

Faculty of Engineering & Technology
P.K.University
Shivpuri (MP)



Evaluation Scheme & Syllabus
Department of Electrical Engineering
B. Tech First Year
(I & II Sem)
(Effective from session 2019-20)

EVALUATION SCHEME

SEMESTER I

		THEORY		PRACTICAL		TOTAL
SUBJECT CODE	SUBJECT NAME	SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
BTEE-101	Engineering Mathematics-I	30	70	NA	NA	NA
BTEE-102	Engineering Physics-I	30	70	25	25	150
BTEE-103	Engineering Chemistry	30	70	25	25	150
BTEE-104	Basic Electrical Engineering	30	70	25	25	150
BTEE-105	Computer System & Programming in C	30	70	25	25	150

SEMESTER II

		THEORY		PRACTICAL		TOTAL
SUBJECT CODE	SUBJECT NAME	SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
BTEE-201	Engineering Mathematics -II	30	70	NA	NA	100
BTEE-202	Engineering Physics-II	30	70	25	25	150
BTEE-203	Elements of Mechanical Engg.	30	70	25	25	150
BTEE-204	Professional Communication	30	70	25	25	150
BTEE-205	Basic Electronics	30	70	NA	NA	100

***Department of Electrical Engineering
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I Year I Semester

BTEE-101 : ENGINEERING MATHEMATICS – I

Unit - 1: Differential Calculus – I

Successive Differentiation, Leibnitz's theorem, Limit, Continuity and Differentiability of functions of several variables, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables, Curve tracing: Cartesian and Polar coordinates.

Unit - 2: Differential Calculus - II

Taylor's and Maclaurin's Theorem, Expansion of function of several variables, Jacobian, Approximation of errors, Extreme of functions of several variables, Lagrange's method of multipliers (Simple applications).

Unit - 3: Matrix Algebra

Types of Matrices, Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form), Linear dependence, Consistency of linear system of equations and their solution, Characteristic equation, Eigen values and Eigen vectors, Cayley-Hamilton Theorem, Diagonalization, Complex and Unitary Matrices and its properties

Unit - 4: Multiple Integrals

Double and triple integrals, Change of order of integration, Change of variables, Application of integration to lengths, Surface areas and Volumes – Cartesian and Polar coordinates. Beta and Gamma functions, Dirichlet's integral and its applications.

Unit - 5: Vector Calculus

Point function, Gradient, Divergence and Curl of a vector and their physical interpretations, Vector identities, Tangent and Normal, Directional derivatives. Line, Surface and Volume integrals, Applications of Green's, Stokes and Gauss divergence theorems (without proof).

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, John-Wiley & Sons
2. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw- Hill Publishing Company Ltd.
3. R.K.Jain&S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Thomas & Finley, Calculus, Narosa Publishing House
4. Rukmanadachari, Engineering Mathematics – I, Pearson Education.

Department of Electrical Engineering
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I Year I Semester

BTEE-102 : ENGINEERING PHYSICS-I

Unit – I: Relativistic Mechanics

Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Einstein's postulates, Lorentz transformation equations, Length contraction & Time dilation, Relativistic addition of velocities; Variation of mass with velocity, Mass energy equivalence, Concept of rest mass of photon.

Unit – II: Modern Physics: Black body radiation spectrum, Weins law and Rayleigh-Jeans law, Assumption of quantum theory of radiation, Planck's law. Wave-particle duality, de-Broglie matter waves, Bohr's quantization rule, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation (Time dependent and time independent) – particle in one dimensional potential box, Eigen values and Eigen function.

Unit – III: Wave Optics: Interference: Coherent sources, Interference in thin films (parallel and wedge shaped film), Newton's rings and its applications..

Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating.

Unit – IV: Polarization and Laser

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate, Optical Activity, Fresnel's theory, Specific rotation.

Laser: Spontaneous and stimulated emission of radiation, population inversion, Einstein's Coefficients, Concept of 3 and 4 level Laser, Construction and working of Ruby, He-Ne lasers and laser applications.

Unit – V: Fiber Optics and Holography : Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Single and Multi Mode Fibers, Dispersion and Attenuation.

Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

Reference Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wielly)
3. Optics –AjoyGhatak(Tata McGraw Hill Education Private Ltd. New Delhi)
4. Optics - Brijlal& Subramanian (S. Chand)
5. Engineering Physics- C. Mani Naidu(Pearson)
6. Lasers Principles, Types and Applications- K R Nambiar (New Age)

ENGINEERING PHYSICS LAB

List of Experiments

Any ten experiments, at least four from each group:

Group -A

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To study the polarization of light by simple reflection using laser.
7. Measurement of Wavelength of a laser (He-Ne) light using single slit diffraction.

Group – B

8. To determine the specific resistance of a given wire using Carey Foster's bridge.
9. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of the coil.
10. To verify Stefan's Law by electrical method.
11. To calibrate the given ammeter and voltmeter by potentiometer.
12. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of a given semiconductor using Hall effect set up.
13. To determine the energy band gap of a given semiconductor material.
14. To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
15. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
16. To determine the ballistic constant of a ballistic galvanometer.
17. To determine the coefficient of viscosity of a liquid.
18. Measurement of fiber attenuation and aperture of fiber.
19. High resistance by leakage method.
20. Magnetic Susceptibility of paramagnetic solution.

Department of Electrical Engineering
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I Year I Semester

BTEE-103 : ENGINEERING CHEMISTRY

- Unit-1** Molecular orbital theory and its applications to homo-nuclear diatomic molecules. Band theory of solids. Liquid crystals and its applications. Point defects in Solids. Structure and applications of Graphite and Fullerenes. Concepts of nano-materials and its applications
- Unit-2** Polymers: Basic concepts of polymer- blends and composites. Conducting and biodegradable polymers. Preparations and applications of some industrially important polymers (Buna N, Buna S, Neoprene, Nylon 6, Nylon 6,6, Terylene). General methods of synthesis of organometallic compound (Grignard Reagent) and their applications in polymerization.
- Unit-3** Electrochemistry: Galvanic cell, electrode potential, Lead storage battery. Corrosion, causes and its prevention. Setting and hardening of cement, applications of cement. Plaster of paris. Lubricants- Classification, mechanism and applications..
- Unit-4** Hardness of water. Disadvantage of hard water. Boiler troubles, Techniques for water softening; Lime-soda, Zeolite, Ion exchange resin, Reverse osmosis. Phase Rule and its application to water system.
- Unit-5** Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values (bomb calorimeter & Dulong's method). Biogas. Elementary ideas and simple applications of UV, Visible, IR and H1NMR spectral Techniques.

Textbook

1. Chemistry for Engineers, by S. Vairam and Suba Ramesh; Wiley India

Reference Books

1. Textbook of Engineering Chemistry by Dr. Gopal Krishna Bhatt, Acme Publishers
2. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
3. Chemistry Concepts and Applications by Steven S. Zumdahl; Cengage Learning
4. Engineering Chemistry, Wiley India
5. Engineering Chemistry Author: Abhijit Mallick, Viva Books
6. Text Book of Engineering Chemistry by Harsh Malhotra; Sonali Publications
7. Concise Inorganic Chemistry by J.D. Lee; Wiley India
8. Organic Chemistry (6 ed) by Morrison & Boyd; Pearson Education
9. Physical Chemistry by Gordon M. Barrow; Mc-Graw Hill
10. Organic Chemistry, Volume 1(6 ed) & 2 (5ed) by I. L. Finar; Pearson Education

Department of Electrical Engineering
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I Year I Semester

BTEE-103: ENGINEERING CHEMISTRY

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA .
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in water sample.
5. Determination of iron content in the given solution by Mohr's method.
6. pH- metric titration.
7. Viscosity of an addition polymer like polyester by viscometer.
8. Determination of iron concentration in sample of water by colorimetric method.
The method involves the use of KCN as a chelating agent and the measurements are carried out at 480 nm.
9. Element detection and functional group identification in organic compounds.
10. Preparation of Bakelite and Urea formaldehyde resin.

Note: Institute can replace two experiments from the aforesaid experiments as per

Department of Electrical Engineering
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I Year I Semester

BTEE-104 BASIC ELECTRICAL ENGINEERING

DETAILED SYLLABUS

Unit-I : Electrical Circuit Analysis:

Introduction, Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, Source transformation, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, AC fundamentals: Sinusoidal, square and triangular waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Unit-II: Steady- State Analysis of Single Phase AC Circuits:

Analysis of series and parallel RLCCircuits, Concept of Resonance in series & parallel circuits, bandwidth and quality factor; Apparent, active & reactive powers, Power factor, Concept of power factor improvement and its improvement (Simple numerical problems)

Network theorems (AC & DC with independent sources): Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem (Simple numerical problems)

Unit-III : Three Phase AC Circuits:

Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power and its measurement (simple numerical problems).

Measuring Instruments: Types of instruments, Construction and working principles of PMMC and moving iron type voltmeters & ammeters, Single phase dynamometer wattmeter, Use of shunts and multipliers (Simple numerical problems on shunts and multipliers)

Unit-IV: Magnetic Circuit:

Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Magnetic circuit calculations (Series & Parallel).

Single Phase Transformer: Principle of operation, Construction, EMF equation, Equivalent circuit, Power losses, Efficiency (Simple numerical problems), Introduction to auto transformer.

Unit-V: Electrical Machines:

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Text Books:

1. "Basic Electrical Engineering", S N Singh; Prentice Hall International
2. "Basic Electrical Engineering", Kuldeep Sahay, New Age International Publishers
3. "Fundamentals of Electrical Engineering", B Dwivedi, A Tripathi; Wiley India
4. "Principles of Electrical Engineering", V. Del Toro; Prentice Hall International
5. "Electrical Engineering", J. B. Gupta, Kataria and Sons

Reference Books:

1. "Electrical and Electronics Technology", Edward Hughes; Pearson
2. "Engineering Circuit Analysis", W.H. Hayt & J.E. Kimerly; McGraw Hill
3. "Basic Electrical Engineering", C L Wadhwa; New Age International
4. "Basic Electrical Engineering", T.K. Nagsarkar, M.S. Shukhija; Oxford University Press

Department of Agriculture Engineering
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P.K. University, Shivpuri (MP)

I Year I Semester

BTAG-104 ELECTRICAL ENGINEERING LABORATORY

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed

1. Verification of Kirchhoff's laws
2. Verification of Superposition theorem
3. Verification of Thevenin's Theorem and Maximum Power Transfer Theorem.
4. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
5. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
6. Connection and measurement of power consumption of a fluorescent lamp (tube light).
7. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
8. Determination of parameters of ac single phase series RLC circuit
9. To observe the B-H loop of a ferromagnetic material in CRO.
10. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
11. Determination of efficiency of a dc shunt motor by load test
12. To study running and speed reversal of a three phase induction motor and record speed in both directions.

Department of Electrical Engineering
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P.K. University, Shivpuri (MP)
I Year I Semester

BTEE-105 COMPUTER SYSTEMS AND PROGRAMMING IN C

Unit1:

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system: Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

Unit2:

Standard I/O in “C”, **Fundamental data types-** Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external, Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Fundamentals of C programming: Structure of C program, writing and executing the first C program, Components of C language. Standard I/O in C.

Unit3:

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch, program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

Unit 4:

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays. Structure, union, enumerated data types

Unit 5:

Pointers: Introduction, declaration, applications File handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler.

Reference:

1. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education .
2. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited – 2015.
3. Programming in C by Kochan Stephen G. Pearson Education – 2015.
4. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication .
5. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
6. Computer Fundamentals and Programming in C. ReemaThareja, Oxford Publication
7. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
8. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
9. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
10. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication
11. Computer Fundamental and C programming by K K Gupta, Acme Learning Publication

Department of Electrical Engineering
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P.K. University, Shivpuri (MP)

I Year I Semester
BTEE-105 COMPUTER PROGRAMMING LAB

- 1.WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
- 2.WAP that calculates the Simple Interest and Compound Interest. The Principal , Amount, Rate of Interest and Time are entered through the keyboard.
- 3.WAP to calculate the area and circumference of a circle.
- 4.WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula $C/5=(F-32)/9$.
- 5.WAP that swaps values of two variables using a third variable.
- 6.WAP that checks whether the two numbers entered by the user are equal or not.
- 7.WAP to find the greatest of three numbers.
- 8.WAP that finds whether a given number is even or odd.
- 9.WAP that tells whether a given year is a leap year or not.
- 10.WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:
Between 90-100%-----Print 'A'
80-90%-----Print 'B'
60-80%-----Print 'C'
Below 60%-----Print 'D'
- 11.WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
- 12.WAP to print the sum of all numbers up to a given number.
- 13.WAP to find the factorial of a given number.
- 14.WAP to print sum of even and odd numbers from 1 to N numbers.
- 15.WAP to print the Fibonacci series.
- 16.WAP to check whether the entered number is prime or not.

17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.
21. WAP that simply takes elements of the array from the user and finds the sum of these elements.
23. WAP to find the minimum and maximum element of the array.
24. WAP to search an element in a array using Linear Search.
25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.
26. WAP to add and multiply two matrices of order $n \times n$.
27. WAP that finds the sum of diagonal elements of a $m \times n$ matrix.
28. WAP to implement `strlen ()`, `strcat ()`, `strcpy ()` using the concept of Functions.
29. Define a structure data type `TRAIN_INFO`. The type contain Train No.: integer type Train name: string Departure Time: aggregate type `TIME` Arrival Time : aggregate type `TIME` Start station: string End station : string The structure type `Time` contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:
 - (i) List all the trains (sorted according to train number) that depart from a particular section.
 - (ii) List all the trains that depart from a particular station at a particular time.
 - (iii) List all the trains that depart from a particular station within the next one hour of a given time.
 - (iv) List all the trains between a pair of start station and end station.
30. WAP to swap two elements using the concept of pointers.
31. WAP to compare the contents of two files and determine whether they are same or not.
32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

Department of Electrical Engineering
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I Year II Semester

BTEE-201 ENGINEERING MATHEMATICS – II

Unit - 1: Ordinary Differential Equations

Linear differential equations of n th order with constant coefficients, Complementary function and Particular integral, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent & independent variables, Method of variation of parameters, Applications to engineering problems (without derivation).

Unit - 2: Series Solution and Special Functions

Series solution of second order ordinary differential equations with variable coefficient (Frobenius method), Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials.

Unit - 3: Laplace Transform

Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Unit - 4: Fourier Series and Partial Differential Equations

Periodic functions, Dirichlet's Conditions, Fourier series of arbitrary periods, Euler's Formulae, Even and odd functions, Half range sine and cosine series, Gibbs Phenomena.

Solution of first order Lagrange's linear partial differential equations, Second order linear partial differential equations with constant coefficients.

Unit - 5: Applications of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension, Equation of transmission lines.

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw- Hill Publishing Company Ltd.
3. R.K.Jain&S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya
4. A. C. Srivastava& P. K. Srivastava, Engineering Mathematics, Vol. – II, PHI Learning Pvt. Ltd.
5. Rukmangadachari, Engineering Mathematics – II, Pearson Education.

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I Year II Semester

BTAG-202 ENGINEERING PHYSICS- II

Unit – I: Crystal Structures and X-ray Diffraction

Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Co-ordination number, Atomic radius and Packing factor of different cubic structures, Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer. Compton Effect.

Unit – II: Dielectric and Magnetic Properties of Materials

Dielectric Properties: Dielectric constant and Polarization of dielectric materials, Relation between E, D and P, Types of Polarization (Polarizability). Equation of internal fields in liquid and solid (One-Dimensional), Clausius-Mossotti equation, Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material, Ferroelectricity, Piezoelectricity.

Magnetic Properties: Magnetization, Origin of magnetic moment, Dia, para and ferro magnetism, Langevin's theory for diamagnetic material, Phenomena of hysteresis and its applications.

Unit – III: Electromagnetic Theory

Equation of continuity, Maxwell's Equations (Integral and Differential Forms) and its derivations, Displacement Current, Poynting vector and Poynting theorem, EM - Wave equation and its propagation characteristics in free space, non-conducting and conducting media, energy density of electromagnetic wave, Skin depth.

Unit – IV: Band Theory of Solids

Free electron Theory, Formation of bands in Solids, Classification of solids on band theory, Density of states, Fermi-Dirac distribution, Concept of effective mass, Charge carrier density (electrons and holes), Conductivity of semiconductors, carrier concentrations Fermi energy, Position of Fermi level in intrinsic and in extrinsic semiconductors. Temperature dependence of conductivity in semiconductors.

Unit – V: Physics of some technologically important Materials

Superconductors: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, London equations, Josephson theory, persistent currents, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Super-conductors.

Nano-Materials: Basic principle of nanoscience and technology, structure, properties and uses of Fullerene, Carbon nanotubes Single and double walled nanotubes, synthesis of nanotubes, Properties and Applications of nanotubes.

Reference books:

1. Concept of Modern Physics - by Beiser (Tata Mc-Graw Hill)
2. Solid State Physics - by C. Kittel, 7th edition (Wiley Eastern)
3. Materials Science and Engineering - by V. Raghavan (Prentice- Hall India)
4. Solid State Physics - by S.O. Pillai, 5th edition (New Age International)
5. Introduction to Electrodynamics - by David J. Griffith (PH I)
6. Engineering Physics- C. Mani Naidu(Pearson)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New D

Department of Electrical Engineering
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I Year II Semester

BTEE-203 ELEMENTS OF MECHANICAL ENGINEERING

UNIT-I:

Force System: Force, Parallelogram Law, Lami's theorem, Principle of Transmissibility of forces. Moment of a force, Couple, Varignon's theorem, Resolution of a force into a force and a couple. Resultant of coplanar force system. Equilibrium of coplanar force system, Free body diagrams, Determination of reactions.

Concept of Centre of Gravity and Centroid and Area Moment of Inertia, Perpendicular axis theorem and Parallel axis theorem

UNIT-II:

Plane Truss: Perfect and imperfect truss, Assumptions and Analysis of Plane Truss by Method of joints and Method of section.

Beams: Types of beams, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment.

UNIT-III:

Simple stress and strain: Normal and shear stresses. One Dimensional Loading; members of varying cross section, bars in series. Tensile Test diagram for ductile and brittle materials, Elastic constants, Strain energy.

Bending (Flexural) Stresses: theory of pure bending, neutral surface and neutral axis, stresses in beams of different cross sections.

Engineering Materials: Importance of engineering materials, classification, mechanical properties and applications of Ferrous, Nonferrous and composite materials.

UNI-IV:

Basic Concepts and Definitions of Thermodynamics: Introduction and definition of thermodynamics, Microscopic and Macroscopic approaches, System, surrounding and universe, Concept of continuum, Thermodynamic equilibrium, Thermodynamic properties, path, process and cycle, Quasi static process, Energy and its forms, Work and heat. Thermodynamic definition of work.

Zeroth law of thermodynamics: Temperature and its' measurement.

First law of thermodynamics: First law of thermodynamics, Internal energy and enthalpy. First law analysis for non-flow processes. Non-flow work Steady flow energy equation; Boilers, Condensers, Turbine, Throttling process, Pumps etc.

UNIT-V:

Second law: Thermal reservoir, Kelvin Planck statement, Heat engines, Efficiency; Clausius' statement Heat pump, refrigerator, Coefficient of Performance. Carnot cycle, Carnot theorem and its corollaries. Clausius inequality, Concept of Entropy.

Properties of pure substances: P-v, T-s and h-s diagram, dryness fraction and steam tables. Rankine Cycle.

Internal Combustion Engines: Classification of I.C. Engines and their parts, working principle and comparison between 2 Stroke and 4 stroke engine, difference between SI and CI engines. P-v and T-s diagrams of Otto and Diesel cycles, comparison of efficiency.

Books & References:

1. Engineering Mechanics: Statics by J.L Meriam, Wiley
2. Engineering Mechanics : Statics and Dynamics by R. C. Hibbler, Pearson
3. Strength of Materials by Timoshenko & Young
4. Mechanics of Solid by R. C. Hibbler, Pearson
5. Engineering Thermodynamics by P.K.Nag, McGraw Hill
6. Thermodynamics An Engineering Approach by Cengel & Boles, McGraw Hill
7. Engineering Thermodynamics by P. Chattopadhyay, OXFORD Publication
8. Internal Combustion Engine by V Ganesan, McGraw Hill Pub .
9. An Introduction to Mechanical Engineering by Wickert & Lewis, Cengage Learning
10. Engineering Mechanics By S. S. Bhavikatti, K. G. Rajashekarappa, New Age International
11. Engineering Mechanics by R K Bansal, Laxmi Publications
12. Fundamentals of Mechanical Engineering by Sawhney, PHI
13. Basic Mechanical Engineering by Pravin Kumar, Pearson

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I Year II Semester

BTEE-203 ELEMENTS OF MECHANICAL ENGINEERING LAB

Note: Any 10 experiments (Minimum of 3 from each module) are to be conducted.

Module 1:

1. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a mild steel specimen.
2. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the Impact Strength of the specimen.
3. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine.
4. To conduct experiment on Torsion of Rod/wire.

Module 2:

1. To Study the working of 2 stroke Diesel/Petrol engine.
2. To Study and working of 4 stroke Petrol/Diesel engine.
3. To Study the model of Babcock and Wilcox and Lancashire boiler.
4. To Study various types of Mounting and Accessories of Boilers.

Module 3:

1. To verify the parallelogram, and Triangle law.
2. To verify the polygon law of force.
3. To determine the coefficient of friction on inclined surface.
4. To determine the efficiency and Mechanical Advantage of Worm & Worm-wheel.
5. To conduct experiment on Force Analysis on simple truss and Jib-crane Apparatus.
6. To conduct friction experiment on screw-jack.

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)

I Year II Semester

BTEE-204 PROFESSIONAL COMMUNICATIONS

Unit-1 Fundamentals of Communications	Technical Communication: features: Distinction between General And Technical Communication; Language as a tool of communications; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of communication: Downward, Upward, Lateral/Horizontal (Peer group) : Importance of technical communication; Barriers to Communication.
Unit-II Written Communication	Words and Phrases: Word formation, Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; correct Usage: all Parts of Speech; Modals; Concord; Articles; Infinitives; Transformation of sentences; Requisites f Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial , Linear, Chronological etc.
Unit-III Business Communication	Principles, Sales & Credit letters; Claim and Adjustment Letters; Job Application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal; Significance; Negotiation skills.
Unit-IV Presentation Strategies and Soft Skills.	Nuances and Modes of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Interpersonal communication: Definition; Types; Team work; Attitude; Way to improve Attitude Listening Skills : Types; Methods for improving Listening Skills.
Unit –V Value- Based	Following essays from the prescribed text book with emphasis on Mechanics of writing.
Text Readings	(i) Humanistic and Scientific Approaches to Human Activity by Moody E. Prior (ii) The Language of Literature and Science by A. Huxley (iii) Man and Nature by J. Bronowski (iv) Science and Survival by Barry Commoner (v) The Mother of the Sciences by A.J. Bahm.

- Text Book**
1. Improve your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi.
 2. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi.
 3. Functional skills in Language and Literature, by R.P. Singh, Oxford Univ. Press, 2005, New Delhi.
- Reference Books**
1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi.
 2. Business Correspondence and Report Writing by Prof. R.C., Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd. , 2001, New Delhi.
 3. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. & Distributors, 2009, Delhi.

BTEE-204 PROFESSIONAL COMMUNICATION

LABORATORY PRACTICAL'S

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A)

LIST OF PRACTICAL'S

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics / Kinesics.
4. Presentation Skills of Technical Paper/Project Reports/Professional Reports based on proper Stress and Intonation Mechanics.
5. Official /Public Speaking based on Rhythmic Patterns.
6. Theme-Presentation /Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehensions Skills based on Reading and Listening Practical on a model Audio-Visual Usage.

Reference Books

1. Bansal R.K. & Harrison: Phonetics in English, Orient Longman , New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B. Pandey & R.P. Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)

I Year II Semester

BTEE-205 BASIC ELECTRONICS

Unit I PNP-N junction diode: Introduction of Semiconductor Materials Semiconductor Diode:

Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Zener Diodes breakdown mechanism (Zener and avalanche) Diode Application: Series , Parallel and Series, Parallel Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits Special Purpose two terminal Devices :Light-Emitting Diodes, Varactor (Varicap) Diodes, Tunnel Diodes, Liquid-Crystal Displays.

Unit-II Bipolar Junction Transistors and Field Effect Transistor: Bipolar Junction Transistor:

Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration DC Biasing BJTs: Operating Point, Fixed-Bias, Emitter Bias, Voltage-Divider Bias Configuration. Collector Feedback, Emitter-Follower Configuration. Bias Stabilization. CE, CB, CC amplifiers and AC analysis of single stage CE amplifier (re Model). Field Effect Transistor: Construction and Characteristic of JFETs. AC analysis of CS amplifier, MOSFET (Depletion and Enhancement)Type, Transfer Characteristic,

Unit- III Operational Amplifiers :Introduction and Block diagram of Op Amp, Ideal & Practical characteristics of Op Amp, Differential amplifier circuits, Practical Op-Amp Circuits (Inverting Amplifier, Non inverting Amplifier, Unity Gain Amplifier, Summing Amplifier, Integrator, Differentiator).

OPAMP Parameters: Input offset voltage, Output offset voltage, Input biased current, Input offset current Differential and Common-Mode Operation

Unit- IV Electronic Instrumentation and Measurements: Digital Voltmeter : Introduction, RAMP Techniques Digital Multimeters: Introduction Oscilloscope: Introduction, Basic Principle, CRT , Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage, current phase and frequency using CRO, Introduction of Digital Storage Oscilloscope and Comparison of DSO with Analog Oscilloscope.

Unit- V Fundamentals of Communication Engineering: Elements of a Communication System, Need of Modulation, Electromagnetic spectrum and typical applications. Basics of Signal Representation and Analysis, Introduction of various analog modulation techniques, Fundamentals of amplitude modulation, Modulation and Demodulation Techniques of AM.

Text Books:

1. Robert L. Boylestand / Louis Nashelsky "*Electronic Devices and Circuit Theory*", Latest Edition, Pearson Education.
2. H S Kalsi, "Electronic Instrumentation", Latest Edition, TMH Publication,.
3. George Kennedy, "Electronic Communication Systems", Latest Edition, TMH,

Reference Books:

1. David A. Bell, "*Electronic Devices and Circuits*", Latest Edition, Oxford University Press.
2. Jacob Millman, C.C. Halkias, StayabrataJit, "*Electronic Devices and Circuits*", Latest Edition ,TMH.
3. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford University Press India.

ELECTRICAL ENGINEERING

SEMESTER III

SEMESTER III						
SUBJECT CODE	SUBJECT NAME	THEORY		PRACTICAL		TOTAL
		SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
BTEE-301	Engineering Mathematics - III	30	70	NA	NA	100
BTEE-302	Analog & Digital Electronics	30	70	NA	NA	100
BTEE-303	Electrical & Electronics Engg. Materials	30	70	NA	NA	100
BTEE-304	Electrical Measurements & Instrumentation	30	70	25	25	150
BTEE-305	Basic Signals & Systems	30	70	NA	NA	100
BTEE-306	Environment & Ecology	30	70	NA	NA	100
BTEE-307	Electrical Workshop	NA	NA	25	25	50
BTEE-308	Simulation Lab-I	NA	NA	25	25	50
BTEE-309	Electronics Lab	NA	NA	25	25	50

SEMESTER IV

SEMESTER IV						
SUBJECT CODE	SUBJECT NAME	THEORY		PRACTICAL		TOTAL
		SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
BTEE-401	Nano Science	30	70	NA	NA	100
BTEE-402	Power Plant Engineering	30	70	NA	NA	100
BTEE-403	Electromagnetic Field Theory	30	70	NA	NA	100
BTEE-404	Electrical Machine-I	30	70	25	25	150
BTEE-405	Universal Human Value & Professional Ethics	30	70	NA	NA	100
BTEE-406	Network Analysis and Synthesis	30	70	25	25	150
BTEE-407	Electrical Instruments Lab	NA	NA	25	25	50
BTEE-408	Simulation Lab-II	NA	NA	25	25	50

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
Semester-III

BTEE-301: ENGINEERING MATHEMATICS –III

UNIT- I

Numerical Techniques – I: Zeroes of transcendental and polynomial equations, Bisection method, Regula-falsi method, Newton-Raphson method, Rate of convergence of above methods.

Interpolation: Finite differences, Newton's forward and backward interpolation. Lagrange's and Newton's divided difference formula for unequal intervals.

UNIT- II

Numerical Techniques –II: Solution of system of linear equations, Matrix Decomposition methods, Jacobi method, Gauss- Seidal method.

Numerical differentiation & Integration: Trapezoidal rule, Simpson's one third and three- eight rules, Solution of ordinary differential equations (first order, second order and simultaneous) by Euler's, Picard's and fourth-order Runge- Kutta methods.

UNIT- III

Statistical Techniques: Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves, Correlation, Linear, non – linear and multiple regression analysis, Binomial, Poisson and Normal distributions. Tests of significations: Chi-square test, t-test.

UNIT- IV

Function of Complex variable: Analytic function, C-R equations, Harmonic Functions, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions, Taylor's and Laurent's series, Singularities, Zeroes and Poles, Residue theorem.

UNIT -V

Integral Transforms: Fourier integral, Complex Fourier transform, Inverse Transforms, Convolution Theorems, Fourier sine and cosine transform, Applications of Fourier transform to simple one dimensional heat transfer equations, wave equations and Laplace equations, Z- Transform and its application to solve difference equation.

Text Books:

1. Peter V. O'Neil, Advance Engineering Mathematics Thomson (Cengage) Learning, 2007.
2. Jain, Iyenger Jain, Numerical Methods for Scientific and Engineering Computation, New Age International, New Delhi
3. J.N. Kapur, Mathematical Statistics, S. Chand & companyLtd.
4. B.S.Grewal, Higher Engineering Mathematics, KhannaPublishers

Reference Books:

1. R.K. Jain &S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publication House.
2. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudralaya,1996.
3. S.S. Sastry, Introductory Methods of Numerical Analysis, PHI Learning Private Limited, New Delhi.
4. E. Balagurusamy, Numerical Methods, Tata McGraw-Hill Publishing Company Limited, New Delhi
5. T. Veerajan& T. Ramchandrandran, Theory & Problems in Numerical Methods, TMH, NewDelhi

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
Semester-III

BTEE-: 302 ANALOG & DIGITAL ELECTRONICS

UNIT I

Special Diodes-LED, Photo diode, Schottky diode, Tunnel diode; their characteristics and applications. Introduction to Power devices- Characteristics of SCR, TRIAC, DIAC.

UNIT II

Amplifier and Frequency Response-Introduction to Amplifier, Transfer Function, Frequency Response of Common Emitter, Multistage amplifier. Frequency response of Common source MOSFET Amplifier.

UNIT III

Feedback- General feedback structure; properties of negative feedback; series-series, series-shunt, shunt-series and shunt-shunt feedback amplifiers.

Oscillators- Basic principle of sinusoidal oscillator, R-C Phase Shift, Wein Bridge oscillators, tuned oscillators- Collpits and Hartley; Crystal oscillator, CLAP Oscillator.

UNIT IV

Number System, Gate Level Minimization (up to three Variables), SOP, POS Simplification.

Combinational Logic Circuits: Binary Adder/ Subtractor, Multiplexer/ Demultiplexer, Decoder/ Encoder

Sequential Logic: Introduction to latches, flip-flops- S-R, T, D, J-K.

UNIT V

Registers & Counter: Serial and parallel data transfer, shift left/right registers, universal shift register. Mode N Counters, ripple counters, synchronous counters, Ring/Johnson counters.

Memory: Introduction to ROM, RAM, PLA, PAL.

Text Books:

1. AS Sedra and K.C. Smith “Microelectronics Circuits” Oxford University Press (India)
2. Malvino & Leach, “Digital Principles and applications” Tata Mc. Graw Hill
3. RA Gayakwad “Op amps and Linear Integrated Circuits” Prentice Hall of India.
4. Balbir Kumar and ShailB. Jain, “Electronic Devices and Circuits” Prentice Hall of India, 2007

Reference Books:

1. Taub & Schilling “Digital Electronics”- Tata McGraw Hill
2. Anil K. Maini, “Digital Electronics: Principles and Integrated circuits” Wiley India Ltd, 2008.
3. Millman, J. and Grabel A, “Microelectronics” McGraw Hill
4. Anand Kumar, “Switching Theory and Logic Design” Prentice Hall of India, 2008.
5. Alope. K. Dutta, “Semiconductor Devices and circuits”, Oxford University Press, 2008.

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
Semester-III

BTEE-303: ELECTRICAL & ELECTRONICS ENGINEERING MATERIALS

UNIT -I

Dielectric Materials: Dielectric as Electric Field Medium, leakage currents, dielectric loss, dielectric strength, breakdown voltage, breakdown in solid dielectrics, flashover, liquid dielectrics, electric conductivity in solid, liquid and gaseous dielectrics, Ferromagnetic materials, properties of ferromagnetic materials in static fields, spontaneous, polarization, curie point, anti-ferromagnetic materials, piezoelectric materials, pyroelectric materials.

UNIT- II

Magnetic Materials: Classification of magnetic materials, spontaneous magnetization in ferromagnetic materials, magnetic Anisotropy, Magnetostriction, diamagnetism, magnetically soft and hard materials, special purpose materials, feebly magnetic materials, Ferrites, cast and cermet permanent magnets, ageing of magnets. Factors effecting permeability and hysteresis.

UNIT- III

Semiconductor Materials: Properties of semiconductors, Silicon wafers, integration techniques, Large and very large scale integration techniques (VLSI).

UNIT- IV

Materials For Electrical Applications: Materials used for Resistors, rheostats, heaters, transmission line structures, stranded conductors, bimetals fuses, soft and hard solders, electric contact materials, electric carbon materials, thermocouple materials. Solid Liquid and Gaseous insulating materials. Effect of moisture on insulation.

UNIT- V

Special Purpose Materials: Refractory Materials, Structural Materials, Radioactive Materials, Galvanization and Impregnation of materials, Processing of electronic materials, Insulating varnishes and coolants, Properties and applications of mineral oils, Testing of Transformer oil as per ISI Reading.

Text Books:

1. RK Rajput, A course in Electrical Engineering Materials, Laxmi Publications, 2009
2. TK Basak, A course in Electrical Engineering Materials, New Age Science Publications, 2009
3. Adrianus J. Dekker, Electrical Engineering Materials, Pearson, 2016.

Reference Books:

1. TTTI Madras, Electrical Engineering Materials
2. C S Indulkar & S Thiruvengadam, Electrical Engineering Materials

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
Semester-III

BTEE -304: ELECTRICAL MEASUREMENTS & INSTRUMENTATION

UNIT- I

Electrical Measurements: Measurement system, Characteristics of instruments, Methods of measurement, Errors in Measurement & Measurement standards, Review of indicating and integrating instruments: Voltmeter, Ammeter, Three phase Wattmeter, Multimeter and Energy meter.

UNIT - II

Measurement of Resistance, Inductance and Capacitance: Measurement of low, medium and high resistances, insulation resistance measurement, AC bridges for inductance and capacitance measurement.

UNIT- III

Instrument Transformers: Current and Potential transformer, ratio and phase angle errors, design considerations and testing.

UNIT- IV

Electronic Measurements: Electronic voltmeter, Multimeter, Wattmeter & energy meter. Time, Frequency and phase angle measurements using CRO; Spectrum & Wave analyzer. Digital counter, frequency meter, voltmeter, multimeter and storage oscilloscope.

UNIT -V

Instrumentation: Transducers, classification & selection of transducers, strain gauges, Thermistors, Thermocouples, LVDT, Inductive & capacitive transducers, Piezoelectric and Hall-effect transducers, Measurement of motion, force, pressure, temperature, flow and liquid level, basic concepts of smart sensors and application. Data Acquisition Systems.

Text Book:

1. A K Sawhney, "Electrical & Electronic Measurement & Instrument", DhanpatRai& Sons, India
2. BC Nakra& K. Chaudhary, "Instrumentation, Measurement and Analysis," Tata McGraw Hill 2nd Edition
3. Purkait, "Electrical & Electronics Measurement & Instrumentation", TMH

Reference Books:

1. Forest K. Harris, "Electrical Measurement", Willey Eastern Pvt. Ltd. India
2. M. Stout , "Basic Electrical Measurement", Prentice Hall of India
3. WD Cooper, "Electronic Instrument & Measurement Technique", Prentice Hall International
4. EW Golding &F.C. Widdis, "Electrical Measurement &Measuring Instrument", AW Wheeler & Co. Pvt. Ltd. India

***Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
II year Semester-III***

BTEE 304 : ELECTRICAL MEASUREMENTS LAB

Note: Minimum ten experiments are to be performed from the following list:

1. Calibration of AC voltmeter and AC ammeter.
2. Measurement of inductance by Maxwell's Bridge.
3. Measurement of inductance by Hay's Bridge.
4. Measurement of inductance by Anderson's Bridge.
5. Measurement of capacitance by Owen's Bridge.
6. Measurement of capacitance by De Sauty Bridge.
7. Measurement of capacitance by Schering Bridge.
8. Measurement of low resistance by using Kelvin's Double bridge.
9. Measurement of phase difference and frequency of AC signal using CRO.
10. Measurement of Power using CT & PT.
11. Measurement of iron loss in a ring by using Maxwell's Bridge.
12. To measure high resistance by using loss of charge method.

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
II Year Semester-III

BTEE-305: BASIC SIGNALS & SYSTEMS

UNIT- I

Introduction To Continuous Time Signals And Systems: Introduction to continuous time and discrete time signals, Classification of signals with their mathematical representation and characteristics. Transformation of independent variable, Introduction to various type of system, basic system properties.

Analogous System: Linear mechanical elements, force-voltage and force-current analogy, modeling of mechanical and electro-mechanical systems: Analysis of first and second order linear systems by classical method.

UNIT- II

Fourier Transform Analysis: Exponential form and Compact trigonometric form of Fourier series, Fourier symmetry, Fourier transform: Properties, application to network analysis. Definition of DTFS, and DTFT, Sampling Theorem.

UNIT-III

Laplace Transform Analysis: Review of Laplace Transform, Properties of Laplace Transform, Initial & Final value Theorems, Inverse Laplace Transform, Convolution Theorem, Impulse response, Application of Laplace Transform to analysis of networks, waveform synthesis and Laplace Transform to complex waveforms.

UNIT- IV

State – Variable analysis: Introduction, State Space representation of linear systems, Transfer function and state Variables, State Transition Matrix, Solution of state equations for homogeneous and non-homogeneous systems, Applications of State – Variable technique to the analysis of linear systems.

UNIT--V

Z – Transform Analysis: Concept of Z – Transform, Z – Transform of common functions, Inverse Z – Transform, Initial& Final value Theorems, Applications to solution of difference equations, Properties of Z-transform.

Text Books:

1. Oppenheim, Wilsky, Nawab, “Signals & Systems”, PHI
2. Anand Kumar, “ Signals& Systems”, PHI
3. Choudhary D. Roy, “Network & Systems”, Wiley Eastern Ltd.

Reference Books:

1. David K. Cheng; “Analysis of Linear System”, Narosa Publishing Co
2. Donald E. Scott, “Introduction to circuit Analysis” Mc. Graw Hill
3. BP Lathi, “Linear Systems & Signals” Oxford University Press, 2008.
4. IJNagrath, S.N. Saran, R. Ranjan and S. Kumar, “Signals and Systems”, Tata Mc.Graw Hill, 2001.
5. ME Van-Valkenberg; “ Network Analysis”, Prentice Hall of India

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
II year Semester-III

BTEE -306: ENVIRONMENT & ECOLOGY

UNIT-I

Definition, Scope & Importance, Need For Public Awareness • Environment definition, Eco system - Balanced ecosystem, Human activities - Food, Shelter, Economic and social Security. Effects of human activities on environment Agriculture, Housing, Industry, Mining and Transportation activities, Basics of Environmental Impact Assessment. Sustainable Development

UNIT-II

Natural Resources • Water Resources • Availability and Quality aspects. Water borne diseases, Water Induced diseases, Fluoride problem in drinking water. Mineral Resources, Forest Wealth, Material cycles - Carbon, Nitrogen and Sulphur Cycles.

Energy - Different types of energy, Electro-magnetic radiation. Conventional and Non-Conventional sources – Hydro-Electric, Fossil Fuel based, Nuclear, Solar, Biomass and Bio.gas. Hydrogen as an alternative future source of Energy.

UNIT-III

Environmental Pollution and their effects. Water pollution, Land pollution. Noise pollution, Public Health aspects, Air Pollution, Solid waste management, e-waste management. Current Environmental Issues of Importance: Population Growth, Climate Change and Global warming - Effects, Urbanization, Automobile pollution. Acid Rain Ozone Layer depletion, Animal Husbandry,

UNIT-IV

V Environmental Protection - Role of Government, Legal aspects, initiatives by Non-Governmental organizations (NGO), Environmental Education, Women Education,

Text Books

1. Environmental Studies - Benny Joseph - Tata Mcgraw Hill - 2005
2. Environmental Studies - Or. D.L. Manjunath, Pearson Education - 2006.
3. Environmental studies - R, Rajagopalan - Oxford Publication • 2005.
4. Text book of Environmental Science & Technology - M. Anji Reddy - US Publication .

Reference Books

1. Principles of Environmental Science and Engineering - P. Venugoplan Rao, Prentice Hall of India.
2. Environmental Science and Engineering - Meenakshi, Prentice Hall India

***Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
II year Semester-III***

BTEE307: ELECTRICAL WORKSHOP

Note: Minimum ten experiments are to be performed from the following list:

1. To study the working and Control of two lamps in series and in parallel
2. To perform the stair case working and it's testing.
3. To study the working principle and wiring of fluorescent lamp.
4. To study and wiring of distribution board including power plug using isolator, MCB, ELCB.
5. To study and estimate a typical, BHK house wiring.
6. Familiarization, soldering, testing and observing the wave forms on CRO of a HW and FW uncontrolled rectifier (using diodes) with capacitor filter.
7. Visit your college substation and familiarize the supply system, Transformer, HT Panel and Distribution etc.
8. To study construction, working and application of workshop tools. Also study the Electrical and Electronics Symbols.
9. To study the wires, cables and their gauges, Domestic Electrical Accessories.
10. Mini Project on PCB.
11. To study fault, Remedies in Domestic Installation and Indian Electricity Rules.
12. To study the different types of earthing system and measure the earth resistance.

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
II year Semester-III

BTEE 308 :SIMULATION LAB – I

Note: Minimum ten experiments are to be performed from the following list:

1. Introduction to MATLAB and its basic commands
2. Determine the root of a polynomial
3. Determination of polynomial using method for least square curve fitting
4. Solution of differential equation using 4th order runge - kutta method
5. Determination of time response of an RLC circuit
6. Single line Modeling of DC motor
7. Step, Ramp and impulse response of transfer function
8. Generation of single and three phase sinusoidal waveform
9. PWM based waveform generation
10. Single phase uncontrolled half wave rectifier using R and RL load
11. Single phase uncontrolled full wave rectifier using R and RL load
12. Three phase uncontrolled full wave rectifier using R and RL load

Institute may add any two software based experiments [Develop Computer Program in 'C' language or use MATLAB or Electrical Domain Simulation Software: "Virtual HIL Device" (Free, Unlimited Users, Full Version) from Typhoon HIL GmbH or Equivalent software] in the above list.

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
Semester-III

BTEE 309: ELECTRONICS LAB

Note: Select at least any five out of the following:

1. To Plot V-I characteristics of junction diode and zener diode.
2. To draw wave shape of the electrical signal at input and output points of the half wave, full wave and bridge rectifiers.
3. To Plot input / output characteristics for common base transistor.
4. To Plot input /output characteristics of FET and determine FET parameters at a given operating point.
5. To determine voltage gain, current gain, input impedance and output impedance of common emitter amplifier.
6. To determine voltage gain, current gain, input impedance and output impedance and frequency response of R-C coupled common emitter amplifier.
7. To design R-C Phase shift / Wein Bridge oscillator and verify experimentally the frequency of oscillation.
8. To study transistor as a switch and determine load voltage and load current when the transistor is ON.

Note: Select at least any five out of the following:

9. To study application of Operational Amplifier as summer integrator and voltage comparator.
10. To study operation of Op-Amp based astable and mono-stable multi vibrators.
11. To study operation IC 555 based astable and mono-stable multi vibrators.
12. To study operation of (a) multiplexer using IC 74150 (b) demultiplexer using IC 74138.
13. To study operation of Adder / Subtractor using 4 bit / 8 bit IC 7483.
14. To study operation of (a) J K Master – slave flip – flop using IC 7476 (b) Modulo N counter using programmable counter IC74190.
15. To verify experimentally output of A/D and D/A converters.
16. To study regulation of unregulated power supply using IC 7805/7812 voltage regulator and measure the load and line regulations

***Department of Electrical Engineering
(Faculty of Engineering & Technology)***

P.K. University, Shivpuri (MP)

II Year Semester-IV

BTEE-401: NANO SCIENCE

UNIT I

Introduction: Definition of Nano-Science and Nano Technology, Applications of Nano-Technology.

Quantum Theory for Nano Science: Particle in a box, Potential step: Reflection and tunneling (Quantum leak). Penetration of Barrier, Potential box (Traped particle in 3D: Nanodot).

Physics of Solid State Structures: Size dependence of properties, crystal structures, face centered cubic nanoparticles; Tetrehedrally bounded semiconductor structures; lattice vibrations.

Energy Bands: Insulators, semiconductor and conductors; Reciprocal space; Energy bands and gaps of semiconductors; effective masses; Fermi Surfaces.

Localized Particles: Acceptors and deep taps; mobility; Excitons.

UNIT II

Quantum Nanostructure: Preparation of quantum wells, Wires and Dots, Size and Dimensionality effect, Fermi gas; Potential wells; Partial confinement; Single electron Tunneling, Infrared detectors; Quantum dot laser superconductivity.

Properties of Individual Nano Particles: Metal nano clusters; Magic numbers; Theoretical modeling of nano particles; geometric structure; electronic structure; Reactivity, Fluctuations, Magnetic clusters; Bulk to nanostructure, semiconducting nanoparticles, Optical Properties, Photo fragmentation, Coulombic Explosion. Rare Gas & Molecular clusters; Inert gas clusters; Superfluid clusters; Molecular clusters.

UNIT III

Growth Techniques of Nanomaterials: Litho and Nonlithographic techniques, RF Plasma, Chemical methods, Thermolysis, Pulsed laser method, Self-assembly, E-beam evaporation, Chemical Vapour Deposition, Pulsed Laser Deposition.

UNIT IV

Methods of Measuring Properties: Structure: X-ray Diffraction Technique, Particle size determination, surface structure. Microscopy: Scanning Probe Microscopy (SPM), Atomic Force Microscopy (AFM), Field Ion Microscopy, Scanning Electron Microscopy, Transmission Electron Microscopy(TEM). Spectroscopy: Infra red and Raman Spectroscopy, X-ray Spectroscopy, Magnetic resonance, Optical and Vibrational Spectroscopy, Luminescence.

UNIT V

Carbon Nano Materials: Bucky Ball and Carbon Nano- Tubes: Nano structures of carbon (fullerene), Fabrication, Structure. Electrical, Mechanical and Vibrational properties and applications. Nano Diamond, Boron Nitride Nano-tubes, Single Electron Transistors, Molecular Machine, Nano-Biometrics, Nano Robots.

Text/Reference Books:

1. CP Poole Jr, FJ Owens, "Introduction to Nanotechnology".

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
II Year Semester-IV

BTEE-402: POWER PLANT ENGINEERING

UNIT I

Hydro-electric power plants – selection of site, elements of power plant, classification, water turbines, governor action, hydro-electric generator, plant layout, pumped storage plants.

UNIT II

Thermal Steam power plants – selection of site, elements and operational circuits of the power plant, turbo-alternators, plant layout, steam turbines, controls and auxiliaries.

UNIT III

Nuclear power plants – selection of site, nuclear reaction – fission process and chain reaction, constituents of power plant and layout, nuclear reactor – working, classification, control, shielding and waste disposal.

UNIT IV

Renewable power plants – Solar power generation – Photo-voltaic and solar thermal generation – solar concentrators, Wind power generation – types of wind mills, wind generators, tidal, biomass, geothermal and magneto-hydro dynamic power generation, micro-hydel power plants, fuel cells and diesel and gas power plants.

UNIT V

Combined operation of power plants – plant selection, choice of size and number of generator units, interconnected systems, real and reactive power exchange among interconnected systems. Power plant economics: load curve, different terms and definitions, cost of electrical energy, tariffs methods of electrical energy, performance & operating characteristics of power plants, Economic Load Sharing.

Text Books:

1. Chakrabarti A., Soni M.L., Gupta P.V., and Bhatnagar U.S., 'A text book on Power Systems Engg.', Dhanpat Rai and Sons, New Delhi, 2nd revised edition, 2010.
2. JB Gupta, 'A course in Power Systems', S.K. Kataria and sons, reprint 2010-2011.

Reference Books:

1. Wadhwa, C.L., 'Generation Distribution and Utilization of Electrical Energy', New Age International publishers, 3rd edition, 2010.
2. Deshpande M.V., 'Elements of Electrical Power systems Design', Pitman, New Delhi, PHI Learning Private Limited, 1st edition, 2009.

*Department of Electrical Engineering
(Faculty of Engineering & Technology)*

P.K. University, Shivpuri (MP)

II Year Semester-IV

BTEE-403: ELECTROMAGNETIC FIELD THEORY

UNIT- I

Coordinate Systems and Transformation:

Basics of Vectors: Addition, subtraction and multiplications; Cartesian, Cylindrical, Spherical transformation.

Vector calculus: Differential length, area and volume, line surface and volume integrals, Del operator, Gradient, Divergence of a vector, Divergence theorem, Curl of a vector, Stokes's theorem, Laplacian of a scalar.

UNIT- II

Electrostatic fields: Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gauss's Law- Maxwell's equation, Electric dipole and flux line, Energy density in electrostatic fields, Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, Dielectric-constants, Continuity equation and relaxation time, boundary conditions, Electrostatic boundary value problems: Poisson's and Laplace's equations., Methods of Images.

UNIT- III

Magneto statics : Magneto-static fields, Biot - Savart's Law, Ampere's circuit law, Maxwell's equation, Application of ampere's law, Magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential.

UNIT- IV

Magnetic forces: Materials and devices, Forces due to magnetic field, Magnetic torque and moment, a magnetic dipole. Magnetization in materials, Magnetic boundary conditions, Inductors and inductances, Magnetic energy.

UNIT- V

Waves and Applications: Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, Displacement current, Maxwell's equation in final form Electromagnetic wave propagation: Wave propagation in loss dielectrics, Plane waves in lossless dielectrics Plane wave in free space. Plain waves in good conductors, Power and the pointing vector, Reflection of a plain wave in a normal incidence. Transmission Lines and Smith Chart.

Text Book:

1. MNOSadiku, "Elements of Electromagnetic", Oxford University Press.

Reference Books:

1. WHHayt and JA Buck, "Engineering Electromagnetic", McGraw- Hill Education.

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
II Year Semester-IV
BTEE-404: ELECTRICAL MACHINES - I

UNIT- I

Principles of Electro-mechanical Energy Conversion: Introduction, Review of magnetic system, Energy in Magnetic system, Force and torque in magnetic field system, Energy balance equation, Energy conversion via electrical field, Energy in a singly excited system, Determination of the Force and Torque from energy and co-energy, concept of Doubly excited system, Generation of EMF in Machines, Torque in machine with cylindrical air gap.

UNIT- II

DC Machines: Construction, Classification and circuit model of DC Machines, Armature winding (Concentrated and Distributed), Winding Factor, EMF and torque equations, Armature reaction, Commutation, Interpoles and compensating windings, Performance characteristics of DC generators, Series and Parallel operation of the DC Generator, Applications.

UNIT- III

DC Machines (Contd.): Performance characteristics of DC motors, Starting of DC motors; 3 point and 4 point starters, Speed control of DC motors; Field control, Armature control and Voltage control (Ward Leonard method); Efficiency and Testing of DC machines (Hopkinson's and Swinburne's Test), Applications.

UNIT- IV

Single Phase Transformer: Construction, EMF Equation, Equivalent Circuit, Phasor diagram, Efficiency and voltage regulation, All day efficiency.

Testing of Transformers- O.C. and S.C. tests, Polarity test, Sumpner's test,

Auto Transformer- Single phase and three phase autotransformers, Volt-amp relation

Copper saving in autotransformer Efficiency, Merits & demerits and applications.

UNIT- V

Three Phase Transformers: Construction, Three phase transformer, Phasor groups and their connections, Open delta connection, Three phase to 2 phase, 6 phase or 12 phase connections and their applications, Parallel operation of single phase and three phase transformers and load sharing, Three winding transformers, Excitation phenomenon and harmonics in transformers.

Text Books:

1. IJNagrath & D.P. Kothari, "Electrical Machines", Tata McGraw Hill
2. Rajendra Prasad, "Electrical Machines", PHI
3. PS Bimbhra, "Electrical Machinery", Khanna Publisher

Reference Books:

1. H. Cotton, "Electrical Technology", CBS Publication.
2. MG Say, "The Performance and Design of AC machines", Pit man & Sons.
3. PS Bimbhra, "Generalized Theory."

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
II Year Semester-IV

BTEE - 405: UNIVERSAL HUMAN VALUES AND PROFESSIONAL ETHICS

[L-T-P: 3-0-0]

Course Objectives

UNIT 1: Course Introduction – Need, Basic Guidelines, Content and Process for Value Education

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self Exploration–what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in **harmony** at various levels

UNIT 2: Understanding Harmony in the Human Being - Harmony in Myself!

7. Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’
 8. Understanding the needs of Self (‘I’) and ‘Body’ - *Sukhand Suvidha*
 9. Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer)
 10. Understanding the characteristics and activities of ‘I’ and harmony in ‘I’
 11. Understanding the harmony of I with the Body: *Sanyamand Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail
 12. Programs to ensure *Sanyamand Swasthya*
- Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

13. *Understanding Harmony in the family – the basic unit of human interaction*
14. Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*;
Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship
15. Understanding the meaning of *Vishwas*; Difference between intention and competence

16. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship

17. Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitvaas* comprehensive Human Goals

18. Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha*)- from family to world family!

- Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT 4: Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

19. Understanding the harmony in the Nature

20. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature

21. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space

22. Holistic perception of harmony at all levels of existence

- Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

23. Natural acceptance of human values

24. Definitiveness of Ethical Human Conduct

25. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

26. Competence in professional ethics:

- a) Ability to utilize the professional competence for augmenting universal human order
- b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
- c) Ability to identify and develop appropriate technologies and management patterns for above production systems.

27. Case studies of typical holistic technologies, management models and production systems

28. Strategy for transition from the present state to Universal Human Order:

- a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers
- b) At the level of society: as mutually enriching institutions and organizations

Reference Material

The primary resource material for teaching this course consists of

a. The text book

R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2

b. The teacher's manual

R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi, 2010

c. A set of DVDs containing

- Video of Teachers' Orientation Program
- PPTs of Lectures and Practice Sessions
- Audio-visual material for use in the practice sessions

In addition, the following reference books may be found useful for supplementary reading in connection with different parts of the course:

1. B L Bajpai, 2004, *Indian Ethos and Modern Management*, New Royal Book Co., Lucknow. Reprinted 2008.
2. PL Dhar, RR Gaur, 1990, *Science and Humanism*, Commonwealth Publishers.
3. Sussan George, 1976, *How the Other Half Dies*, Penguin Press. Reprinted 1986, 1991
4. Ivan Illich, 1974, *Energy & Equity*, The Trinity Press, Worcester, and HarperCollins, USA
5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, *limits to Growth*, Club of Rome's Report, Universe Books.
6. SubhasPalekar, 2000, *How to practice Natural Farming*, Pracheen(Vaidik) KrishiTantra Shodh, Amravati.
7. A Nagraj, 1998, *JeevanVidyaekParichay*, Divya Path Sansthan, Amarkantak.
8. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if people mattered*, Blond & Briggs, Britain.
9. A.N. Tripathy, 2003, *Human Values*, New Age International Publishers.

Relevant websites, movies and documentaries

1. Value Education websites, <http://uhv.ac.in>, <http://www.uptu.ac.in>
2. Story of Stuff, <http://www.storyofstuff.com>
3. Al Gore, *An Inconvenient Truth*, Paramount Classics, USA
4. Charlie Chaplin, *Modern Times*, United Artists, USA
5. IIT Delhi, *Modern Technology – the Untold Story*
6. Gandhi A., *Right Here Right Now*, Cyclewala Productions

Department of Electrical Engineering
(Faculty of Engineering & Technology)

P.K. University, Shivpuri (MP)

II Year Semester-IV

BTEE - 406: NETWORK ANALYSIS AND SYNTHESIS

Unit- I

Graph Theory: Importance of Graph Theory in Network Analysis, Graph of a network, Definitions, planar & Non Planar Graphs, Isomorphism, Tree, Co Tree, Link, basic loop and basic cut set, Incidence matrix, Cut set matrix, Tie set matrix, Duality, Loop and Nodal methods of analysis.

Unit -II

Network Theorems (Applications to dependent & independent sources): Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem, Millman's theorem, Compensation theorem, Tellegen's Theorem.

Unit -III

Transient Circuit Analysis: Natural response and forced response, Transient response and steady state response for arbitrary inputs (DC and AC), Evaluation of time response both through classical and Laplace methods.

Unit- IV

Network Functions: Concept of complex frequency, Transform impedances network functions of one port and two port networks, Concept of poles and zeros, Properties of driving point and transfer functions.

Two Port Networks- Characterization of LTI two port networks; Z, Y, ABCD, A'B'C'D', g and h parameters, Reciprocity and symmetry, Inter-relationships between the parameters, Inter-connections of two port networks, Ladder and Lattice networks: T & Π representation, terminated two Port networks, Image Impedance.

Unit -V

(a) Network Synthesis- Positive real function; definition and properties, Properties of LC, RC and RL driving point functions, Synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms.

(b) Filters- Image parameters and characteristics impedance, Passive and active filter fundamentals, Low pass filters, High pass (constant K type) filters, Introd. to active filters.

Text Books:

1. ME Van Valkenburg, "Network Analysis", Prentice Hall of India.
2. Alexander, Sadiku, "Fundamentals of Electric Circuits", McGraw Hill.
3. D. Roy Choudhary, "Networks and Systems", Wiley Eastern Ltd.
4. CL Wadhwa, "Network Analysis and Synthesis", New Age International Publishers.
5. A. Chakrabarti, "Circuit Theory", Dhanpat Rai & Co.

Reference Books:

1. Hayt, Kimmerly, Durbin, "Engineering Circuit Analysis", McGraw Hill.
2. Donald E. Scott, "An Introduction to Circuit analysis: A System Approach", McGrawHill.
3. ME Van Valkenburg, "An Introduction to Modern Network Synthesis", Wiley Eastern Ltd.
4. T.S.K.V. Iyer, "Circuit Theory", Tata McGraw Hill.

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
II Year Semester-IV

BTEE404: ELECTRICAL MACHINES-I LAB

Note: Minimum ten experiments are to be performed from the following list, out of which there should be at least two software based experiments.

1. To obtain magnetization characteristics of a DC shunt generator.
2. To obtain load characteristics of a DC shunt generator and compound generator
(a) Cumulatively compounded (b) Differentially compounded.
3. To obtain efficiency of a DC shunt machine using Swinburne's test.
4. To perform Hopkinson's test and determine losses and efficiency of DC machine.
5. To obtain speed-torque characteristics of a DC shunt motor.
6. To obtain speed control of DC shunt motor using (a) armature resistance control
(b) field control
7. To obtain speed control of DC separately excited motor using Ward-Leonard.
8. To obtain equivalent circuit, efficiency and voltage regulation of a single phase transformer using O.C. and S.C. tests.
9. To obtain efficiency and voltage regulation of a single phase transformer by Sumpner's test.
10. To obtain 3-phase to 2-phase conversion by Scott connection.
11. To determine excitation phenomenon (B.H. loop) of single phase transformer Using C.R.O.
12. To demonstrate the parallel operation of three phase Transformer and to obtain the load sharing at a particular load.

Institute may add any two software based experiments [Develop Computer Program in 'C' language or use MATLAB or Electrical Domain Simulation Software: "Virtual HIL Device" (Free, Unlimited Users, Full Version) from Typhoon HIL GmbH or Equivalent software] in the above list.

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
II Year Semester-IV

BTEE 406: NETWORKS LAB

Note: Minimum ten experiments are to be performed from the following list, out of which there should be at least two software based experiments.

1. Verification of principle of superposition with AC sources.
2. Verification of Thevenin, Norton and Maximum power transfer theorems in AC circuits.
3. Verification of Tellegen's theorem for two networks of the same topology.
4. Determination of transient response of current in RL and RC circuits with step voltage input.
5. Determination of transient response of current in RLC circuit with step voltage input for
6. under damped, critically damped and over damped cases.
7. Determination of frequency response of current in RLC circuit with sinusoidal AC input.
8. Determination of z and h parameters (DC only) for a network and computation of Y and ABCD Parameters.
9. Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values.
10. Determination of image impedance and characteristic impedance of T and Π networks, using O.C. and S.C. tests.
11. Verification of parameter properties in inter-connected two port networks: series, parallel and cascade. Also study loading effect in cascade.
12. Determination of frequency response of a Twin – T notch filter.
13. To determine attenuation characteristics of a low pass / high pass active filters.

Institute may add any two software based experiments [Develop Computer Program in 'C' language or use MATLAB or Electrical Domain Simulation Software: "Virtual HIL Device" (Free, Unlimited Users, Full Version) from Typhoon HIL GmbH or Equivalent software] in the above list.

***Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
II Year Semester-IV***

BTEE 407: ELECTRICAL INSTRUMENTATION LAB

Note: Minimum ten experiments are to be performed from the following list

1. Measurement of displacement using LVDT.
2. Measurement of load using strain gauge based load cell.
3. Measurement of water level using strain gauge based water level transducer
4. Measurement of temperature by RTD.
5. Design and Test a signal conditioning circuit for any transducer.
6. Simulate and analyze the frequency domain measurement of electrical signals using spectrum analyzer.
7. Study of PID controllers in flow measurement.
8. Measurement of flow rate by anemometer.
9. Measurement of solar energy using sensor.
10. Implementation of Color Sensor for differentiating frequencies.
11. Determine rotational speed and angle of a motor shaft using Encoder.
12. Range finding and object detection using detection sensor.
13. Measurement using various sensors and analyzing the output using Lab-VIEW software.
14. Design a circuit for noise reduction in measurement system.

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
II Year Semester-IV

BTEE-408 SIMULATION- LAB II

Note: Minimum ten experiments are to be performed from the following list

1. Design of three phase inverter using R and RL Load
2. Design of DC to DC converter using R and RL Load
3. Simulate the response of DC machine using three phase rectifier
4. Simulate the response of DC machine using PID controller
5. Simulate the response of Induction machine using three phase inverter
6. Simulate the response of synchronous machine using three phase inverter
7. Introduction to fuzzy system toolbox
8. Speed control of DC machine using fuzzy system
9. Introduction to neural network toolbox
10. Load forecasting of power system using neural network
11. Introduction to Genetic Algorithm
12. Least square curve fitting using Genetic Algorithm

Institute may add any two software based experiments [Develop Computer Program in 'C' language or use MATLAB or Electrical Domain Simulation Software: "Virtual HIL Device" (Free, Unlimited Users, Full Version) from Typhoon HIL GmbH or Equivalent software] in the above list

ELECTRICAL ENGINEERING

SEMESTER-V

		THEORY		PRACTICAL		TOTAL
SUBJECT CODE	SUBJECT NAME	SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
BTEE-501	Managerial Economics	30	70	NA	NA	100
BTEE-502	Electrical Machines-II	30	70	25	25	150
BTEE-503	Sociology	30	70	NA	NA	100
BTEE-504	Power Transmission & Distribution	30	70	NA	NA	100
BTEE-505	Control System	30	70	25	25	150
BTEE-506	Internet of Things	30	70	NA	NA	100
BTEE -507	Software Based Power System Lab	NA	NA	25	25	50

SEMESTER-VI

		THEORY		PRACTICAL		TOTAL
SUBJECT CODE	SUBJECT NAME	SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
BTEE-601	Industrial Management	30	70	NA	NA	100
BTEE-602	Power System Analysis	30	70	NA	NA	100
BTEE-603	Special Electrical Machines	30	70	NA	NA	100
BTEE-604	Power Electronics	30	70	25	25	150
BTEE-605	Microprocessor	30	70	25	25	150
BTEE -607	Electrical Design & Fabrication Lab	NA	NA	25	25	50

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-V
BTEE - 501: MANAGERIAL ECONOMICS

L-T-P: 3-0-0

Unit	Topic
I	Introduction of Engineering Economics and Demand Analysis: Meaning and nature of Economics, Relation between science, engineering, technology and economics; Meaning of Demand, Determinants of Demand, Shifts in demand, Law of Demand, Price Elasticity of Demand & Types, Income Elasticity, Cross price Elasticity, Determinants of Elasticity, uses and importance of elasticity.
II	Concept of Supply: Law of Supply, Factors affecting Supply, Elasticity of supply. Demand Forecasting: Introduction, Meaning and Forecasting, Methods or Techniques of Demand Forecasting, Criteria for Good Demand Forecasting, Demand Forecasting for a New Product;
III	Cost Analysis- Introduction, Types of Costs, Cost-Output Relationship: Cost Function, Cost-Output Relationships in the Short Run, and Cost-Output Relationships in the Long Run; Short run and long run, Break- Even Analysis; Production functions: laws of variable proportions, law of returns; Economies of scale: Internal and external.
IV	Market Structure: Market Structure Perfect Competition, Imperfect competition – Monopolistic, Oligopoly, duopoly sortent features of price determination and various market conditions.
V	Nature and characteristics of Indian economy, concepts of LPG, elementary concepts of National Income, Inflation and Business Cycles ,Concept of N.I. and Measurement., Meaning of Inflation, Types and causes , Phases of business cycle .Investment decisions for boosting economy(National income and per capital income)

References:

1. Premvir Kapoor, Sociology and Economics for Engineers, Khanna Publishing House (Edition 2018)
2. Salvatore D, "Principles of Microeconomics", Oxford University Press.
3. Koutsoyiannis A, "Modern Microeconomic", Macmillan Education Ltd.
4. Dwivedi DN, "Principles of Microeconomics", Pearson Education.
5. Cowell, FA, "Microeconomic Principles and Analysis", Oxford University Press.

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-V

BTEE-502: ELECTRICAL MACHINES- II

L T P: 3 0 0

Unit – I: Synchronous Machine-I

Constructional features, Armature winding, EMF Equation, Winding coefficients, Equivalent circuit and phasor diagram, Armature reaction, O.C.& S.C. tests, Voltage regulation using Synchronous Impedance method, MMF method, Potier's Triangle method, Parallel operation of synchronous generators, Operation on infinite bus, Synchronizing power and torque co-efficient.

Unit – II: Synchronous Machine-II

Two reaction theory, Power flow equations of cylindrical and salient pole machines, Operating characteristics.

Synchronous Motor-Starting methods, Effect of varying field current at different loads, V-curves, Hunting & damping, Synchronous condenser.

Unit – III: Three phase Induction Machine-I

Constructional features, Rotating magnetic field, Principle of operation, Phasor diagram, Equivalent circuit, Torque and power equations, Torque-slip characteristics, No-load & blocked rotor tests, Efficiency, Induction generator & its applications

Unit – IV: Three phase Induction Machine-II

Starting, Deep bar and double cage rotors, Cogging & Crawling, Speed control (with and without emf injection in rotor circuit)

Unit – V: Single phase Induction Motor

Double revolving field theory, Equivalent circuit, No-load and blocked rotor tests, Starting methods, Repulsion motor, Universal motor, Brushless DC Motors

Spoken Tutorial (MOOCs):

Spoken Tutorial MOOC, ' Course on ExpEYES', IIT Bombay (<http://spoken-tutorial.org/>)

Text Books:

1. D.P. Kothari & I.J. Nagrath, "Electric Machines", Tata McGrawHill
2. Smarajit Ghosh, "Electric Machines", Pearson
3. Fitzgerald, A.E., Kingsley and S.D. Umans, "Electric Machinery", McGraw Hill.
4. P.S. Bimbhra, "Electrical Machinery", Khanna Publisher

Reference Books:

5. P.S. Bimbhra, "Generalized Theory of Electrical Machines", Khanna Publishers
6. M.G. Say, "Alternating Current Machines", Pitman & Sons

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-V
BTEE – 503: SOCIOLOGY

L-T-P: 3-0-0

- Unit I** Industrial Sociology: Nature, Scope and Importance of Industrial Sociology. Social Relations in Industry, Social Organisation in Industry- Bureaucracy, Scientific Management and Human Relations.
- Unit II** Rise and Development of Industry: Early Industrialism – Types of Productive Systems – The Manorial or Feudal system. The Guild system, The domestic or putting-out system, and the Factory system. Characteristics of the factory system. Causes and Consequences of industrialization. Obstacles to and Limitations of Industrialization.
- Unit III** Industrialization in India. Industrial Policy Resolutions – 1956. Science. Technology and Innovation Policy of India 2013.
- Unit IV** Contemporary Issues: Grievances and Grievance handling Procedure. Industrial Disputes: causes, Strikes and Lockouts. Preventive Machinery of Industrial Disputes: Schemes of Workers Participation in Management- Works Committee, Collective Bargaining, Bi-partite & Tri-partite Agreement, Code of Discipline, Standing Orders. Labour courts & Industrial Tribunals.
- Unit V** Visualizing the future: Models of industrialization- Collectivist, anarchist, free market, environmentalist, etc. Cultural issues, consumer society and sociological concerns.

References:

1. PREMVIKAKAPOOR, Sociology & Economics for Engineers, Khanna Publishing House (Edition 2018).
2. GISBERT PASCAL, Fundamentals of Industrial sociology, Tata McGraw Hill, New Delhi, 1972.
2. SCHNEIDER ENGNO V., Industrial Sociology 2nd Ed., McGraw Hill Publishing Co., New Delhi, 1979.
3. MAMORIAC.B. And MAMORIA S., Dynamics of Industrial Relations in India.
4. SINHAG.P. and P.R.N. SINHA, Industrial Relations and Labour Legislations, New Delhi, Oxford and IBH Publishing Co.,
5. S.C. SHARMA, Industrial Safety and Health Management, Khanna Book Publishing Co. (P) Ltd., Delhi
5. NADKARNI, LAKSHMI, Sociology of Industrial Worker, Rawat, Jaipur, 1998.
6. BHOWMICKSHARIT, Industry, Labour and Society, Orient, 2012.
7. RICHARD BROWN, JOHN CHILD, AND S R PARKER, The Sociology of Industry 1st Edition, Routledge, 2015.

***Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-V***

BTEE-504: POWER TRANSMISSION & DISTRIBUTION

L T P: 3 1 0

Unit – I: Power System Components:

Single line diagram of Power system, Brief description of power system Elements: Synchronous machine, transformer, transmission line, bus bar, circuit breaker and isolator.

Supply System: Different kinds of supply system and their comparison, choice of transmission voltage.

Transmission Lines:

Configurations, types of conductors, resistance of line, skin effect, Kelvin's law, Proximity effect.

Unit – II: Over Head Transmission Lines

Calculation of inductance & capacitance of single phase, three phase, single circuit & double circuit transmission lines. Representation and performance of short, medium and long transmission lines, Ferranti effect, Surge impedance loading.

Unit – III: Corona and Interference:

Phenomenon of corona, corona formation, calculation of potential gradient, corona loss, factors affecting corona, methods of reducing corona and interference. Electrostatic and electromagnetic interference with communication lines.

Overhead line Insulators: Type of insulators and their applications, potential distribution over a string of insulators, methods of equalizing the potential, string efficiency.

Unit – IV: Mechanical Design of transmission line:

Catenary curve, calculation of sag & tension, effects of wind and ice loading, sag template, vibration dampers.

Insulated cables: Type of cables and their construction, dielectric stress, grading of cables, insulation resistance, capacitance of single phase and three phase cables, dielectric loss, heating of cables.

Unit – V: Neutral grounding:

Necessity of neutral grounding, various methods of neutral grounding, earthing transformer, grounding practices.

Distribution Systems: Distribution system layout, Introduction of Distribution System, Primary & Secondary distribution, Design consideration, distribution system losses, Classification of Distributed system- Radial Ring interconnected systems, Stepped distribution.

Text Books:

1. W.D. Stevenson, "Element of Power System Analysis", McGraw Hill
2. C.L. Wadhwa, "Electrical Power System", New age international Ltd. Third Edition
3. Asfaq Hussain, "Power System", CBS Publishers and Distributors
4. B. R. Gupta, "Power System Analysis and Design", Third Edition, S. Chand & Co.
5. M. V. Deshpande, "Electrical Power System Design", Tata McGraw Hill
6. S.N. Singh, "Electric Power Generation, Transmission & Distribution", PHI Learning

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-V

BTEE-505: CONTROL SYSTEM

L T P: 3 0 0

Unit-I: Control System Concepts:

Concept of Control system, Physical Systems and their Mathematical Modeling, Constructional and working of AC & DC servomotor, synchros, stepper motor and tachometer. Transfer function models, Block diagram algebra, Signal flow graph, Mason's gain formula, Open loop and closed loop systems and their sensitivity analysis.

Unit-II: Time Response Analysis:

Standard test signals, time response of first and second order systems, time response specifications, steady state errors and error constants.

Design specifications of second order systems, Proportional, Derivative, Integral and PID compensations, design considerations for higher order systems and performance indices.

Unit-III: Stability and Algebraic Criteria:

Concept of stability and its necessary conditions, Routh-Hurwitz criteria and its limitations.

Root Locus Technique: Root contour, Construction of root loci, Effect of transportation lag and Root locus of non-minimal phase system and Effect of pole-zero cancellation.

Unit-IV: Frequency Response Analysis:

Frequency Response analysis from transfer function model, Construction of polar and inverse polar plots. Stability in Frequency Domain: Nyquist stability criterion, Determination of gain and phase margin from Bode & Nyquist Plots, Nichol Charts, Correlation between time and Frequency Responses.

Unit-V: Introduction to Design:

The design problems and preliminary considerations of lead, lag and lead-lag compensation networks, design of closed loop systems using compensation techniques in time and frequency domains.

State Space Technique:

The concept of state & space, State-space model of physical system, conversion of state-space to transfer function model and vice-versa, Similarity transformation of the control system, Concept of controllability and observability and their testing.

Text Books:

1. Nagrath & Gopal, "Control System Engineering", New age International.
2. K. Ogata, "Modern Control Engineering", Pearson India.
3. B.C. Kuo & Farid Golnaraghi, "Automatic Control System" McGraw Hill, 2018.
4. D. Roy Choudhary, "Modern Control Engineering", Prentice Hall of India.
5. Ambikapathy, "Control Systems", Khanna Publishers

Reference Books:

5. Norman S. Mise, Control System Engineering, Wiley Publishing Co.
6. Ajit K Mandal, "Introduction to Control Engineering" New Age International.
7. R.T. Stefani, B. Shahian, C.J. Savant and G.H. Hostetter, "Design of Feedback Control Systems" Oxford University Press.
8. Samarjit Ghosh, "Control Systems theory and Applications", Pearson Education.

***Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-V***

BTEE-506:INTERNET OF THINGS

L T P: 3 1 0

Unit-I: IoT Web Technology

The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.

Unit-II:

IoT Applications for Value Creation Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT for Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.

Unit-III:

Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smarty Approach. Data Aggregation for the IoT in Smart Cities, Security.

Unit-IV:

Architectural Approach for IoT Empowerment Introduction, Defining a Common Architectural Ground, IoT Standardization, M2M Service Layer Standardization, OGC Sensor Web for IoT, IEEE, IETF and ITU-T Standardization activities, Interoperability Challenges, Physical vs. Virtual, Solve the Basic First, Data Interoperability, Semantic Interoperability, Organizational Interoperability, Eternal Interoperability, Importance of Standardization, Plan for Validation and testing, Important Economic Dimension, Research Roadmap for IoT Testing Methodologies. Semantic as an Interoperability Enabler and related work.

Unit-V: Identity Management Models in IoT

Introduction, Vulnerabilities of IoT, Security requirements, Challenges for a secure Internet of Things, identity management, Identity portrayal, Different identity Management model: Local identity, Network identity, Federated identity, Global web identity, Identity management in Internet of Things, User-centric identity management, Device-centric identity management, Hybrid identity management.

Text Books/ Reference Books:

1. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things key applications and protocols", Wiley
2. Michael Miller "The Internet of Things" Pearson
3. Adrian McEwen, Hakin Cassimally, "Designing the Internet of Things" Wiley India

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-V

BTEE-502 ELECTRICAL MACHINES – II LABORATORY

L T P: 0 0 2

Note: Minimum ten experiments are to be performed from the following list, out of which there should be at least two software based experiments.

1. To perform no load and blocked rotor tests on a three phase squirrel cage induction motor and determine equivalent circuit.
2. To perform load test on a three phase induction motor and draw Torque -speed characteristics.
3. To perform no load and blocked rotor tests on a single phase induction motor and determine equivalent circuit.
4. To study speed control of three phase induction motor by varying supply voltage and by keeping V/f ratio constant.
5. To perform open circuit and short circuit tests on a three phase alternator and determine voltage regulation at full load and at unity, 0.8 lagging and leading power factors by
(i) EMF method (ii) MMF method.
6. To determine V-curves and inverted V-curves of a three phase synchronous motor.
7. To determine X_d and X_q of a three phase salient pole synchronous machine using the slip test and to draw the power-angle curve.
8. To study synchronization of an alternator with the infinite bus by using:
(i) dark lamp method (ii) two bright and one dark lamp method.
9. To determine speed-torque characteristics of three phase slip ring induction motor and study the effect of including resistance, or capacitance in the rotor circuit.
10. To determine speed-torque characteristics of single phase induction motor and study the effect of voltage variation.
11. To determine speed-torque characteristics of a three phase induction motor by
(i) keeping v/f ratio constant (ii) increasing frequency at the rated voltage.
12. To draw O.C. and S.C. characteristics of a three phase alternator from the experimental data & determine voltage regulation at full load, and unity, 0.8 lagging and leading power factors.
13. To determine steady state performance of a three phase induction motor using equivalent circuit.

*For Software based experiments (Develop Computer Program in 'C' language or use MATLAB or Equivalent open source software i.e. - Scilab)

Spoken Tutorial (MOOCs):

Spoken Tutorial MOOCs, ' Course on Scilab', IIT Bombay (<http://spoken-tutorial.org/>)

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-V

BTEE-505: CONTROL SYSTEM LABORATORY

L T P: 0 0 2

Note: The minimum of 10 experiments are to be performed from the following, out of which at least three should be software based.

1. To determine response of first order and second order systems for step input for various values of constant 'K' using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To study and calibrate temperature using resistance temperature detector (RTD)
4. To design Lag, Lead and Lag-Lead compensators using Bode plot.
5. To study DC position control system
6. To study synchro-transmitter and receiver and obtain output vs input characteristics
7. To determine speed-torque characteristics of an ac servomotor.
8. To study performance of servo voltage stabilizer at various loads using load bank.
9. To study behavior of separately excited dc motor in open loop and closed loop conditions at various loads.
10. To study characteristics of positional error detector by angular displacement of two servo potentiometers.

Software based experiments (Use MATLAB, LABVIEW etc. or equivalent open source freeware software like Scilab using Spoken Tutorial MOOCs)

11. To simulate PID controller for transportation lag.
12. To determine time domain response of a second order system for step input and obtain Performance parameters.
13. To convert transfer function of a system into state space form and vice-versa.
14. To plot root locus diagram of an open loop transfer function and determine range of gain 'k' for stability.
15. To plot a Bode diagram of an open loop transfer function.
16. To draw a Nyquist plot of an open loop transfer functions and examine the stability of the closed loop system.

Spoken Tutorial (MOOCs):

Spoken Tutorial MOOCs, ' Course on Scilab', IIT Bombay

Reference Books:

1. K.Ogata, "Modern Control Engineering" Prentice Hall of India.
2. Norman S.Nise, "Control System Engineering", John Wiley & Sons.
3. M.Gopal, "Control Systems: Principles & Design" Tata McGraw Hill.

***Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-V***

BTEE -507 SOFTWARE BASED POWER SYSTEM LAB

Note: Minimum ten experiments are to be performed from the following list

1. Calculate the parameters of single phase transmission line
2. Calculate the parameters of three phase single circuit transmission line
3. Calculate the parameters of three phase double circuit transmission line
4. Determine the ABCD constant for transmission line.
5. Simulate the Ferranti effect in transmission line
6. Calculate the corona loss of transmission line
7. Calculation of sag & tension of transmission line
8. Calculation of string efficiency of insulator of transmission line
9. Calculation for grading of underground cables
10. Simulate the skin effect in the transmission line
11. Calculation of ground clearance of transmission line
12. Calculate the parameters for underground cable

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-VI
BTEE – 601: INDUSTRIAL MANAGEMENT

L-T-P: 3-0-0

Unit	Topic
I	Introduction: Concept and scope of Industrial Management. Productivity: Definition, measurement, productivity index, types of production system, Industrial Ownership.
II	Functions of Management, Taylor’s Scientific Management Theory, Fayol’s Principles of Management, Social responsibilities of Management, Introduction to Human resources management: Nature of HRM, functions and importance of HRM.
III	Work Study: Introduction, definition, objectives, steps in work study, Method study: definition, objectives, steps of method study, Work Measurement: purpose, types of study — stop watch methods — steps — allowances — standard time calculations — work sampling, Production Planning and Control Inventory Control: Inventory, Cost, Models of inventory control: EOQ, ABC, VED
IV	Quality Control: statistical quality control, Control charts for variables and attributes, Acceptance Sampling- Single sampling- Double sampling plans, Introduction to TQM.
V	Project Management: Project network analysis, CPM, PERT and Project crashing and resource Leveling

References:

1. Engineering Management (Industrial Engineering & Management)/ S.C. Sharma & T.R. Banga, Khanna Book Publishing Co. (P) Ltd., Delhi (ISBN: 978-93-86173-072)
2. Industrial Engineering and Management/ P. Khanna, Dhanpatrai publications Ltd.
3. Production & Operation Management /PaneerSelvam /PHI.
4. Industrial Engineering Management/NVSRaju/Cengage Learning.
5. Industrial Engineering Management I RaviShankar/ Galgotia.

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-VI

BTEE-602: POWER SYSTEM ANALYSIS

L T P: 3 0 0

Unit-I: Representation of Power System Components:

Synchronous machines, Transformers, Transmission lines, One-line diagram, Impedance and reactance diagram, per unit system.

Symmetrical Components:

Symmetrical Components of unbalanced phasors, power in terms of symmetrical components, sequence impedances and sequence networks.

Unit-II: Symmetrical Fault Analysis:

Transient if R-L series circuit, calculation of 3-phase short circuit current and reactance of Synchronous machine, internal voltage of loaded machines under transient conditions.

Unsymmetrical Faults:

Analysis of single line to ground fault, line-to-line fault and Double Line to ground fault on an unloaded generators & power system network with and without fault impedance. Formation of Z bus using singular transformation & algorithm, computer method for short circuit calculations.

Unit-III: Load Flows:

Introduction, bus classifications, nodal admittance matrix (YBUS), development of load flow equations, load flow solution using Gauss Siedel and Newton-Raphson method, approximation to N-R method, line flow equation sand fast decoupled method.

Unit-IV: Power System Stability:

Stability and Stability limit, Steady state stability study, derivation of Swing equation, transient stability studies by equal area criterion and step-by-step method. Factors affecting steady state and transient stability and methods of improvement.

Unit-V: Traveling Waves:

Wave Equation for uniform Transmission lines, velocity of propagation, surge impedance, reflection and transmission of traveling waves under different line loadings. Bewlay's lattice diagram, protection of equipments and line against traveling waves.

Text Book:

1. W.D. Stevenson, Jr. "Elements of Power System Analysis", McGraw Hill.
2. C.L. Wadhwa, "Electrical Power System", New Age International.
3. Chakraborty, Soni, Gupta & Bhatnagar, "Power System Engineering", Dhanpat Rai & Co.
4. T.K. Nagsarkar & M.S. Sukhija, "Power System Analysis" Oxford University Press, 2007.

Reference Books:

5. O.I. Elgerd, "Electric Energy System Theory" Tata McGraw Hill.
6. Hadi Sadat, "Power System Analysis", Tata McGraw Hill.
7. D. Das, "Electrical Power Systems" New Age International.
8. J.D. Glover, M. S. Sharma & T. Overbye, "Power System Analysis and Design", Cengage.
9. P.S.R. Murthy "Power System Analysis" B.S. Publications.
10. Stagg and El-Abiad, "Computer Methods in Power System Analysis" Tata McGraw Hill
11. Kothari & Nagrath, "Modern Power System Analysis" Tata McGraw Hill
12. A.J. Wood, B.F. Wollenberg, "Power Generation, Operation and Control" John Wiley & Sons

***Department of Electrical Engineering
(Faculty of Engineering & Technology)***

P.K. University, Shivpuri (MP)

III Year Semester-VI

BTEE-603: SPECIAL ELECTRICAL MACHINES

L T P: 3 1 0

Unit-I: Poly-phase AC Machines:

Construction and performance of double cage and deep bar three phase induction motors; e.m.f. injection in rotor circuit of slip ring induction motor, concept of constant torque and constant power controls, static slip power recovery control schemes (constant torque and constant power),

Unit-II: Induction Generator:

SEIG, DFIG: Operating Principle, Equivalent Circuit, Characteristics, Application

Two Phase AC Servomotors: Construction, torque-speed characteristics, performance and applications.

Unit-III: Stepper Motors:

Principle of operation, variable reluctance, permanent magnet and hybrid stepper motors, characteristics, drive circuits and applications. Switched Reluctance Motors: Construction; principle of operation; torque production, modes of operation, drive circuits.

Unit-IV: Permanent Magnet Machines:

Types of permanent magnets and their magnetization characteristics, demagnetizing effect, permanent magnet dc motors, sinusoidal PM A C motors, brushless dc motors and their important features and applications, PCB motors. Single phase synchronous motor; construction, operating principle and characteristics of reluctance and hysteresis motors; introduction to permanent magnet generators and applications

UNIT-V: Single Phase Commutator Motors:

Construction, principle of operation, characteristics of universal and repulsion motors ; Linear Induction Motors. Construction, principle of operation, Linear force, and applications.

Text Books:

1. P.S. Bimbhra "Generalized Theory of Electrical Machines" Khanna Publishers.
2. P.C. Sen "Principles of Electrical Machines and Power Electronics" John Willey & Sons, 2001

Reference Books:

3. Cyril G. Veinott "Fractional and Sub-fractional horse power electric motors" McGraw Hill International, 1987
4. M.G. Say "Alternating current Machines" Pitman & Sons

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-VI

BTEE-604: POWER ELECTRONICS

L T P: 3 0 0

Unit-I: Power semiconductor devices:

Introduction: Concept of Power Electronics, scope and applications, desired Characteristics of controllable switches Power semiconductor switches and their characteristics: Power Diode, Power BJT, Power MOSFET, IGBT, SCR, TRIAC, GTO.

Unit-II: Thyristor:

Rating & protection, Methods of SCR commutation, Gate Drive Circuit, Series and Parallel operation.

DC-DC Converters:

Introduction, Control Strategies, Buck converter, Boost Converter, Buck-Boost converter, Analysis of buck converter, Switched Mode power Supply (SMPS).

Unit-III: Phase Controlled Converters:

Single phase half wave controlled rectifier with various loads, Effect of freewheeling diode.

Single phase fully controlled and half controlled bridge converters with various loads. Performance Parameters of single phase uncontrolled and controlled converters.

Three phase half wave converters, Three phase fully controlled and half controlled bridge converters, Effect of source impedance, Single phase and three phase dual converters

Unit-IV: AC Voltage Controllers:

Principle of On-Off and phase controls, Single phase ac voltage controller with resistive and inductive loads, sequence control, Introduction to Matrix converter.

Cyclo Converters:

Basic principle of operation, single phase to single phase, three phase to single phase output voltage equation.

Unit-V: Inverters:

Single phase and Three phase bridge inverters, VSI, CSI, Voltage control of single phase inverters, PWM Techniques, Introduction to Multi level inverter.

Text Books:

1. M.H. Rashid, "Power Electronics: Circuits, Devices & Applications", Pearson India, 4th Edition, 2018.
2. Ned Mohan, T.M. Undeland and W.P. Robbins, "Power Electronics: Converters, Applications and Design", Wiley India Ltd, 2008
3. P.C. Sen, "Power Electronics", McGraw Hill Education (India) Pvt. Ltd.
4. P.S. Bhimbra, "Power Electronics", Khanna Publishers.

Reference Books:

5. M.S. Jamil Asghar, "Power Electronics" Prentice Hall of India Ltd., 2004
6. Chakrabarti & Rai, "Fundamentals of Power Electronics & Drives", Dhanpat Rai & Sons.
7. V.R. Moorthy, "Power Electronics : Devices, Circuits and Industrial Applications" Oxford University Press, 2007
8. S.N. Singh, "A Text Book of Power Electronics" Dhanpat Rai & Sons

***Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-VI***

BTEE-605: MICROPROCESSOR

L T P: 3 1 0

Unit-I: Introduction to Microprocessor:

Introduction to Microprocessor and its applications, Microprocessor Evolution Tree, Microprocessor Architecture (Harvard & Princeton), General Architecture of the Microprocessor and its operations, Component of Microprocessor system: Processor, Buses, Memory, Inputs-outputs (I/Os) and other Interfacing devices.

Unit-II: 8-bit Microprocessor:

Intel 8085 microprocessor: Pin Diagram, Internal architecture: ALU, Registers, Timing and control unit, interrupt:

Instruction Set of 8085: Instruction format, op-codes, mnemonics, no. of bytes computation of the instruction, Machine cycles and Tstates and Execution time computation of an instruction. Classification of instruction with their examples. Writing of assembly Language programs.

Unit-III: 16-bit Microprocessor:

Architecture of Intel 8086: Pin Diagram, Bus Interface Unit, Execution unit, Register organization, Memory addressing, Memory Segmentation, Pipelining, Min & Max operating Modes

8086 Instruction set: Format, Addressing Modes, Instruction Set Groups: Data transfer, Arithmetic, Logic, String, Branch control transfer and Processor control.

Interrupts: Hardware and software interrupts.

Unit-IV: Fundamental of Programming:

Program structure for microprocessors, Flowcharts of series, parallel, and controls structures.

Assembler Level Programming: Memory space allocation for monitor and user program. Assembly language program using Debug or MAS MAssembler.

Unit-V: Peripheral Interfacing:

Programmed I/O, Memory Mapped I/O, Interrupt Driven I/O, DMA I/O interface, Serial and Parallel communications.

Peripheral Devices: DMA controller (Intel 8237), Programmable peripheral interface (Intel 8255), Programmable timer/counter (Intel 8253/8254), Programmable Interrupt Controller (Intel 8259).

Text Books:

1. Gaonkar, Ramesh S, "Microprocessor Architecture, programming and applications with the 8085" Penram International Publishing 5th Ed.
2. Avtar Singh & Walter A. Triebel "8088 & 8086 Microprocessor" Pearson Education.
3. Ray, A.K. & Burchandi, K.M., "Advanced Microprocessors and Peripherals: Architecture, Programming and Interfacing" Tata Mc. Graw Hill.
4. AK Gautam, "Advanced Microprocessors", Khanna Publishers.

Reference Books:

5. Brey, Barry B. "INTEL Microprocessors" Prentice Hall (India)
6. Aditya P Mathur, "Introduction to Microprocessor" Tata McGraw Hill

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-VI

BTEE-604: POWER ELECTRONICS LABORATORY

L T P: 0 0 2

Note: The minimum of 10 experiments is to be performed out of which at least three should be softwarebased.

1. To study triggering of (i) IGBT (ii) MOSFET (iii) power transistor
2. To study V-I characteristics of SCR and measure latching and holding currents.
3. To compare the R, RC &UJT trigger circuit for SCR.
4. To study the commutation circuit for SCR.
5. To study single phase fully controlled bridge rectifiers with resistiveand inductive loads.
6. To study single phase fully controlled bridge rectifiers with DC motor load.
7. To study three-phase fully controlled bridge rectifier with resistive and inductive loads.
8. To study single-phase ac voltage regulator with resistive and inductive loads.
9. To study single phase cyclo-converter
10. To study the four quadrant operation of chopper circuit
11. To study MOSFET/IGBT based single-phase bridge inverter.
Software based experiments(PSPICE/MATLAB or equivalent open source freeware software like Scilabusing Spoken Tutorial MOOCs)
12. To obtain the simulation of single phase half wave controlled rectifier with R and RL load and plot loadvoltage and load current waveforms.
13. To obtain simulation of single phase fully controlled bridge rectifier and plot load voltage and load current waveform for inductive load.
14. To obtain simulation of single phase full wave ac voltage controller and draw load voltage andload currentwaveforms for inductive load.
15. To obtain simulation of step down dc chopper with L-C output filter for inductive load and determine steady-state values of output voltage ripples in output voltage and load current.

Spoken Tutorial (MOOCs):

Spoken Tutorial MOOCs, ' Course on Scilab', IIT Bombay

Text/Reference Books:

1. M.H.Rashid, “Power Electronics: Circuits, Devices and Applications”, 3rd Edition, Prentice Hall of India.
2. D.W. Hart, “Introduction to power Electronics”, Prentice Hall of India.

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)

III Year Semester-VI

BTEE-605: MICROPROCESSOR LABORATORY

L T P: 0 0 2

A. Study Experiments (any two):

1. To study 8085 based microprocessor system
2. To study 8086 and 8086A based microprocessor system
3. To study Pentium Processor

B. Programming based Experiments (any four):

4. To develop and run a program for finding out the largest/smallest number from a given set of numbers.
5. To develop and run a program for arranging in ascending/descending order of a set of Numbers
6. To perform multiplication/division of given numbers
7. To perform conversion of temperature from 0F to 0C and vice-versa
8. To perform computation of square root of a given number
9. To perform floating point mathematical operations
(addition, subtraction, multiplication and division)

C. Interfacing based Experiments (any four):

10. To obtain interfacing of RAM chip to 8085/8086 based system
11. To obtain interfacing of keyboard controller
12. To obtain interfacing of DMA controller
13. To obtain interfacing of PPI
14. To obtain interfacing of UART/USART
15. To perform microprocessor based stepper motor operation through 8085 kit
16. To perform microprocessor based traffic light control
17. To perform microprocessor based temperature control of hot water

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-VI

BTEE -607- ELECTRICAL DESIGN & FABRICATION LAB

Note: Minimum ten experiments are to be performed from the following list:

1. PCB Design & Fabrication.
2. Transformer design & Fabrication.
3. Small Power Supply design & Fabrication.
4. Filter design & Fabrication.
5. Controller design & Fabrication.
6. Inductor design and Fabrication.
7. Measurement of electrical parameters of AC & DC machine.
8. Design & Fabrication of High Power factor controlled rectifier.
9. Design & Fabrication of Microcontroller based digital energy meters / sensors.
10. Design & Fabrication of Power amplifier.
11. Design Fabrication of AC phase converter and its firing circuit.
12. IGBT based single phase inverter design and Fabrication.
13. Design & Fabrication of chopper.

ELECTRICAL ENGINEERING

SEMESTER-VII

SEMESTER-VII						
SUBJECT CODE	SUBJECT NAME	THEORY		PRACTICAL		TOTAL
		SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
BTEE-701	Entrepreneurship Development	30	70	NA	NA	100
BTEE-702	Electric Drives	30	70	25	25	150
BTEE-703	Power Station Practice	30	70	NA	NA	100
BTEE-704	Analog & Digital Communication	30	70	25	25	150
BTEE-705	Power System Operation and Control	30	70	NA	NA	100
	Mini project	NA	NA	25	25	50
	Industrial training					

SEMESTER VIII

SEMESTER VIII						
SUBJECT CODE	SUBJECT NAME	THEORY		PRACTICAL		TOTAL
		SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
BTEE-801	Non-Conventional Energy Resources	30	70	NA	NA	100
BTEE-802	Advanced Control System	30	70	NA	NA	100
BTEE-803	Utilization of Electrical Energy and Traction	30	70	NA	NA	100
BTEE-804	Power Converters Applications	30	70	NA	NA	100
	Project	NA	NA	25	25	50

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
IV Year Semester-VII

BTEE-701: ENTREPRENEURSHIP DEVELOPMENT

L T P
3 1 0

UNIT -I

Entrepreneurship- definition.growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.

UNIT -IV

Project Planning and control:

The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication.

UNIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.

Text / Reference Books:

1. Forbat, John, "Entrepreneurship" New Age International.
2. Havinal, Veerbhadrappa, "Management and Entrepreneurship" New Age International
3. Joseph, L. Massod, "Essential of Management", Prentice Hall of India.

***Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
IV Year Semester-VII***

BTEE-702: ELECTRIC DRIVES

L T P - 3 1 0

UNIT-I: Fundamentals of Electric Drive: Electric Drives and its parts, advantages of electric drives
Classification of electric drives Speed-torque conventions and multi-quadrant operations Constant
torque and constant power operation

Types of load Load torque: components, nature and classification

UNIT-II: Dynamics of Electric Drive: Dynamics of motor-load combination Steady state
stability of Electric Drive Transient stability of electric Drive

Selection of Motor Power rating: Thermal model of motor for heating and cooling, classes of motor
duty, determination of motor power rating for continuous duty, short time duty and intermittent duty.
Load equalization

UNIT-III: Electric Braking: Purpose and types of electric braking, braking of DC, three
phase induction and synchronous motors

Dynamics During Starting and Braking: Calculation of acceleration time and energy loss
during starting of DC shunt and three phase induction motors, methods of reducing energy loss
during starting. Energy relations during braking, dynamics during braking

UNIT-IV: Power Electronic Control of DC Drives: Single phase and three phase
controlled converter fed separately excited DC motor drives (continuous conduction only), dual
converter fed separately excited DC motor drive, rectifier control of DC series motor. Supply
harmonics, power factor and ripples in motor current Chopper control of separately excited DC
motor and DC series motor.

UNIT-V: Power Electronic Control of AC Drives:

Three Phase induction Motor Drive:

Static Voltage control scheme, static frequency control scheme (VSI, CSI, and cyclo – converter
based) static rotor resistance and slip power recovery control schemes.

Three Phase Synchronous motor: Self controlled scheme

Special Drives: Switched Reluctance motor, Brushless dc motor. Selection of motor for particular
applications

Text Books:

1. G.K. Dubey, "Fundamentals of Electric Drives", Narosa publishing House.
2. S.K. Pillai, "A First Course on Electric Drives", New Age International.
3. B.N. Sarkar, "Fundamental of Industrial Drives", Prentice Hall of India Ltd.

Reference Books:

- 1 M. Chilkin, "Electric Drives", Mir Publishers, Moscow.
- 2 Mohammed A. El-Sharkawi, "Fundamentals of Electric Drives", Thomson Asia, Pvt.
Ltd. Singapore.
- 3 N.K. De and Prashant K. Sen, "Electric Drives", Prentice Hall of India Ltd.
- 4 V. Subrahmanyam, "Electric Drives: Concepts and Applications", TataMcGraw Hill

***Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
IV Year Semester-VII***

BTEE-703: POWER STATION PRACTICE

L T P-3 1 0

UNIT-I: Introduction: Electric energy demand and growth in India, electric energy sources.

Thermal Power Plant: Site selection, general layout and operation of plant, detailed description and use of different parts.

Hydro Electric Plants: Classifications, location and site selection, detailed description of various components, general layout and operation of Plants, brief description of impulse, reaction, Kaplan and Francis turbines, advantages & disadvantages, hydro-potential in India

UNIT-II: Nuclear Power Plant: Location, site selection, general layout and operation of plant. Brief description of different types of reactors Moderator material, fissile materials, control of nuclear reactors, disposal of nuclear waste material, shielding.

Gas Turbine Plant: Operational principle of gas turbine plant & its efficiency, fuels, open and closed-cycle plants, regeneration, inter-cooling and reheating, role and applications.

Diesel Plants: Diesel plant layout, components & their functions, its performance, role and applications

UNIT-III: Sub-stations Layout: Types of substations, bus-bar arrangements, typical layout of substation.

Power Plant Economics and Tariffs: Load curve, load duration curve, different factors related to plants and consumers, Cost of electrical energy, depreciation, generation cost, effect of Load factor on unit cost. Fixed and operating cost of different plants, role of load diversity in power system economy. Objectives and forms of Tariff; Causes and effects of low power factor, advantages of power factor improvement, different methods for power factor improvements.

UNIT-IV: Economic Operation of Power Systems: Characteristics of steam and hydro-plants, Constraints in operation, Economic load scheduling of thermal plants Neglecting and considering transmission Losses, Penalty factor, loss coefficients, Incremental transmission loss. Hydrothermal Scheduling

UNIT-V: Non Conventional Energy Sources: Power Crisis, future energy demand, role of Private sectors in energy management, concepts & principals of MHD generation, Solar power plant, Wind Energy, Geothermal Energy, Tidal energy, Ocean Thermal Energy.

Text Books:

1. B.R. Gupta, "Generation of Electrical Energy", S. Chand Publication.
2. Soni, Gupta & Bhatnagar, "A text book on Power System Engg.", Dhanpat Rai & Co.
3. P.S.R. Murthy, "Operation and control of Power System" BS Publications, Hyderabad.

Reference Books:

4. W. D. Stevenson, "Elements of Power System Analysis", McGraw Hill.
5. S. L. Uppal, "Electrical Power", Khanna Publishers.

***Department of Electrical Engineering
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P.K. University, Shivpuri (MP)
IV Year Semester-VII***

BTEE-704: ANALOG & DIGITAL COMMUNICATION

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UNIT I:

Elements of communication system and its limitations Amplitude Modulation: Amplitude modulation and detection, Generation and detection of DSB-SC, SSB and vestigial side band modulation, carrier acquisition AM transmitters and receivers, super hetrodyne receiver, IF amplifiers, AGC circuits Frequency Division multiplexing

UNIT II:

Angle Modulation: Basic definitions Narrow band and wideband frequency modulation, transmission bandwidth of FM signals Generation and detection of frequency modulation Noise: External noise, internal noise Noise calculations, signal to noise ratio Noise in AM and FM systems

UNIT III:

Pulse Modulation: Introduction, sampling process Analog Pulse Modulation Systems-Pulse Amplitude Modulation, Pulse width modulation and Pulse Position Modulation. Waveform coding Techniques: Discretization in time and amplitude, Quantization process, quantization noise, Pulse code Modulation, Differential Pulse code Modulation, Delta Modulation and Adaptive Delta Modulation.

UNIT IV:

Digital Modulation Techniques: Types of digital modulation, waveforms for amplitude, frequency and phase shift keying, methods of generation of coherent and noncoherent, ASK,FSK and PSK, comparison of above digital techniques.

UNIT V:

Time Division Multiplexing: Fundamentals, Electronic Commutator, Bit/byte interleaving, TI carrier system, synchronization and signaling of TI, TDM and PCM hierarchy, synchronization techniques Introduction to Information Theory: Measure of information, Entropy & Information rate, channel capacity, Hartley Shannan law, Huffman coding, shannanFano coding.

Text Books:

- 1.SimonHaykin,“ Communication Systems” John Wiley & Sons 4th Edition
- 2.G.Kennedy and B. Davis,“ Electronic Communication Systems” 4th Edition, Tata McGraw Hill
3. Simon Haykin, “Digital Communications” John Wiley & Sons
4. T.L. Singal, “Analog & Digital Communication”, Tata McGraw Hill

Reference Books:

1. B.P. Lathi, “Modern Analog & Digital Communication Systems” Oxford University Press.
2. Taub& Schilling, “Communication System: Analog and Digital” Tata McGraw Hill
3. R.P. Singh & S.D. Sapre, “Communication Systems Analog and Digital” Tata McGraw Hill.

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
IV Year Semester-VII

BTEE - 705: POWER SYSTEM OPERATION AND CONTROL

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UNIT-I: Introduction: Structure of power systems, Power system control center and real time computer control, SCADA system Level decomposition in power system Power system security Various operational stages of power system Power system voltage stability

UNIT-II: Economic Operation: Concept and problems of unit commitment Input-output characteristics of thermal and hydro-plants System constraints Optimal operation of thermal units without and with transmission losses, Penalty factor, incremental transmission loss, transmission loss formula (without derivation) Hydrothermal scheduling long and short terms Concept of optimal power flow

UNIT-III: Load Frequency Control:

Concept of load frequency control, Load frequency control of single area system:

Turbine speed governing system and modeling, block diagram representation of single area system, steady state analysis, dynamic response, control area concept, P-I control, load frequency control and economic dispatch control. Load frequency control of two area system: Tie line power modeling, block diagram representation of two area system, static and dynamic response

UNIT-IV: Automatic Voltage Control: Schematic diagram and block diagram representation, different types of Excitation systems & their controllers.

Voltage and Reactive Power control: Concept of voltage control, methods of voltage control-control by tap changing transformer. Shunt Compensation, series compensation, phase angle compensation

UNIT-V

State Estimation: Detection and identification, Linear and non-linear models.

Flexible AC Transmission Systems:

Concept and objectives FACTS controllers: Structures & Characteristics of following FACTS Controllers. TCR, FC-TCR, TSC, SVC, STATCOM, TSSC, TCSC, SSSC, TC-PAR, UPFC

Text Books:

1. D.P. Kothari & I.J. Nagrath, "Modern Power System Analysis" Tata McGraw Hill, 3rd Edition.
2. P.S.R. Murty, "Operation and control in Power Systems" B.S. Publications.
3. N. G. Hingorani & L. Gyugyi, "Understanding FACTS" Concepts and Technology of Flexible AC Transmission Systems"
4. A. J. Wood & B.F. Wollenburg, " Power Generation, Operation and Control " John Wiley & Sons.

Reference Books:

1. O.I. Elgerd, "Electric Energy System Theory" Tata McGraw Hill.
2. P. Kundur, " Power System Stability and Control McGraw Hill.
3. T. K. Nagsarkar & M.S. Sukhiza, ' Power System Analysis' Oxford University Press.

***Department of Electrical Engineering
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P.K. University, Shivpuri (MP)
IV Year Semester-VII***

BTEE – 702: ELECTRIC DRIVES LAB

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Note: - Minimum 10 experiments are to be performed from the following out of which at least three should be simulation based.

(A) Hardware Based Experiments:

1. To study speed control of separately excited dc motor by varying armature voltage using single-phase fullycontrolled bridge converter.
2. To study speed control of separately excited dc motor by varying armature voltage using single phase half controlled bridge converter.
3. To study speed control of separately excited dc motor using single phase dual converter (Static Ward-Leonard Control)
4. To study speed control of separately excited dc motor using MOSFET/IGBT chopper
5. To study closed loop control of separately excited dc motor
6. To study speed control of single phase induction motor using single phase ac voltage controller.
7. To study speed control of three phase induction motor using three phase ac voltage controller
8. To study speed control of three phase induction motor using three phase current source inverter
9. To study speed control of three phase induction motor using three phase voltage source inverter
10. To study speed control of three phase slip ring induction motor using static rotor resistance control using rectifier and chopper
11. To study speed control of three phase slip ring induction motor using static scherbius slip power recoverycontrol scheme

Simulation Based Experiments (using MATLAB or any other software)

12. To study starting transient response of separately excited dc motor
13. To study speed control of separately excited dc motor using single phase fully / half controlled bridgeconverter in discontinuous and continuous current modes.
14. To study speed control of separately excited dc motor using chopper control in motoring and braking modes.
15. To study starting transient response of three phase induction motor
16. To study speed control of three phase induction motor using (a) constant/V/F control (b) Constant Voltage and frequency control.

***Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
IV Year Semester-VII***

BTEE- 702: ANALOG AND DIGITAL COMMUNICATION LAB

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Note: The minimum 10 experiments are to be performed from the following:

1. To study amplitude modulation using a transistor and determine depth of modulation.
2. To study generation of DSB-SC signal using balanced modulator.
3. To study generation of SSB signal
4. To study envelope detector for demodulation of AM signal and observe diagonal peak clipping effect.
5. To study super heterodyne AM receiver and measurement of sensitivity, selectivity and fidelity.
6. To study frequency modulation using voltage controlled oscillator.
7. To detect FM signal using Phase Locked Loop.
8. To measure noise figure using a noise generator.
9. To study PAM, PWM and PPM.
10. To realize PCM signal using ADC and reconstruction using DAC and 4 bit/8bit system. Observe quantization noise in each case.
11. To study Delta Modulation and Adaptive Delta Modulation. 12. To study PSK-modulation system.
13. To study FSK-modulation system.
14. To study sampling through a Sample-Hold circuit and reconstruction of the sampled signal and observe the effect of sampling rate & the width of the sampling pulses.
15. To study functioning of colour television
16. Fabricate and test a PRBS generator
17. Realization of data in different forms, such as MRZ-L, NRZ - M&N, NRZ-S. Manchester coding & decoding (Biphase L) of NRZ-L data.

***Department of Electrical Engineering
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P.K. University, Shivpuri (MP)
IV Year Semester-VII***

BTEE 706 MINOR PROJECT

***Department of Electrical Engineering
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P.K. University, Shivpuri (MP)
IV Year Semester-VII***

INDUSTRIAL TRAINING

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IV Year Semester-VIII*

BTEE- 801: NON-CONVENTIONAL ENERGY RESOURCES

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UNIT-I Introduction

Various non-conventional energy resources- Introduction, availability, classification, relative merits & demerits.

Solar Cells: Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations.

UNIT-II Solar Thermal Energy:

Solar radiation, flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

UNIT-III Geothermal Energy:

Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations.

Magneto-hydrodynamics (MHD):

Principle of working of MHD Power plant, performance and limitations.

Fuel Cells:

Principle of working of various types of fuel cells and their working, performance and limitations.

UNIT-IV

Thermo-electrical and thermionic Conversions:

Principle of working, performance and limitations.

Wind Energy:

Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems.

UNIT-V

Bio-mass:

Availability of bio-mass and its conversion theory.

Ocean Thermal Energy Conversion (OTEC):

Availability, theory and working principle, performance and limitations.

Wave and Tidal Wave:

Principle of working, performance and limitations.

Waste Recycling Plants.

Text/References Books:

1. Raja etal, "Introduction to Non-Conventional Energy Resources" Scitech Publications.
2. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006.
3. M.V.R. KoteswaraRao, " Energy Resources: Conventional & Non-Conventional " BSPPublications,2006.
4. D.S. Chauhan,"Non-conventional Energy Resources" New Age International.
5. C.S. Solanki, "Renewal Energy Technologies: A Practical Guide for Beginners" PHI Learning

***Department of Electrical Engineering
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P.K. University, Shivpuri (MP)
IV Year Semester-VIII***

BTEE – 802: ADVANCED CONTROL SYSTEM

Unit-I

State Space Analysis of Continuous System:

Review of state variable representation of continuous system, conversion of state variable models to transfer function and vice-versa, solution of state equations and state transition matrix, controllability and observability, design of state observer and controller

Unit-II

Analysis of Discrete System:

Discrete system and discrete time signals, state variable model and transfer function model of discrete system, conversion of state variable model to transfer function model and vice-versa, modeling of sample-and-hold circuit, solution of state difference equations, steady state accuracy, stability on the z-plane and Jury stability criterion, bilinear transformation, Routh-Hurwitz criterion on rth planes

Unit-III

Stability:

Lyapunov's stability theorems for continuous and discrete systems, methods for generating Lyapunov function for continuous and discrete system, Popov's criterion.

Non linear System:

Types of non linearities, phenomena related to non - linear systems.

Analysis of non linear systems-Linearization method, second order non-linear system on the phase plane, types of phase portraits, singular points, system analysis by phase-plane method, describing function and its application to system analysis.

Unit-IV

Optimal Control:

Introduction, formation of optimal control problem, calculus of variations minimization of functions, constrained optimization. Pontryagin's Minimum Maximum Principle, Linear Quadratic Problem-Hamilton Jacobi equation, Riccati equation and its solution.

Unit-V

Adaptive Control:

Introduction, modal reference adaptive control systems, controller structure, self tuning regulators. Introduction to neural network, fuzzy logic and genetic algorithms

Text Books:

1. M.Gopal, "Digital Control and State variable Methods", Tata McGraw Hill
2. AjitK.Madal, "Introduction to Control Engineering: Modelling, Analysis and Design"
3. New Age International.
4. D.Landau, "Adaptive Control", Marcel Dekker Inc.
5. S.Rajasekaran&G.A.VjayalakshmiPai, "Neural Networks,Fuzzy Logic and Genetic
6. Algorithms: Synthesis and Applications" Prentice Hall of India.

Reference Book:

7. Donald E. Kiv, "Optimal Control Theory: An Introduction" Prentice Hall
8. B.C. Kuo, "Digital Control Systems" Sounders College Publishing
9. C.H.Houpis and G.B.Lamont, "Digital Control Systems:Theory,Hardware,Software" McGraw Hill.

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P.K. University, Shivpuri (MP)
IV Year Semester-VIII*

**BTEE – 803: UTILIZATION OF ELECTRICAL ENERGY AND
TRACTION**

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Unit-I:

Electric Heating:

Advantages and methods of electric heating
Resistance heating
Electric arc heating
Induction heating
Dielectric heating

Unit-II:

Electric Welding:

Electric Arc Welding
Electric Resistance welding
Electronic welding control

Electrolyte Process:

Principles of electro deposition, Laws of electrolysis, applications of electrolysis

Unit-III

illumination:

Various definitions, Laws of illumination, requirements of good lighting Design of indoor lighting and outdoor lighting systems

Refrigeration and Air Conditioning:

Refrigeration systems, domestic refrigerator, water cooler Types of air conditioning, Window air conditioner

Unit-IV:

Electric Traction - I

Types of electric traction, systems of track electrification
Traction mechanics- types of services, speed time curve and its simplification, average and schedule speeds
Tractive effort, specific energy consumption, mechanics of train movement, coefficient of adhesion and its influence

Unit-V:

Electric Traction – II

Salient features of traction drives
Series – parallel control of dc traction drives (bridge transition) and energy saving
Power Electronic control of dc and ac traction drives
Diesel electric traction.

Text Books:

1. H.Partab,“Art and Science of Electrical Energy” DhanpatRai& Sons.
2. G.K.Dubey,“Fundamentals of Electric Drives” Narosa Publishing House

Reference Books:

3. H. Partab, “Modern Electric Traction” DhanpatRai& Sons.
4. C.L. Wadhwa, “ Generation, Distribution and Utilization of Electrical Energy”
New Age International Publications.

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P.K. University, Shivpuri (MP)
IV Year Semester-VIII***

BTEE – 804: POWER CONVERTER APPLICATIONS

UNIT-I

HVDC Transmission:

Schematic diagram, modes of operation, twelve pulse line commutated converters, effect of source inductance, control of HVDC converters, converter faults and protection, harmonic filters.

UNIT-II

FACT Controllers :

Principle of power transmission, principles of shunt compensation and series compensation; Shunt compensators-TCR, TSC, SVC, STATCOM
Series compensators-TSSC, FCSC, TCSC, SSVC; Phase angle compensator, Unified power flow controller (UPFC), comparison of compensators.

UNIT-III

Power Supplies:

Desirable specifications of power supplies, drawbacks of linear power supply. Switch-Mode Power supply (SMPS)-schematic diagram, flyback converter, forward converter, push- pull converter, half bridge and full bridge converters; Uninterruptible power supply (UPS)- configurations of off-line and on-line UPS, switch mode and resonant power supplies; aircraft power supply.

UNIT-IV

Industrial Applications:

High frequency inverters for induction and dielectric heating, ac voltage controllers for resistance heating and illumination control, high frequency fluorescent lighting, electric welding control.

UNIT-V

Interconnection of Renewable Energy Sources to the Utility Grid :

Photovoltaic array interconnection, wind and small hydro interconnection, interconnection of energy storage systems;
DC circuit breaker, single phase and three phase ac switches; Excitation control of synchronous generators.

Text Books:

1. Ned Mohan, T.M. Undeland and William P. Robins, "Power Electronics: Converters, Applications and Design", John Wiley & Sons.
2. M.H. Rashid, "Power Electronics: Circuits, Devices and Applications" Prentice Hall of India.

Reference Books:

3. K.R. Padiyar, "HVDC Power Transmission: Technology and System Reactions" New Age International

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IV Year Semester-VIII***

BTEE-805: PROJECT