, clarity, precision as defining features of technical communication; Various types of business writing: Letters, reports, notes, memos; Language and format of various types of business letters; Language and style of reports; Report writing strategies; Analysis of a sample report.

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Subject Title	Subject Code	Credits			Practical		
Electrical Workshop	EET- 308	L	T	P	Externals (35)	Internals (15)	Total (50)
		-	-	2	Min: 14	Min: Nil	Min: 20 (D Grade)

Practical External - Max Marks: 35
Practical Internal - Max Marks: 15

Lab work & Sessional – Max Marks: 10
Assignment / Quiz – Max. Marks: 05

Contents (Practical)
Electrical Workshop
Miscellaneous Electrical Workshop Processes Acquaintance with the average tools and equipments used for electrical workshop. Soldering wire jointing of different types, Making of Extension board containing two 5A and one one 15A plug-points, Soldering electrical elements with the necessary switches micro-switches and extension terminals.
House Wiring Processes Wiring of different lamp control, stair casing circuits, batton wiring, Cleat wiring and conduit wiring Assembly and interchange wiring of fluorescent tube light, Connection of table and ceiling fans with regulators, Earth resistance measurement and earthling processes.
Distribution Boards Processes To make a distribution board containing at least two switches, one fan regulator and one 5A plug point energy meter with main switch, Fault detection and repair of domestic electric installation, Fault detection and its repair in institution's workshop installations, To make a single phase main distribution board with five outgoing circuits for light and fan load including main switch and fuses (only internal connections), Wiring and testing of alarm and indicating relays, indicating lights etc, Dismantling, repairing, assembling and testing of domestic appliance like electric iron, room heater, electric toaster, water heater, electric kettle, electric oven, ceiling fan, Table Fan, regulators, alarm bell, Coil winding for small transformers or alarm bell, Assembling small transformer cores from the given lamination plates. Assembling small battery charger
Armature Winding Armature winding of car dynamo, Armature winding of table fan, Armature winding of ceiling fan. Armature winding of 3 phase induction motor.

References:

1. Electrical workshop TMH,Hajara Choudhary
2. Electrical Workshop,IK International,R P Singh
3. My Electrical Workshop,Frank Thornton addy man,The wireless press ltd.