SWAMI VIVEKANAND UNIVERSITY, SIRONJA, SAGAR (M.P.)

SYLLABUS

For

BACHELOR OF TECHNOLOGY (B.Tech.)
ELECTRICAL & ELECTRONICS ENGG.

Course Code: BTEX

Department of Electrical & Electronics Engineering
Faculty of Engineering

Duration of Course : 4 Year

Examination Mode : Semester

Examination System : Grading

Swami Vivekanand University, Sironja Sagar (M.P.)
2014-2015

Swami Vivekanand University, Sagar(M.P.)

Semester-I

Mathematics - I (BTEX-0101)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max (a)	Min (b)	(c)	(d) = (a+c)	Max (e)	Min (f)	(g)	(h) = (e+f)	(i) = (d+h)	
BTEX-0101	Mathematics - I	3	1	-	4	80	25	20	100	-	-	-	-	100	03 Hrs

UNIT – I **Marks :16**

MATRICES Characteristic equation – Eigen values and eigen vectors of a real matrix – Properties of eigen values – Caley – Hamilton theorem – Orthogonal reduction of a symmetric matrix to diagonal form – Orthogonal matrices – Reduction of quadratic form to canonical form by orthogonal transformations.

UNIT – II **Marks :16**

DIFFERENTIAL CALCULUS Curvature – Cartesian and polar coordinates – Circle of curvature – Involutes and Evolutes – Envelopes – Properties of envelopes.

UNIT – III **Marks :16**

FUNCTIONS OF SEVERAL VARIABLES Function of two variables – Partial derivatives – Total differential – Taylor's expansion – Maxima and Minima – Constrained Maxima and Minima by Lagrangean Multiplier method – Jacobians

UNIT – IV **Marks :16**

ORDINARY DIFFERENTIAL EQUATIONS Simultaneous first order linear equations with constant coefficients – Linear equations of second order with constant and variable coefficients – Homogeneous equation of Euler type – Equations reducible to homogeneous form

UNIT – V **Marks :16**

THREE DIMENSIONAL ANALYTICAL GEOMETRY Direction cosines and ratios – Angle between two lines – Equation of a plane – Equation of a straight line – Coplanar lines – Shortest distance between skew lines – Sphere – Tangent plane – Plane section of a sphere – Orthogonal spheres.

Text Books

1. Grewal B.S, Higher Engg Maths, Khanna Publications, 38th Edition.,
2. Dr.V.Ramamurthy & Dr. Sundarammal Kesavan," Engineering Mathematics" – Vol I & II Anuradha Publications, Revised Edition 2006.
3. Veerajan, T., Engineering Mathematics, Tata McGraw Hill Publishing Co., New Delhi,2000.

Reference Books

1. Kreyszig.E, "Advanced Engineering Mathematics", 8th edition, John Wiley & Sons. Singapore,2001.
2. Kandasamy P etal. "Engineering Mathematics", Vol.I (4th revised edition), S.Chand &Co., New Delhi,2000.
3. Narayanan S., Manicavachagom Pillay T.K., Ramanaiah G., "Advanced Mathematics for Engineering students", Volume I (2nd edition), S.Viswanathan Printers and Publishers, 1992.

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Fundamentals of Physics (BTEX-0102)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max (a)	Min (b)	(c)	(d) = (a+c)	Max (e)	Min (f)	(g)	(h) = (e+f)	(i) = (d+h)	
BTEX-0102	Fundamentals of Physics	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs

UNIT – I **Marks :16**

WAVE OPTICS-I Interference- definition, types, explanation of interference, Interference by division of wave front: Fresnel's biprism, fringe width, Interference in thin films
Wedge shaped films, Interference by division of amplitude: Newton's rings, Michelson's Interferometer and its applications.

UNIT – II **Marks :16**

WAVE OPTICS-II Diffraction :- Introduction - Differences between Fresnel and Fraunhofer diffractions Single slit diffraction (Qualitative and quantitative treatment) – Differences between interference and diffraction, resolving power of optical instruments (prism and gratting). Polarization:- Introduction – double refraction –Negative crystals & Positive crystals - Nicol's prism – Quarter wave plate and half wave plate – Production and detection of circularly and elliptically polarised light.

UNIT – III **Marks :16**

QUANTUM PHYSICS De Broglie's hypothesis, De Broglie's wave length, Davisson and Germer's experiment, Compton Effect, concept of wave packet & their properties, wave function & probability interpretation, Heisenberg's Uncertainty Principle, its elementary proof and applications, energy and momentum operators, time dependent and time independent Schrödinger wave equation. Application of time independent Schrödinger wave equation to particle trapped in a one dimensional square potential well.

UNIT – IV **Marks :16**

NUCLEAR PHYSICS
General properties of nucleus, Nuclear model (liquid drop model and shell model), accelerator, linear particle accelerator, cyclotron, general betatron, Counters and particle detectors Geiger-Muller Counter, nuclear fission, nuclear fusion, nuclear reaction, nuclear reactors.

UNIT – V **Marks :16**

LASER AND FIBER OPTICS
Laser: Stimulated and spontaneous processes, main part of laser, laser action population inversion, pumping, Optical resonators, characteristics of laser beam, Principles and working of Ruby, Nd:YAG, He-Ne & with energy level diagram and Applications of lasers Fiber Optics - Fundamental idea about optical fiber, types of fibers,acceptance angle & cone, numerical aperture, V-number, propagation of light through step index fiber (Ray theory) pulse dispersion, attenuation, losses, various uses, and application of optical fibers.

Text Books

1. Gaur and Gupta "Engineering Physics"
2. Tiwari and Navneet Gupta "Engineering Physics"
3. Vikram Yadav "Engineering Physics"

Reference Books

1. Beiser, "Modern Physics", McGraw-Hill Inc., New Delhi.
2. Avadhanulu and Kshirsagar "Engineering Physics".
3. Jenkins and White: "Optics", McGraw-Hill Book Company.
4. Sanjeev Puri: Modern Physics, Narosa Pub.Co. 2004.
5. Kaplan: Nuclear Physics, Narosa Publishing, 1987.
6. Tyagrajan and Ghatak: Lasers, Macmillan, 2001.

List of Experiments

1. Keiser: G Optical fiber Communication, McGraw-Hill, 2000.
2. Fresenal Biprism,
3. Newton's Rings,
4. Michelsons Interferometer.
5. Resolving Powers –Telescope,
6. Spectrometers-R.I., Wavelength, using prism and grating
7. Optical polarization based experiments: Brewster’s angle, polarimeter etc.
8. Measurements of wavelength of LASER
9. To study the CRO.
10. Charging and discharging of capacitor
11. Other conceptual experiments related to theory syllabus

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Chemistry (BTEX-0103)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max	Min		(d) =	Max	Min		(h) =	(i) =	
						(a)	(b)	(c)	(a+c)	(e)	(f)	(g)	(e+f)	(d+h)	
BTEX-0103	Chemistry	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs

UNIT – I **Marks :16**

TECHNOLOGY OF WATER

Source of water, Impurities in water, Analysis of water- Hardness of water, Estimation of Hardness, Alkalinity of water, Determination of alkalinity, Disadvantages of using hard water in boiler- sludge and scale formation, Boiler corrosion, Water softening techniques (Internal and External treatment), treatment of water for domestic purposes.

UNIT – II **Marks :16**

CORROSION AND ITS CONTROL

Corrosion: Basic concept- Principles, Mechanism of Dry or Chemical Corrosion and Wet or Electrochemical Corrosion, Pilling Bedworth rule, Types of corrosion- Galvanic corrosion, Concentration cell corrosion, Pitting corrosion, Stress corrosion, Microbiological corrosion, Factors influencing corrosion, Corrosion control.

UNIT – III **Marks :16**

A. FUELS

Definition & Classification of fuels, Calorific values, Analysis of coal, Carbonization of coal, Manufacturing of coke & recovery of by products.Cracking, Knocking, Anti-knocking, Octane & Cetane number, Gaseous fuels.

B. LUBRICANTS

Introduction, functions & classification of lubricants, Mechanism of lubrication, Properties and Testing of lubricants.

UNIT – IV **Marks :16**

POLYMERS

Introduction and classification of polymers, Types of polymerization: addition or chain polymerization, condensation polymerization, Mechanism of addition polymerization -Free radical and Ionic polymerization, Ziegler Natta polymerization, Vulcanization of rubbers, Preparation, Properties and Applications of important polymers- Polyethylene, PVC, PMMA, Nylons, Terylene, Glyptal, Bakelite, Urea-formaldehyde, Silicone resin, Neoprene, Buna S, Buna N.

UNIT – V **Marks :16**

INSTRUMENTATIONAL METHODS OF CHEMICAL ANALYSIS

Introduction to Spectroscopy, Electromagnetic spectrum, Introduction, Principle, Instrumentation and Application of IR, UV- Visible, NMR, Basic Principle and Instrumentation of Potentiometry, Flame photometry and Chromatography.

Text Books

1. Jain.P.C and Monika Jain, Engineering Chemistry, Danpat Raj publishing company (P) Ltd, New Delhi – 2002.
2. Dara.S.S, Text book of Engineering Chemistry, S. Chand & Company Ltd, New Delhi
3. Sharma B.K., “Instrumental methods of chemical analysis” 24th Edition Krishna Prakashan Media Pvt. Ltd, Meerut, 2005.

Reference Books

1. Kuriacose J.C. and Rajaram J. Chemistry in Engineering and Technology, Volume II, Tata McGraw Hill p.b. Co., 1988.
2. Jeyalakshmi.R & Ramar. P, Engineering Chemistry, 1st Edition, Devi Publications, Chennai 2006.
3. Rattan S., Text book of Engineering Chemistry, S.K. Kataria and Sons, Publication, 1st Edition, New Delhi, 2012

List of Experiments

1. Preparation of standard solutions.
2. Conductometric titration-determination of strength of an acid.
3. Determination of alkalinity, hydroxyl, carbonate and bicarbonate in water.
4. Determination of total hardness in water using EDTA titrations.
5. Estimation of iron by potentiometer.
6. Estimation of Copper in Ore
7. Determination of viscosity of lubricating oil with change of temperature by
    a. Red Wood Viscometer Number 1
    b. Red Wood Viscometer Number 2
8. Determination of Flash and Fire point of liquid fuel and lubricants by
    a. Cleaveland's Open Cup Method
    b. Abel's Flash Point Apparatus
    c. Pensky Martin's Flash Point Apparatus.
9. Determination of Cloud and Pour point of lubricants by Cloud and Pour point Apparatus.
10. Determination of carbon residue of lubricants by Conradson's Apparatus.

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REFERENCE BOOKS FOR PRACTICAL

1. Chemistry department manual, Edition, 2008.
2. Chawla S., Theory and Practicals of Engineering Chemistry, Dhanpat Rai & Co. (Pvt.) Ltd. 6th Edition, New Delhi – 2011.

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Basic Engg.- I (BTEX-0104)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max (a)	Min (b)	(c)	(d) = (a+c)	Max (e)	Min (f)	(g)	(h) = (e+f)	(i) = (d+h)	
BTEX-0104	Basic Engg.- I	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs

UNIT – I **Marks :16**

AC & DC CIRCUITS

Circuit parameters, Ohms law, Kirchhoff's law. Average and RMS values, concept of phasor representation, RLC series circuits and series resonance, RLC parallel circuits (includes simple problems in DC & AC circuits) Introduction to three phase systems – types of connections, relationship between line and phase values.

UNIT – II **Marks :16**

MAGNETIC CIRCUITS

Definition of mmf, flux and reluctance, leakage flux, fringing, magnetic materials and B-H relationship. Problems involving simple magnetic circuits. Faraday's laws, induced emfs and inductances, brief idea on Hysteresis and eddy currents.

UNIT – III **Marks :16**

ELECTRICAL MACHINES

Working principle, construction and applications of DC machines and AC machines (single phase transformers, single phase induction motors – split phase, capacitor start and capacitor start & run motors).

UNIT – IV **Marks :16**

DIGITAL ELECTRONICS

– Number system, Boolean Theorems, DeMorgan's Theorem, Logic gates, Implementation of Boolean expression using logic gates, Half adder, Full adder. Electronic Components – Resistors, Inductors and Capacitors and their types. CRO.

UNIT – V **Marks :16**

SEMICONDUCTOR – Energy band diagram, Intrinsic and Extrinsic semi conductors, PN Junction diode, Zener diode and their V-I characteristics , Zener diode used as a Voltage regulator, Light emitting diode and Photo diode. Rectifier – Half wave and full wave Rectifier and their efficiency and ripple factor, Filters.

Text Books

1. Vincent Del Toro, Electrical Engineering Fundamentals, PHI Learning, II Edition
2. S.Ghosh, Fundamentals of Electrical and Electronics Engineering, PHI, II Edition.
3. Millman, Halkias & Parikh, Integrated Electronics, Mc Graw Hill, II Edition
4. Nagrath & Kothari, Basic Electrical Engineering, III Edition TMH.
5. Mehta V.K., Principals of Electronics, S. Chand & Co.
6. Moris Mano, Digital Electronics, PHI Pub.
7. Kalsi H.s. , Electronics Instrumentation, ISTE Pub.

Reference Books

1. Kothari D. P and Nagrath IJ, Basic Electrical Engineering, Tata McGraw- Hill, 1991.
2. Thomas L.Floyd Electronic devices, Addison Wesley Longman (Singapore) Pvt . Ltd., 5th Edition.
3. Nagrath & Kothari, Basic Electrical Engineering, III Edition TMH.
4. Mehta V.K., Principals of Electronics, S. Chand & Co.

List of Experiments

1. Study of KVL and KCL.
2. Study of Transformer, name plate rating, determination of rayio and polarity.
3. Determination of equivalent circuit parameters of a single phase transformer by O.C. and S.C. tests and estimation of voltage regulation and efficiency at various loading conditions and verification by load test.
4. Identification and testing of different Electronics components.
5. Observing input and output waveforms of rectifiers.
6. Verification of truth table for various gates.
7. To study the V-I characteristics of PN diode and Zener Diode.
8. To implement basic logic gate by using universal gate(NAND & NOR).
9. Measurement of frequency and time period of a signal using CRO.

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Computer Lab (BTEX-0105)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max (a)	Min (b)	(c)	(d) = (a+c)	Max (e)	Min (f)	(g)	(h) = (e+f)	(i) = (d+h)	
BTEX-0105	Computer Lab	-	-	2	2	-	-	-	-	-	-	50	50	50	

PURPOSE

This Lab Course will enable the students to understand the basics of computer and to know the basics of MSOffice.

INSTRUCTIONAL OBJECTIVES

1. To learn the basics of computer, Computer Peripherals and its application in real world.
2. Demonstration on Ms-Word, Ms-Excel, Ms-Power Point and Ms-Access

Text Books

1. Introduction to Information Technology ITL Education Solutions Ltd., Pearson 2nd Edition, 2006.

List of Experiments

1. Study experiment on evolution of computer programming languages.
2. Suggest some of the Network Topologies that can be incorporated in your campus. Justify your choice.
3. Experiments to demonstrate directory creation and file creation.
4. Create a document with all formatting effects.
5. Create a document with tables.
6. Create labels in MS word.
7. Create a document to send mails using mail merge option.
8. Create an Excel File to analyze the student's performance. Create a chart for the above data to depict it diagrammatically.
9. Create Excel sheet to use built-in-function like sum, count, countif ,if, etc.
10. Create Excel sheet to maintain employee information and use this data to send mails using mail merge.
11. Create a Power Point presentation for your personal profile with varying animation effects with timer.
12. Consider student information system which stores student personal data, mark information and non-academic details.
    * Use MS Access to create Tables and execute SQL queries to do this following
    * Display all student records.
    * Display student details with respect to his identity.
    * Delete some records from the table.
    * Find total marks obtained by student in each list.

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Workshop Practice (BTEX-0106)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max (a)	Min (b)	(c)	(d) = (a+c)	Max (e)	Min (f)	(g)	(h) = (e+f)	(i) = (d+h)	
BTEX-0106	Workshop Practice	-	-	2	2	-	-	-	-	50	15	50	100	100	

PURPOSE
To provide the students with hands on experience on different trades of engineering like fitting, carpentary, smithy, welding and sheet metal.

INSTRUCTIONAL OBJECTIVES
To familiarize with
1. The basics of tools and equipments used in fitting, carpentry, sheet metal, welding and smithy.
2. The production of simple models in the above trades.

Text Books

1. Gopal, T.V., Kumar, T., and Murali, G., A first course on workshop practice – Theory, practice and work book, Suma Publications, 2005.

Reference Books

1. Kannaiah,P. & Narayanan,K.C. Manual on Workshop Practice, Scitech Publications, Chennai, 1999.
2. Venkatachalapathy, V.S. , First year Engineering Workshop Practice, Ramalinga Publications, Madurai, 1999.

List of Experiments

1. EMPHASIS TO BE LAID ON REAL LIFE APPLICATIONS WHEN FRAMING THE EXERCISES.
2. FITTING
   Tools & Equipments – Practice in Filing and Drilling.
   Making Vee Joints, Square, dovetail joints, Key Making.
3. CARPENTARY
   Tools and Equipments- Planning practice. Making Half Lap, dovetail, Mortise & Tenon joints, a mini model of a single door window frame.
4. SHEET METAL
   Tools and equipments - Fabrication of a small cabinet, Rectangular Hopper, etc.
5. WELDING
   Tools and equipments - Arc welding of butt joint, Lap Joint, Tee Fillet.
   Demonstration of Gas welding, TIG & MIG.
6. SMITHY
   Tools and Equipments –Making simple parts like hexagonal headed bolt, chisel.

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English (BTEX-0107)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max (a)	Min (b)	(c)	(d) = (a+c)	Max (e)	Min (f)	(g)	(h) = (e+f)	(i) = (d+h)	
BTEX-0107	English	3	1	-	4	80	25	20	100	-	-	-	-	100	03 Hrs

UNIT – I **Marks :16**

LANGUAGES AND SKILLS OF COMMUNICATION

Linguistic Techniques, Reading Comprehension, Phonetic symbols/signs, Oral Presentation, Process of communication, Verbal and non-verbal Communication, Barriers of communication

UNIT – II **Marks :16**

APPLICATION OF LINGUISTIC ABILITY

Definitions of Engineering terms, objects, processes & principles ,Paragraph Writing on topics of General Interest, Importance of Listening Skills, Unseen Passage, Conversational Dialogues

UNIT – III **Marks :16**

LETTER WRITING

Applications, Enquiry & Complaint letters, Calling & Sending quotations, Placing orders, Tenders.

UNIT – IV **Marks :16**

PRECISE WRITING

Slogan – Writing, Technical Description of Simple engineering objects & processes, Note – making.

UNIT – V **Marks :16**

REPORT WRITING

Observation Report, Survey Report, Report of Trouble, Laboratory Report, Project Report, Telephonic Etiquettes, Debate, Speech.

Text Books

1. Abraham Benjamin Samuel Practical Communication Communicative English LSRW2000 – SRMEC –June 2006 Revised Edition.
2. Staff of the Department of Humanities and Social Science, Anna University, “English for Engineers /Technologist Vol.-I”. Orient Longman, 1990.

Reference Books

1. Herbert. A. J. The structure of Technical English Orient Longman 1995.
2. Pickett and Laster, ‘Technical English, Writing, Reading and Speaking’, New York Harper and Row Publications, 1997.
3. Interactive course in phonetics and spoken English published by Acoustics Engineers (ACEN) 2002.

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Project - I (BTEX-0108)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max (a)	Min (b)	(c)	(d) = (a+c)	Max (e)	Min (f)	(g)	(h) = (e+f)	(i) = (d+h)	
BTEX-0108	Project - I	-	-	4	4	-	-	-	-	-	-	50	50	50	

The objectives of the course 'Project work' are

1. To provide students with a comprehensive experience for applying the knowledge gained so far by studying various courses.
2. To develop an inquiring aptitude and build confidence among students by working on solutions of small industrial problems.
3. To give students an opportunity to do some thing creative and to assimilate real life work situation in institution.
4. To adapt students for latest developments and to handle independently new situations.
5. To develop good expressions power and presentation abilities in students.

The faculty and student should work according to following schedule:

i) Each student undertakes substantial and individual project in an approved area of the subject and supervised by a member of staff.
ii) The student must submit outline and action plan for the project execution (time schedule) and the same be approved by the concerned faculty
iii) At all the steps of the project, students must submit a written report of the same.

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Semester-II

Mathematics - II (BTEX-0201)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max (a)	Min (b)	(c)	(d) = (a+c)	Max (e)	Min (f)	(g)	(h) = (e+f)	(i) = (d+h)	
BTEX-0201	Mathematics - II	3	1	-	4	80	25	20	100	-	-	-	-	100	03 Hrs

UNIT – I **Marks :16**

Laplace Transform: Introduction of Laplace Transform, Laplace Transform of elementary functions, properties of Laplace Transform, Change of scale property, second shifting property, Laplace transform of the derivative, Inverse Laplace transform & its properties, Convolution theorem, Applications of L.T. to solve the ordinary differential equations

UNIT – II **Marks :16**

Fourier Series: Introduction of Fourier series , Fourier series for Discontinuous functions, Fourier series for even and odd function, Half range series Fourier Transform: Definition and properties of Fourier transform.

UNIT – III **Marks :16**

Second Order linear differential equation with variable coefficients : Methods one integral is known, removal of first derivative, changing of independent variable and variation of parameter, Solution by Series Method.

UNIT – IV **Marks :16**

Linear and Non Linear partial differential equation of first order: Formulation of partial differential equations, solution of equation by direct integration, Lagrange's Linear equation, charpit's method. Linear partial differential equation of second and higher order: Linear homogeneous and Non homogeneous partial diff. equation. Separation of variable method for the solution of wave and heat equations.

UNIT – V **Marks :16**

Vector Calculus: Differentiation of vectors, scalar and vector point function, geometrical meaning of Gradient, unit normal vector and directional derivative, physical interpretation of divergence and Curl. Line integral, surface integral and volume integral, Green's, Stoke's and Gauss divergence theorem.

Text Books

1. Grewal B.S, Higher Engg Maths, Khanna Publications, 38th Edition., Veerajan, T., Engineering

Reference Books

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India
2. Higher Engineering Mathematics by BS Grewal, Khanna Publication
3. Advance Engineering Mathematics by D.G.Guffy

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Material Physics (BTEX-0202)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max (a)	Min (b)	(c)	(d) = (a+c)	Max (e)	Min (f)	(g)	(h) = (e+f)	(i) = (d+h)	
BTEX-0202	Material Physics	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs

UNIT – I **Marks :16**

STRUCTURE OF MATERIALS

Type of solids, Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – NaCl, ZnS, diamond and graphite structures – Brages law X-ray diffraction for crystal structure.

UNIT – II **Marks :16**

SEMICONDUCTING MATERIALS

Introduction, intrinsic and extrinsic semiconductors, carrier concentration in intrinsic semiconductors, carrier concentration in n type semiconductors, carrier concentration in p-type semiconductors, Hall effect and its applications - variation of carrier concentration with temperature, conductivity of extrinsic semiconductor, P-N junction – forward bias – reverse bias –V-I characteristics of a p-n junction. Basic introduction of transistors.

UNIT – III **Marks :16**

DIELECTRIC MATERIALS

Introduction, Fundamental definitions, Local field, Clausius- Mossotti relation, different types of electric polarization (dipolar, ionic and electronic polarizations), frequency and temperature effects on polarization, dielectric loss, dielectric breakdown, determination of dielectric constant, properties and different types of insulating materials, ferroelectric materials, spontaneous polarization in BaTiO3, electrets.

UNIT – IV **Marks :16**

MAGNETIC & SUPERCONDUCTING MATERIALS

MAGNETIC MATERIALS Concept of magnetism- Dia, para, ferro magnetic materials · Hysteresis loop· Soft and hard magnetic material· magnetic Storages application of magnetic materials

SUPERCONDUCTING MATERIALS Introduction – basic theories for superconductivity Meissner effect - Properties of superconductors - Type-I and Type-II superconductors – High Tc superconductors – application.

UNIT – V **Marks :16**

NANO MATERIALS

Introduction to nano science, nano materials synthesis of nono materials (using different routes) properties of nano materials, carbon nano tubes, application of nano materials.

Text Books

1. Gaur and Gupta "Engineering Physics"
2. Tiwari and Navneet Gupta "Engineering Physics"
3. Vikram Yadav "Engineering Physics"
4. Materials Science’. By Dr. M. Arumugam.

Reference Books

1. Beiser, "Modern Physics", McGraw-Hill Inc., New Delhi.
2. Avadhanulu and Kshirsagar "Engineering Physics".
3. Azroff: Solid State Physics, Tata McGraw-Hill, 2004.
4. Materials Science'. By Dr. M. Arumugam.
5. Science of Engg. Materials and Carbon Nano tubes- C. M. Shrivastava and C. Srinivasan

List of Experiments

1. Uses of Potentiometers and Bridges (Electrical)
2. Experiments connected with diodes
3. Experiments connected with transistor.
4. Measurement of energy band gap of semiconductor.
5. To study Hall effect.
6. To study Solar cell.
7. To study the LED
8. Other conceptual experiments related to theory syllabus.

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Energy & Environment Science (BTEX-0203)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max (a)	Min (b)	(c)	(d) = (a+c)	Max (e)	Min (f)	(g)	(h) = (e+f)	(i) = (d+h)	
BTEX-0203	Energy & Environment Science	3	1	-	4	80	25	20	100	-	-	-	-	100	03 Hrs

UNIT – I **Marks :16**

ENERGY

Energy, Energy scenario in world and India, Sources of energy, Renewable and nonrenewable sources of energy, Advantages and disadvantages of different sources of energy- Fossil fuel, Coal, Oil, Gas, Nuclear, Solar, Wind, Geothermal, Hydel, Hydrogen and Ocean energy.

UNIT – II **Marks :16**

ENVIRONMENT AND ECOSYSTEM

Ecology and ecosystem, Structure and types of an ecosystem, Food chain and food web, segment of Environment-Atmosphere, Hydrosphere, Lithosphere, Biosphere, Cycles in ecosystem-Gaseous, Sedimentary and Water.

UNIT – III **Marks :16**

ENVIRONMENTAL POLLUTION-I

Introduction, Air Pollution, Lapse Rate and Inversion Temperature, Air Pollutants, Classification of Air Pollutants, Causes of air pollution, Adverse effect of air pollution, Acid rain, Global warming, Chemical & photochemical smog and Ozone layer depletion, Control of Air Pollution.

UNIT – IV **Marks :16**

ENVIRONMENTAL POLLUTION-II

Water Pollution, Classification of water pollutants, Characteristics of waste water, Waste water treatment- Primary, Secondary and Tertiary, Eutrophication, Soil or
and Pollution, Radioactive Pollution, Noise Pollution

UNIT – V **Marks :16**

ENVIRONMENTAL PROTECTION AND WASTE MANAGEMENT

Solid waste management, Treatment and disposal methods, important environmental protection act in India- water, air (prevention and control of pollution) act, Wild life
conservation and forest act, Functions of central and state pollution control boards, Environmental impact assessment.

Text Books

1. Sharma.B.K. and Kaur, Environmental Chemistry, Goel Publishing House, Meerut, 1994.
2. De A.K., Environmental Chemistry, New Age International Pvt. Ltd., New Delhi, 1996.
3. Kurian Joseph & R. Nagendran, Essential of Environmental Studies, Pearson Education, 2004.

Reference Books

1. Dara S.S., A Text Book of Environmental Chemistry and pollution contro, S.Chand & Company Ltd., New Delhi, 2004.
2. Jeyalakshmi.R, Principles of Environmental Science, 1st Edition, Devi Publications, Chennai 2006.
3. Kamaraj.P & Arthanareeswari.M, Environmental Science – Challenges and Changes, 1st Edition,Sudhandhira Publications, 2007.

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Basic Engg.- II (BTEX-0204)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max (a)	Min (b)	(c)	(d) = (a+c)	Max (e)	Min (f)	(g)	(h) = (e+f)	(i) = (d+h)	
BTEX-0204	Basic Engg.- II	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs

UNIT – I **Marks :16**

Building Materials & Construction Stones, bricks, cement, lime, timber-types, properties, test & uses, laboratory tests concrete and mortar Materials: Workability, Strength properties of Concrete, Nominal proportion of Concrete preparation of concrete, compaction, curing. Elements of Building Construction, Foundations conventional spread footings, RCC footings, brick masonry walls, plastering and pointing, floors, roofs, Doors, windows, lintels, staircases – types and their suitability

UNIT – II **Marks :16**

Surveying & Positioning:

Introduction to surveying Instruments – levels, thedolites, plane tables and related devices. Electronic surveying instruments etc. Measurement of distances – conventional and EDM methods, measurement of directions by different methods, measurement of elevations by different methods. Reciprocal leveling.

UNIT – III **Marks :16**

Engineering Mechanics

Forces and Equilibrium: Graphical and Analytical Treatment of Concurrent and non concurrent Co- planner forces, free Diagram, Force Diagram and Bow's notations, Application of Equilibrium Concepts: Analysis of plane Trusses: Method of joints, Method of Sections. Frictional force in equilibrium problems. Centre of Gravity and moment of Inertia: Centroid and Centre of Gravity, Moment Inertia of Area and Mass, Radius of Gyration, Introduction to product of Inertia.

UNIT – IV **Marks :16**

Measurement

Temperature, pressure, velocity, flow, strain, force and torque measurement, concept of measurement error & uncertainly analysis, measurement by Vernier caliper, micrometer, dial gauges, slip gauges, sine-bar and combination set; introduction to lath, drilling, milling and shaping machines.

UNIT – V **Marks :16**

Reciprocating Machines

Thermodynamics: First and second law of thermodynamics; steam properties, steam processes at constant pressure, volume, enthalpy & entropy, Steam engines, hypothetical and actual indicator diagram; Carnot cycle and ideal efficiency; Otto and diesel cycles; working of two stroke & four stroke petrol & diesel IC engines.

Text Books

1. Raju K.V.B., Ravichandran P.T., Basics of Civil Engineering, Ayyappa Publications, Chennai, 2000.
2. Ramesh Babu, Civil Engineering, VRB Publishers, Chennai, 2000.
3. Kumar, T., Leenus Jesu Martin., and Murali, G., Basic Mechanical Engineering, Suma Publications, Chennai, 2007.
4. Prabhu, T. J., Jai Ganesh, V., Jebaraj, S., Basic Mechanical Engineering, Scitech Publications, Chennai, 2000.

Reference Books

1. Rangwala,S.C., Engineering Materials, Charotar Publishing House, Anand,
2. National Building Code of India, Part V, Building Materials, 2005
3. Surendra Singh, Building Materials, Vikas Publishing Company, New Delhi
4. Prabhu, T. J., Jai Ganesh, V., Jebaraj, S., Basic Mechanical Engineering, Scitech Publications, Chennai, 2000.
5. Palanichamy, M.S., Basic Civil & Mechanical Engineering, Tata McGraw-Hill , New Delhi 1991.
6. Nagpal G. R., Power Plant Engineering, Khanna Publisher, Delhi,2004

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Computer Science (BTEX-0205)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max (a)	Min (b)	(c)	(d) = (a+c)	Max (e)	Min (f)	(g)	(h) = (e+f)	(i) = (d+h)	
BTEX-0205	Computer Science	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs

UNIT – I **Marks :16**

PROGRAMMING FUNDAMENTALS

Computer Basics; Program Development Life Cycle: Flow Chart, Algorithm, Compilation and Execution; Introduction to C Language: program structure, variables, keywords, data types; Input / Output functions: scanf, printf; simple programs.

UNIT – II **Marks :16**

DECISION AND LOOP CONTROL STRUCTURE

Logical operators; Decision statements: if/else, switch/case statements; Loop control statements – for, while, do/while.

UNIT – III **Marks :16**

ARRAYS AND FUNCTIONS

Arrays: Introduction to arrays; One dimensional array: declaration, reading and printing array elements, sorting and searching. Functions: Definition; declaration of functions; return statement;recursion.

UNIT – IV **Marks :16**

INTRODUCTION TO OOP CONCEPTS

OOP concepts: classes and objects, encapsulation, inheritance, overloading, polymorphism, constructor and destructor, data hiding,simple program in C++.

UNIT – V **Marks :16**

INHERITANCE AND OVERLOADING

Inheritance – single, multiple, multilevel; Overloading – Function overloading, Operator overloading.

Text Books

1. Kanetkar P.Yashwant, “Let us C”, BPB publications, 2002.
2. Ashok N.Kamthane, “Programming with ANSI and Turbo C”, Pearson Education, 2006.
3. Herbert Schildt, “The Complete Reference C++”, TataMcGrawHill, 2001, 3rd Edition.
4. Robert Lafore, “Object Oriented Programming in Microsoft C++”, The Waite Group, Galgotia Publications Pvt. Ltd., 2002.

Reference Books

1. Robert Lafore, “Object Oriented Programming in Microsoft C++”, The Waite Group, Galgotia Publications Pvt. Ltd., 2002.

List of Experiments

Note to the Instructors: Design exercise problems to demonstrate the use of C and C++ in the area of specialization.

1. Programs to demonstrate the use of scanf( ) and printf( ) functions
2. Programs to evaluate arithmetic expressions
3. Pprograms using conditional statements
4. Programs using for,while , do…while
5. Programs on arrays
6. Programs to perform matrix addition and multiplication
7. Programs to implement functions
8. Programs to illustrate recursion
9. Program to create classes and objects using C++
10. Program to implement Constructor and Destructor in C++
11. Program to implement single inheritance in C++
12. Program to implement Function overloading in C++
13. Program to implement Operator overloading in C++

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Engg. Graphics Lab (BTEX-0206)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max (a)	Min (b)	(c)	(d) = (a+c)	Max (e)	Min (f)	(g)	(h) = (e+f)	(i) = (d+h)	
BTEX-0206	Engg. Graphics Lab	-	-	2	2	-	-	-	-	50	15	50	100	100	

UNIT – I **Marks :**

FUNDAMENTALS OF ENGINEERING GRAPHICS

Lettering, two dimensional geometrical constructions, conics, representation of three-dimensional objects – principles of projections – standard codes – projection of points.

UNIT – II **Marks :**

PROJECTION OF LINES AND SOLIDS

Projection of straight lines, projection of solids – auxiliary projections

UNIT – III **Marks :**

SECTIONS AND DEVELOPMENTS

Sections of solids and development of surfaces.

UNIT – IV **Marks :**

PICTORIAL PROJECTIONS

Conversion of projections: Orthographic projection, isometric projection of regular solids & combination of solids.

UNIT – V **Marks :**

BUILDING DRAWING

Building Drawing – plan, elevation and section of single storied residential (or) office building with flat RCC roof and brick masonry walls having not more than 3 rooms (planning / designing is not expected in this course).

Text Books

1. Jeyapoovan, T., Engineering Drawing and Graphics using AutoCAD 2000, Vikas Publishing house Pvt Ltd, NewDelhi, 2005.
2. Narayanan, K.L & Kannaiah, P., Engineering Graphics, Scitech Publications, Chennai, 1999.

Reference Books

1. Bhatt, N.D., Elementary Engineering Drawing (First Angle Projection), Charotar Publishing Co., Anand, 1999.
2. Venugopal, K. Engineering Drawing & Graphics, New Age international Pvt. Ltd., 2001.
3. Natarajan, K.V. Engineering Drawing & Graphics, Private Publication, Chennai, 1990.

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Seminar/GD/Lang. Lab (BTEX-0207)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max (a)	Min (b)	(c)	(d) = (a+c)	Max (e)	Min (f)	(g)	(h) = (e+f)	(i) = (d+h)	
BTEX-0207	Seminar/GD/Lang. Lab	-	-	2	2	-	-	-	-	-	-	50	50	50	

UNIT – I **Marks :**

Topics to be covered in the Language Lab Sessions:
Introduction session: Introduce oneself, Family background, Educational qualification, Hobbies and interest, Expertise, Experience (If any), Strength and weaknesses.

UNIT – II **Marks :**

Body language: Importance of body language, Dressing sense, Walking sense, Talking and communication, Dining and eating sense.

UNIT – III **Marks :**

Telephonic etiquettes: How to receive calls, How to respond, How to make a call, Common expressions for calling.
PPTs presentations:
Improving speaking skills: Speech practices, Role plays (on stage), GD and Debate, Extempore speech, Word games, JAM (Just a minute) session, Describing objects and situations.

UNIT – IV **Marks :**

Reading skills: Improving reading skills, Paragraph reading, Storytelling and reading, Audio and video sessions.

UNIT – V **Marks :**

Writing skills: Paragraph writing, Word power/ vocabulary building, Article writing, Translations from Hindi to English and vice-versa.
Presentation skills: Oral presentations, on all the learning sessions. Seminar on given topics.

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Project work-II (BTEX-0208)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max (a)	Min (b)	(c)	(d) = (a+c)	Max (e)	Min (f)	(g)	(h) = (e+f)	(i) = (d+h)	
BTEX-0208	Project work-II	-	-	4	4	-	-	-	-	-	-	50	50	50	

The objectives of the course 'Project work' are

1. To provide students with a comprehensive experience for applying the knowledge gained so far by studying various courses.

2. To develop an inquiring aptitude and build confidence among students by working on solutions of small industrial problems.

3. To give students an opportunity to do some thing creative and to assimilate real life work situation in institution.

4. To adapt students for latest developments and to handle independently new situations.

5. To develop good expressions power and presentation abilities in students.

The faculty and student should work according to following schedule:

i) Each student undertakes substantial and individual project in an approved area of the subject and supervised by a member of staff.

ii) The student must submit outline and action plan for the project execution (time schedule) and the same be approved by the concerned faculty.

iii) At all the steps of the project, students must submit a written report of the same.

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Semester-III

MATHEMATICS-III (BTEX-0301)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0301	MATHEMATICS-III	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs.

UNIT- I **Marks : 16**

Functions of complex variables : Analytic functions, Harmonic Conjugate, Cauchy-Riemann Equations, Line Integral, Cauchy's Theorem, Cauchy's Integral Formula, Singular Points, Poles & Residues, Residue Theorem , Application of Residues theorem for evaluation of real integrals

UNIT- II **Marks : 16**

Errors & Approximations, Solution of Algebraic & Trancedental Equations (Regula Falsi , Newton-Raphson, Iterative, Secant Method), Solution of simultaneous linear equatins by Gauss Elimination, Gauss Jordan, Crout's methods , Jacobi's and Gauss-Siedel Iterative methods

UNIT- III **Marks : 16**

Difference Operators, Interpolation (Newton Forward & Backward Formulae, Central Interpolation Formulae, Lagrange's and divided difference formulae), Numerical Differentiation and Numerical Integration.

UNIT- IV **Marks : 16**

Solution of Ordinary Differential Equations(Taylor's Series, Picard's Method, Modified Euler's Method, Runge-Kutta Method, Milne'sPredictor & Corrector method), Correlation and Regression, Curve Fitting (Method of Least Square).

UNIT- V **Marks : 16**

Concept of Probability : Probability Mass function, Probability density function. Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution ,Gamma Distribution ,Beta Distribution ,Testing of Hypothesis :Students t-test, Fisher's z-test, Chi-Square Method

Reference Books:

1. Numerical Methods using Matlab by Yang,Wiley India
2. Pobability and Statistics by Ravichandran ,Wiley India
3. Numerical Methods using Matlab by J.H.Mathews and K.D.Fink, P.H.I.

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CIRCUIT ANALYSIS (BTEX-0302)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0302	CIRCUIT ANALYSIS	3	1	2	6	80	25	20	100	50	15	50	100	200	3 hrs.

UNIT- I **Marks : 16**

Introduction to circuit elements R,L,C and their characteristics in terms of linearity & time dependant nature, voltage & current sources controlled & uncontrolled sources KCL and KVL analysis, Nodal & mesh analysis, analysis of magnetically coupled circuits, Transient analysis :- Transients in RL, RC&RLC Circuits, initial conditions, time constants. Steady state analysis- Concept of phasor & vector, impedance & admittance, Network topology, concept of Network graph, Tree, Tree branch &link, Incidence matrix, cut set and tie set matrices, dual networks, Dot convention, coupling coefficient,tuned circuits, Series & parallel resonance.

UNIT- II **Marks : 16**

Network Theorems for AC & DC circuits- Thevenins & Norton's, Superpositions, Reciprocity, Compensation, Substitution, Maximum power transfer, and Millman's theorem, Tellegen's theorem,problems with dependent & independent sources.

UNIT- III **Marks : 16**

Frequency domain analysis – Laplace transform solution of Integro-differential equations, transform of waveform synthesized with step ramp, Gate and sinusoidal functions, Initial & final value theorem,Network Theorems in transform domain.

UNIT- IV **Marks : 16**

Concept of signal spectra, Fourier series co-efficient of a periodic waveform, symmetries as related to Fourier coefficients, Trigonometric & Exponential form of Fourier series.

UNIT- V **Marks : 16**

Network function & Two port networks – concept of complex frequency, Network & Transfer functions for one port & two ports, poles and zeros, Necessary condition for driving point & transfer function. Two port parameters – Z,Y, ABCD, Hybrid parameters, their inverse & image parameters,relationship between parameters, Interconnection of two ports networks, Terminated two port network.

Reference Books:

1. Mittal GK; Network Analysis; Khanna Publishe
2. B.Chattopadhyay & P.C.Rakshit; Fundamental of Electrical circuit theory; S Chand
3. M.E. Van Valkenburg, Network Analysis,(PHI)
4. Chakraborti :Circuit theory: Dhanpat Rai

List of Experiments:

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

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DIGITAL ELECTRONICS AND LOGIC DESIGN-I (BTEX-0303)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0303	DELD-I	3	1	2	6	80	25	20	100	50	15	50	100	200	3 hrs.

UNIT- I **Marks : 16**

Number Systems and Codes : Digital number systems, base conversion, Binary, Decimal, octal, Hexadecimal, number system with radix r, Gray codes.Alphanumeric codes concept of parity, complement r's & (r-1)'s, subtraction with complements, Basic Theorems & Properties of Boolean Algebra: AND, OR, NOT operators, laws of Boolean Algebra, Demorgon's theorem, Boolean expression & logic diagram. Negative logic,Alternate logic gate representation (concept of bubbled gates), sum of minterms & product of maxterms, Truth table & maps, 2,3,4,5 and 6 variable maps, Solving digital problems using Maps, Don't care conditions, Tabular minimization. Sum of product & product of sum reduction, Exclusive OR & Exclusive NOR circuits, Parity generator & checkers.

UNIT- II **Marks : 16**

Combinational Circuits : Design procedure, Adders (half and Full), subtractor (half and full) code convertors, Analysis of design, Universal building blocks, Implementation of any logic circuit with only NAND gates or with only NOR gates, Binary serial adder, parallel adder, serial/parallel adder, BCD adder, Binary multiplier, Decoder, Demultiplexer, Encoders, priority encoder, Multiplexers & implementation of combinational logic Diagram.

UNIT- III **Marks : 16**

Sequential Logic Circuit : Latches, SR latch with NAND & NOR gates, D latch, edge triggered flip flop, J-K flip flop, T flip flop, Master slave flip flop, Analysis of clocked sequential circuit, state table, state diagram, state reduction state equations, state assignments, flip flop excitation table. Design procedure for sequential circuits, Design with state reduction, Applications of flip flop.

UNIT- IV **Marks : 16**

Registers and Counters : Synchronous and Asynchronous and counter, counters with MOD numbers, Down counter, UP/DOWN counter, propagation delay in ripple counter, programmable counter, BCD counter, cascading, counter applications, Decoding in counter, Decoding glitches, Ring Counter, Johnson counter, Rotate left & Rotate right counter, Registers – Buffer, Shift left, shift right, shift left/Right registers, parallel in parallel out, serial in serial out, parallel in serial out, serial in parallel out registers.

UNIT- V **Marks : 16**

Random Access Memory, Timing waveform, Memory Decoding, Internal Construction, Read only memory – Combinational circuit implementation, Type of ROMs, combinational PLDs, Programmable Logic Array (PLA), Programmable Array Logic (PAL), sequential programmable device. Analog to digital conversion – Ramp type, dual slope, integration, successive approximation, parallel conversion, parallel/ serial conversion, convertor specifications, Digital to Analog convertors.

Reference Books:

1. M.Mano; Digital logic & Computer Design; PHI
2. Tocci ; Digital Systems Principle & applications; Pearson Education Asia
3. Mano; Digital design; Pearson Education Asia
4. Thomas Blakeslee; Digital Design with standard MSI and LSI; Wiley Interscience

List of Experiments:

1. Verification of all the logic gates.
2. Design of BCD to Excess-3 code converter.
3. Implementation of NAND & NOR as Universal gate.
4. Design of RS, JK, T& D Flip flop.
5. Multiplexer based boolean function
6. Design of combinational circuit for the
7. Half adder
8. Full adder
9. Half subtractor
10. Full subtractor
11. Design various D-A convertors.

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ELECTRONIC DEVICES AND CIRCUITS-I (BTEX-0304)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0304	EDC-I	3	1	2	6	80	25	20	100	50	15	50	100	200	3 hrs.

UNIT- I **Marks : 16**

Semiconductor Diode & Rectifiers: Semiconductor diodes, ideal & practical diode equivalent circuit & frequency response, graphical analysis of diode circuits, diode applications, clipping and clamping circuits, half wave & full wave rectifier circuits with & without filters. Type of diodes and their applications, Signal diodes, Power Diode, Zener diode, Varactor diode, Schottky diode, PIN diode, Tunnel diode, Photo diode. Direct tunneling equivalent cirucuit, Tunnel diode oscillator; Solar Cell, LED, LEDs specification & geometry of LEDs, Colours of LEDs, LCD, Diffusion and Transition capacitance of P-N junction diode, Simple zener regulators.

UNIT- II **Marks : 16**

Transistor Characteristics: Construction, principle of operation, V-I characteristics, Symbols, equivalent circuit, parameter calculations, applications, limitations and specifications of BJT, FET, UJT and MOSFET'S (Different configurations of transistors are to be considered), Specifications ofBJT, FET, UJT and MOSFET's.

UNIT- III **Marks : 16**

Amplifiers: Biasing, DC Equivalent Model, criteria for fixing operating point and methods of bias stabilizaion, thermal runaway and thermal stability, small signal low- frequency transistor amplifier – circuits; h-parameters, representation of transistor, analysis of single stage transistor amplifier using h-parameters, voltage gain current gain, input impedance output impedance, Comparison of BJT & FET. RC coupled amplifier – frequency response, cascaded amplifiers (all configurations of BJT and FET are to be considered). High frequency model of transistor And cut-off frequencies of a transistor, single stage and multi stage amplifiers, Calculation of bandwidth of single and multistage amplifiers, concept of gain bandwidth product. Specifications of amplifiers, effect of cascading on bandwidth, Darlington amplifier, boot strapping, stability and thermal consideration, Noise in BJT.

UNIT- IV **Marks : 16**

Feedback Amplifiers and Oscillators: Concept of feedback, negative & positive feedback gain & sensitivity, Bandwidth, classification of feedback amplifiers, general characteristics of negative feedback amplifier, effect of feedback on amplifiers characteristics, condition for oscillation, RC and LC type of oscillators, Crystal oscillators, frequency and amplitude stability of oscillations, Generalized analysis of LC oscillators, quartz, Hartley Clopitts, R-C Phase shift and Wein Bridge oscillators,UJT oscillator.

UNIT- V **Marks : 16**

Power Amplifiers and Tuned Amplifiers & Regulator: Classification of power amplifiers,Class A,B,AB and C power amplifiers, Push pull & complementary push pull amplifiers. Design of heat sinks, Power output, efficiency, cross – over distortion and harmonic distortion, Derating curve. Specifications of power amplifiers, single tunned and double tunned voltage amplifiers. Interstage design, Staibility consideration, Class B and Class C tuned power amplifiers and specifications.

Reference Books

1. Cathey; Electronic devices and circuits (Shaum); TMH
2. Bogart; Electronic Devices and Circuits; Universal Book Stall, Delhi
3. Millman & Halkias; Integrated Electronics; McGraw- Hill.
4. Nagrath I.J.; Electronics; PHI
5. Nashelsky & Boysted; Electronic Devices and Circuits; PHI
6. Millman Halkias; Electronic Devices and Circuits; McGraw- Hill
7. Millman & Grabel; Micro Electronics; McGraw-Hill
8. Salivahanan; Electronic Devices and Circuits; TMH

List of Experiments:-

1. V-I Characteristics of different types of Diodes.
2. Applications of diodes and Design of various clipping and clamping circuits.
3. Design half & full wave rectifier
4. Design & Analysis of transistor amplifier in CE, CB & CC configuration.
5. Use of UJT as relaxation Oscillator.
6. Design & Analysis of JFET Amplifier.
7. Design & Analysis of MOSFET Amplifier.
8. To study and construct power amplifiers of various classes.
9. Study of various oscillators.

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ELECTRONIC INSTRUMENTATION (BTEX-0305)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0305	ELECTRONIC INSTRUMENTATION	3	1	2	6	80	25	20	100	50	15	50	100	200	3 hrs.

UNIT- I **Marks : 16**

Electronic Voltmeter: Electronic voltmeter and their advantages, VTVMs Differential amplifier type electronic voltmeter, D.C. voltmeter using direct coupled amplifier, chopper amplifier type of voltmeter, Electronic voltmeters using rectifiers, True RMS responding voltmeter, Electronic multimeters, Differential voltmeter, Vector voltmeter, Vector impedance meter, measurement of power at radio frequency, calorimeter, Bolometer .

UNIT- II **Marks : 16**

A.C. Bridge Measurement: Sources and detectors, Use of Bridges for measurement of inductance, Capacitance & Q factor Maxwells bridge, Maxwells inductance capacitance bridge, Hays bridge, Andersons bridge, Owen's Bridge, De-sauty's Bridge, Schering Bridge, Heaviside cambell's bridge, Weins bridge, Universal bridge, Sources of errors in Bridge circuit, Q meter and its applications and measurement methods.

Transducers: Transducers definition and classification, mechanical devices as primary detectors, Characteristic & choice of Transducers, Resistive inductive and capacitive transducers, strain gauge and gauge factor, Thermistor, Thermo couples, LVDT, RVDT, Synchros, Piezo-Electric transducers, Hall effect transducers, Photo optic transducers.

UNIT- III **Marks : 16**

Signal Generators: Fixed & variable frequency AF oscillators, Sine wave generators, Standard signal generator, AF Sine and Square wave generator Function generator, Square and pulse generator, Random noise generator, Sweep generator, TV Sweep generator, Marker generator, Sweep- Marker generator, Wobbly scope, Video pattern generator Vectroscope, Beat frequency oscillator.

Wave analyser: Basic wave analyzer, Frequency selective wave analyzer, heterodyne wave analyzer, Harmonic distortion, analyzer, spectrum analyzer digital Fourier analyzer.

UNIT- IV **Marks : 16**

CRO: Different parts of CRO, Its Block diagram, Electrostatic focusing, Electrostatic deflection, post deflection acceleration, Time base circuit, Oscilloscope probes and transducers, Attenuators, Application of CROs, Lissajous patterns, Special purpose CROs- Multi input, Dual trace, Dual beam,

Sampling, Storage (Analog & Digital)Oscilloscopes.
Digital Instruments:- Electrophoretic image display, Liquid vapour display dot-matrix display Analog recorders, Graphic recorders, Strip chart recorders, single point & multipoint recorders, X-Y records, Magnetic tape recorders, Basic components of tape recorders, Methods of recording, Direct recording, Frequency modulated recording, Pulse duration modulation recording, Digital tape recorders.

UNIT- V **Marks : 16**

Instruments used in computer-controlled instrumentation RS 232C and IEEE 488, GPIB electric interface. Introduction to analog & Digital data acquisition systems-Instrumentation systems used, Interfacing transducers to electronic control & measuring systems Multiplexing - D/A multiplexing A-D Multiplexing, Special encoders. Digital control description Microwave instruments, Scattering parameters, Network analyzer, Microwave power measurement- Sources & detectors, Fiber optic power measurement, Stabilized calibrated light sources end to endmeasurement of fiber losses.

Reference Books

1. Morris A.S., "Principles of Measurement & Instrumentation".
2. Rangan C.S., G.R. Sarma, Mani, "Instrumentation : Devices & systems", TMH
3. Murthy BVS, "Transducers and Instrumentation", PHI.
4. Doeblin D.O., "Measurement Systems- Applications and Design".
5. Albert. D. Helfrick, W.D. Cooper, "Modern Electronic Instrumentation and measurement techniques", PHI.
6. Kalsi H.S., "Electronic Instrumentation", TMH.
7. Ghosh, Introduction to Measurement & Instrumentation, forth Edition. PHI.

List of Experiments:-

1. Measurement of inductance of a coil using Anderson Bridge.
2. Measurement of capacitance of a capacitor using Schering Bridge.
3. LVDT and capacitance transducers characteristics and calibration.
4. Resistance strain gauge- Strain Measurement and calibration.
5. Measurement of R, L,C & Q using LCR-Q meter.
6. Study & measurement of frequency using Lissajous patterns.
7. Measurement of pressure using pressure sensor.
8. Study of Piezo-electric Transducer and Measurement of impact using Piezo-electric Transducer
9. Measurement of Displacement using LVDT.
10. Measurement of speed of a Motor using photoelectric transducer.
11. Study & Measurement using ph meter.
12. Temperature measurement & Control using thermo couple & using thermistor.

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Semester-IV

ELECTRICAL ENGINEERING MATERIAL (BTEX-0401)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0401	ELECTRICAL ENGINEERING MATERIAL	3	1	-	-	80	25	20	100	-	-	-	-	100	3 hrs.

UNIT- I **Marks : 16**

Conducting Material: Classification and main properties, High resistivity alloy: Constant Mangann,Nichrome, Electrochemical, properties of copper, Aluminum, steel tungsten, Molybdenum, Platinum, Tantalum, Niobium, Mercurry, Nickel, Titanum, Carbon, Lead, thermal, Bitmetals, thermocouple,materials, specific resistance, conductance, variation of resistance with temperature, super conductors.

UNIT- II **Marks : 16**

Semi Conductor Materials: General conception, variation of electrical conductivity, Elements having semiconductor properties, general application, hall effect, energy levels, conduction in semiconductors, Intrinsic conduction, impurity conduction, P and N type impurities, electrical change, Neutrality, Drift, Mobility current flow in semi conductors P-N junction formation by alloying, Elasing (forward and reverse) of P-n junction, Reverse separation current, Zener effect, Junction, capacitance, hall defects and hall coeffiecient.

UNIT- III **Marks : 16**

Magnetic Materials: Details of magnetic materials, reduction between B.H. and , soft and hard magnetic materials. Di-magnetic, Para magnetic and Ferromagnetic materials, electrical sheet steel, cast iron. Permanent magnetic materials. Dynamic and static hysteresis loop. Hysterisis loss, eddy current loss, Magnetisation, magnetic susceptibility, coercive force, core temperature, rectangular hysteresia loop,Magnet rest square loop core materials, iron silicon, Iron alloys.

UNIT- IV **Marks : 16**

Insulating Materials: General electrical mechanical and chemical properties of insulating material, Electrical characteristics volume and surface resistivity complex permitivity loss, and dielectric loss, equivalent circuits of an imperfect dielectric polarization and polarisability classification of dielectric.

UNIT- V **Marks : 16**

Mechanical Properties: Classification insulating materials on the basis of temperature rise. General properties of transformer oil, commonly used varnishes, solidifying insulating materials, resins, bituminous waxes, drying oils, Fibrous insulating materials, wood, paper and cardboard, insulating textiles, varnished adhesive tapes, inorganic fibrous material and other insulating materials, such as mica, ceramic, bakelite, ebonite, glass, PVC, rubber, other plastic molded materials.

Reference Books

1. Kortisky; Electrical Engineering Materials:
2. Indulkar and S. Thruvengadem; Electrical Engineering Materials; S. Chand
3. Dekkor AK; Electrical Engineering Materials; PHI.
4. TTTI Madras; Electrical Engineering Materials; TMH.
5. Electrical Engineering Material s & Devices; John Allison ;TMH
6. Materials for Electrical Engineering: B.M. Tareev
   Anderson; Di-Electrics :

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ELECTRICAL MACHINE-I (BTEX-0402)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0402	ELECTRICAL MACHINE-I	3	1	2	6	80	25	20	100	50	15	50	100	200	3 hrs.

UNIT- I **Marks : 16**

Working principle, e.mf. equation, construction, phasor diagrams, equivalent circuit, voltage regulation, losses, separation of hysteresis and eddy current losses, efficiency, tests: open circuit and short circuit, load, Sumpner's test, Condition for maximum efficiency and regulation, Power and distribution transformer, allday efficiency, Excitation phenomenon, Autotransformer: working, advantages , its equivalent circuit and phasor diagram.

UNIT- II **Marks : 16**

Three phase transformer: its construction, groups and connections, their working and applications; Scottconnection; Parallel operation of Transformers: application, advantages, requirement and load sharing; Tap changers, cooling, conservator and breather. Pulse and high frequency transformers.

UNIT- III **Marks : 16**

Three phase Induction Motor-I Working principle, construction, comparison of slip ring and squirrel cage motors, steady state analysis, phasor diagram and equivalent circuit, power flow diagram, torque-speed and power-speed characteristics, Losses and efficiency, No load and block rotor test, circle diagram.

UNIT- IV **Marks : 16**

Three phase Induction Motor-II Starting of squirrel cage and slip ring motors, power factor control, Cogging & Crawling, Double cage &Deep bar Indication Motor, impact of unbalanced supply and harmonics on performance, speed control, braking, Induction Generator. Applications of induction motor.

UNIT- V **Marks : 16**

Single Phase Motors: Single Phase Induction motor; double revolving field theory, equivalent circuit and its determination, performance calculation, starting methods and types of single phase Induction motors: their working principle and applications, comparison with three phases Induction Motor. Single phase A.C. series motor, Servo motors, Linear Induction Motor.

Reference Books

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

List of Experiments:

1. Perform turn ratio and polarity test on 1-phase transformer
2. Perform load test on a 1-phase transformer and plot its load characteristic
3. Perform OC and SC tests on a 1-phase transformer and determine its equivalent circuit. Also find its efficiency and regulation at different load and power factor.
4. Perform OC and SC tests on a 3-phase transformer and determine its equivalent circuit. Also find its efficiency and regulation at different load and power factor.
5. Perform Sumpner's test on two 1-phase transformer and determine its efficiency at various load.
6. Perform No-load and block rotor test on a 3- phase IM and determine its equivalent circuit.
7. Perform load test on a 3- phase IM and plot its performance characteristics.
8. Study various types of starters used for 3-phase IMs.
9. 9. Perform No-load and block rotor test on a 1- phase IM and determine its equivalent circuit

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DIGITAL ELECTRONICS & LOGIC DESIGN-II (BTEX-0403)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0403	DELD-II	3	1	2	6	80	25	20	100	50	15	50	100	200	3 hrs.

UNIT- I — Marks : 16

Specification of sequential systems: Characterizing equation & definition of synchronous sequential machines. Mealy and Moore model machines state table and transition diagram. Minimization of the flow table of completely and incompletely specifies sequential machines.

UNIT- II — Marks : 16

High level description and specification of standard combinational & sequential modules. Concept of iterative arrays.

UNIT- III — Marks : 16

Secondary state assignments in sequential machine; parallel & serial decomposition of sequential machines. Introduction to asynchronous sequential machine, races and hazards. Information loss-less machine.

UNIT- IV — Marks : 16

Algorithmic state machine and fundamental concept of hardware / firmware algorithms. Controllers and data system designing.

UNIT- V — Marks : 16

Concept of PROM, PLE and FPLA. Other PLD devices like EPLA, GAL, PHEEL, Mega PAL .

Reference Books

1. M. Mano “Digital Design” John Wiley & Sons, PHI.
2. P.K. Lala “Digital System Design using Programmable logic Devices” BS Publication
3. K.L.Short “Microprocessors and Programmed Logic” PHI.
4. Z. Navatri “ VHDL Analysis & Modelingof Digital Systems” Mc-Graw Hill.
5. Z. Kohavi “Switching & Finite Automata Theroy” TMH.
6. S. C. See “Digital Circuits and Logic Design” PHI,
7. M.K. Ercegovac & T. Lang, “Digital Systems and Hardware/Firmware Algorithms” John Wiley.
8. Stefan Sjoholm & Lennart Lind “VHDL for Designers” Prentice-Hall.
9. P.J. Ashenden “The Designers Guide to VHDL” Harcourt Asia PTE Ltd. M. Ercegovac et.al “ Introductionto Digital Systems”

List of Experiments:-

1. To study secondary state assignments in sequential machine.
2. To implement sequential modules.
3. To Design the algorithmic state machine.
4. To Design a serial decomposition of sequential machine.
5. To implement PAL.
6. To design Moore model of machine.

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ELECTRICAL INSTRUMENTATION (BTEX-0404)

Course code	Title of the Paper	Periods Per week			Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
					Theory				Practical					
		L	T	P	C Max (a)	Min (b)	MST (c)	Total (d = a+c)	Max (e)	Min (f)	TW (g)	Total (h= e+g)		
BTEX-0404	ELECTRICAL INSTRUMENTATION	3	1	2	6 80	25	20	100	50	15	50	100	200	3 hrs.

UNIT- I **Marks : 16**

Measurement and error, Accuracy and precision, sensitivity resolution, Error & Error analysis, Effect of temperature, Internal friction, Stray field, Hysterisis and Frequency variation & method of minimizing them, Loading effects, due to shunt connected and series connect ed instruments, calibration curve, Testing & calibration of instruments. Galvanometers – Theory & operation of ballistic galvanometer, D'arsonal galvanometer, galvanometer motion & damping, Sensitivity, Flux meter, Vibration galvanometer, Spot deflection galvanometer. Definition of analog & digital instruments, Classification of analog instruments, their operating principle, Operating force, Types of supports, Damping, Controlling.

UNIT- II **Marks : 16**

Different types of Ammeter & Voltmeter – PMMC, MI, Electrodynamometer, Hotwire, Electrostatic, Induction, Rectifier, Ferro dynamic & Electro-thermic, Expression for control & deflection torque, their advantages, disadvantages & error, Extension of range of instruments using shunt & multiplier.

UNIT- III **Marks : 16**

Instrument transformers: Potential and current transformers, ratio and phase angle errors, testing of instrument transformers, Difference between CT and PT, errors and reduction of errors. Measurement of power: Power in AC and DC Circuit, Electrodynamometer type of wattmeter, Construction, theory, operation & error, Low power factor & UPF wattmeter, Double element and three element dynamometer wattmeter, Measurement of power in three phase circuit, one, two & three wattmeter method, Measurement of reactive power by single wattmeter, Measurement of power using CTs & PTs.

UNIT- IV **Marks : 16**

Measurement of Energy: Single phase induction type energy meter – construction & operation – driving and braking torques –errors & compensations – Testing by phantom loading and using R.S.S. meter- Three phase energy meter – Tri-vector meter – Maximum demand meter, Ampere hour meter.Potentiometer – DC potentiometer standardization – Lab type Crompton's potentiometer, application of DC potentiometer, AC polar type and coordinate type potentiometer, their construction and applications.

UNIT- V **Marks : 16**

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

Reference Books

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

List of Experiments:-

1. Measurement of low resistance using Kelvin's Double Bridge.
2. Measurement of medium resistance using Wheatstone's bridge
3. Measurement of high resistance by loss of charge method
4. Measurement of Insulation resistance using Megger
5. Measurement of earth resistance by fall of potential method and verification by using earth tester
6. Measurement of power in a single phase ac circuit by 3 voltmeter/ 3 Ammeter method
7. Calibration of a dynamometer type of wattmeter with respect to a standard/Sub Standard wattmeter
8. Calibration of a induction type single phase energy meter
9. Calibration of a dynamometer type of wattmeter by Phantom Loading method
10. Measurements using Instrument Transformers

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ELECTRONIC DEVICES AND CIRCUITS-II (BTEX-0405)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0405	EDC-II	3	1	2	6	80	25	20	100	50	15	50	100	200	3 hrs.

UNIT- I **Marks : 16**

Operational Amplifiers: Design aspects of Monolithic OpAmps, ideal characteristics, specifications, offset voltages and currents, frequency compensation techniques, measurement of opamp parameters, applications of op-amp inverting, non inverting amplifiers, integrators, function generator, logarithmic amplifier, instrumentation amplifiers, signal conditioning circuits, multivibrators,square wave generator, rectifiers, peak detectors & voltage regulator.

UNIT- II **Marks : 16**

Filters: Active filters, LPF, HPF, BPF, BEF, All pass filter, higher order filters & their design, switched capacitor filters, 555 timer and its applications, 556 function generator IC and its applications, phase locked ICs (PLL) 565 and their applications. IC 1496 (Balanced modulatorapplications).

UNIT- III **Marks : 16**

Acoustics: Microphones – Carbon, moving coil, ribbon, crystals condenser, their working principle and characteristic, Noise Figure and sensitivity and shielding. Loud Speakers – Moving Coil, electrodynamics horn type, multi-way speaker system, cross over network and their frequency characteristic. Various types of sound recording, magnetic recording, disk and crystal recording, Reverberations, building and studio acoustics, high fidelity.

UNIT- IV **Marks : 16**

Microwave: Generation of microwave by tubes, limitation of conventional tubes, Klystron amplifiers, reflex Klystron oscillator, magnetrons, traveling wave tube (TWT), backward wave oscillator (BWO), high frequency limitation of transistor, microwave transistor, Manley Rowe relations, parametric amplifiers and frequency multipliers, Gun effect, Gun diode oscillator, Avalanche effect, IMPATT & TRAPATT, BARRITT, TUNNETT, MITATT, microwave field effect transistors, MASER, LASER, Microwave Integrated Circuits (MICs) diode, Schottky barrier andbackward diodes, PIN diode and their applications.

UNIT- V **Marks : 16**

Logic Families: DTL, ITL, ECL, TTL, MOS Logic Families, parameters and their comparison, transistor logic, interfacing of logic families, Integrated transistor, FET and MOS as switches, switching speed of integrated diode, transistor, FET devices, comparison between TTL and DTL,multi emitter transistor, Characteristics of TTL with Shottkey devices, transfer characteristics of ECL, Fan in and Fan out speed of operation, logic versatility of ECL gates, temperature compensated bias MOS, CMOS and their transfer characteristics, MOS invertors, CMOS inverter, rise and fall time inCMOS gates, interfacing BIT and CMOS gates.

Reference Books

1. Micro Electronics :Jacob Millman (ISE)
2. Integrated Circuits:Botkar (Khanna)
3. Applications of linear Integrated circuits :Clayton
4. Microwave Design and Circuits :S.L. Liao (PHI)
5. Microwaves and Radar :A.K. Maini (Khanna)
6. Tobbey; OP- Amps their design and Application
7. Gaikward RA; OP- Amp and linear Integreted circuits; PHI
8. Salivahanan; Linear Integrated Circuits; TMH
9. Kennedy J; Principles ofcommunications; TMH
10. R.G.Gupta; Audio and Video System; TMH
11. Linear Integrated Circuits :D. Raychowdhary and Shail Jain

    Introduction to System Design using Integrated ckt: B.S. Sonde (New Age Pub.).

List of Experiments:-

1. Char. of Op-Amp (input offset voltage, slew rate CMRR, BW, Input bias current)
2. Linear application of OP-Amp (voltage follower, inviting and non-inverting amplifier and their frequency response adder subtractor differential amplifier, integrator and differential frequency response)
3. Study of Op-Amp as a comparator
4. Design of Schmitt trigger
5. Design of monoastable & astable multivibrator
6. To construct and plot frequency response of low & high pass filter

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Semester-V

ENERGY CONSERVATION AND MANAGEMENT (BTEX-0501)

Paper code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+ g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-501	ENERGY CONSERVATION AND MANAGEMENT	3	1	-	4	80	25	20	100	_	_	_	_	100	3 hrs.

UNIT- I **Marks : 16**

General energy problem: Energy use patterns and scope for conservation. Energy audit: Energy monitoring, Energy accounting and analysis, Auditing and targeting. Energy conservation policy, Energy management & audit, Energy audit, Types of energy audit, energy management (audit), qualities and function of energy managers, language of an energy manager, Questionnaire, Check list for top management, Loss of energy in material flow, energy performance, Maximizing system efficiency, Optimizing, input energy requirements, Energy auditing instruments, Material load energy balance diagram.

UNIT- II **Marks : 16**

Thermodynamics of Energy Conservation. Basic principle. Irreversibility and second law efficiency analysis of systems. Primary energy sources, optimum use of prime-movers, energy efficient housekeeping, energy recovery in thermal systems, waste heat recovery techniques, thermal insulation. Thermal energy audit in heating, ventilation and air conditioning. Maintenance and Energy audit – friction, lubrication and tribo-logical innovations. Predictive and preventive maintenance.

UNIT- III **Marks : 16**

Load curve analysis & load management DSM, Energy storage for power systems (Mechanical, Thermal, Electrical & Magnetic) Restructuring of electric tariff from energy conservation consideration, Economic analysis depreciation method, time value of money, Evaluation method of projects, replacement analysis, special problems inflation risk analysis. Payback period, Energy economics, Cost Benefit Risk analysis, Payback period.

UNIT- IV **Marks : 16**

Energy efficient electric drives, Energy efficient motors V.S.D. power factor improvement in power system. Energy Conservation in transportation system especially in electric vehicle. Energy flow networks, Simulation & modeling, formulation & Objective & constraints, alternative option, Matrixchart.

UNIT- V **Marks : 16**

Energy conservation task before industry, Energy conservation equipments, Co-Generation, Energy conservation process, Industry Sugar, Textiles, Cement Industry etc Electrical Energy Conservation in building, heating and lighting. Domestic gadgets.

Reference Books

1. Energy Management Principles- Craig B. Smith, Pergamon Press.
2. Energy Conservation- Paul O Callagan- Pergamon Press.
3. Design & Management of energy conservation. Callaghan.
4. Elect, Energy Utilization & Conservation. Dr. Tripathi S.C.
5. Energy Management – W.R. Murphy & G. Mckey Butler worths.
6. Energy Management Head

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ELECTRICAL MACHINE-II (BTEX-0502)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Durati on of Exam
						Theory				Practical					
		L	T	P	C	Max (a)	Min (b)	MST (c)	Total (d = a+c)	Max (e)	Min (f)	TW (g)	Total (h= e+g)		
BTE X-0502	ELECTRICAL MACHINE-II	3	1	2	6	80	25	20	100	50	15	50	100	200	3 hrs.

UNIT- I **Marks : 16**

D.C. Machine-I

Basic construction of DC machines; types of DC machines and method of excitation; lap and wave windings; Emf equation; armature reaction and methods of limiting armature reaction; Commutation process and methods for improving commutation; Basic performance of DC generators and their performance characteristics; Metadyne and Amplidyne.

UNIT- II **Marks : 16**

D.C. Machine-II

Basic operation of DC motors; Torque equation; Operating characteristics of DC motors, Starting of DC motors, speed control of DC motors; losses and efficiency of DC machines; testing of DC machines, Swinburne's test and Hopkinson's test.

UNIT- III **Marks : 16**

Synchronous Machine-I

Construction, excitation system including brushless excitation; polyphase distributive winding, emf equation, generation of harmonics and their elimination; armature reaction; synchronous reactance and impedance, equivalent circuit of alternator, relation between generated voltage and terminal voltage, voltage regulation of alternators using synchronous impedance, zpf

UNIT- IV **Marks : 16**

Synchronous Machine-II

Salient pole machines; two reaction theory equivalent circuit model and phasor diagram; determination of Xd and Xq by slip test; regulation of salient pole alternator, power angle equation and characteristics; synchronizing of alternator with infinite busbar,; parallel operation and load sharing; synchronizing power and synchronizing torque coefficient; synchroscopes and phase sequence indicator.

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UNIT- V **Marks : 16**

Synchronous machineIII

Synchronous motor operation, starting and stopping of synchronous motor, pull in torque, motor under load power and torque, reluctance torque, effect of excitation, effect of armature reaction, power factor adjustment, V curves, inverted V curves, synchronous motors as power factor correcting device, hunting and damper winding efficiency and losses. Analysis of short circuit oscillogram, determination of various transient, sub transient and steady reactances and time constants, equivalent circuit. Single phase synchronous motors- hysteresis motor, reluctance motor. Repulsion motor, stepper motor.

Reference Books

1. P.S. Bhimbra, Electrical Machinery, Khanna Pub.
2. P.S. Bhimbra, Generalized theory of Electrical Machines, Khanna publishers,Delhi
3. AshfaqHusain, Electric Machines, Dhanpat Rai, New Delhi
4. I.J. Nagrath & D.P. Kothari, Electric Machines, Tata McGraw Hill , New Delhi
5. Syed A. Nasar,Electric Machines & Power Systems, Volume I , Tata McGraw Hill,New Delhi
6. A. E. Fitzerald, C. Kingsley & S.D. Umans , Electric Machinery Tata McGraw Hill ,New Delhi,5th Edition.
7. M.G. Say,Performance & design of AC machines, CBS publishers & distributors,Delhi, 3rd edition
8. A.E. Clayton & N.N. Nancock, The Performance & design of DC machines CBS publications & distributors, Delhi, 3rd edition

List of Experiments:-

1. To plot magnetisation characteristic of a separately excited DC generator.
2. To perform load test on DC generators.
3. To perform load test on DC series and shunt motor
4. To perform Swinburn's test on a DC machine and find out its efficiency under full load condition.
5. To conduct Hopkinson's test on a pair of DC shunt machine.
6. To perform OCC and SCC test on an alternator and determine its regulation.
7. To determine regulation of alternator using mmf and zpf methods.
8. To synchronise alternator with infinite bus bar.
9. To plot V and inverted V curves for a synchronous motor
10. To find X_d & X_q of salient pole synchronous machine by slip test.
11. To determine negative sequence and zero sequence reactance of an alternator.
12. To determine subtransient direct axis and quadrature axis synchronous reactances of salient pole machine.

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POWER SYSTEM-I (BTEX-0503)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0503	POWER SYSTEM-I	3	1	2	6	80	25	20	100	50	15	50	100	200	3 hrs.

UNIT-I **Marks : 16**

Transmission Systems: Various systems of transmission & their comparison, HVDC transmission Converter, inverter, filters & substation layout. Voltage and Reactive Power control.

UNIT-II **Marks : 16**

Distribution Systems: Primary and secondary distribution systems, concentrated & uniformly distributed loads on distributors fed at one and both ends, ring distribution, sub mains and tapered mains, voltage drop and power loss calculations, voltage regulators, Feeders Kelvin's law and modified Kelvin's law for feeder conductor size and its limitations.

UNIT-III **Marks : 16**

Overhead Transmission Lines: Types of Conductors, Line Parameters: calculation of inductance and capacitance of single and double circuit transmission lines, three phase lines with stranded and bundle conductors, Generalized ABCD constants and equivalent circuits of short, medium & long lines. Line Performance: circle diagram, regulation and efficiency of short, medium and long lines, Series and shunt compensation, FACTS.

UNIT-IV **Marks : 16**

Overhead Line Insulators: Types, string efficiency, grading ring, preventive maintenance. Mechanical Design of Transmission Lines: Different types of tower, sag-tension calculations, sag template, string charts, vibration dampers, line supports, spacing of conductors and grounds. Corona losses, radio & audio noise, transmission line - communication line interference

UNIT-V **Marks : 16**

Cables: Classification, Construction and characteristic of different types. Insulation resistance and capacitance, grading (capacitance and inter sheath), laying, jointing and splicing of cables. Phenomenon of dielectric losses, dielectric stress and sheath loss in cables.

Reference Books

1. Central Electricity Generating Board; “Modem Power System Practice”, Vol 1-8,Pergamon Oxfd
2. James J. Burke,” Power Distribution Engineering: Fundamentals & Applications”; Marcel Dekker
3. Westinghouse Electric Corp; Electric Transmission & Distribution Reference Book; East Pittsbrg
4. Wadhwa CL; ”Electric Power Systems”; Wiley Eastern Limited.
5. Ashfaq Hussain; ”Electrical Power System
6. Gupta BR; ”Power System Analysis and Design”
7. Ray “ Electrical Power System:Concepts, Theory and practice”, PHI
8. Nagrath IJ and Kothari DP;“Power System Engineering”, Tata McGraw Hill
9. John S. Grainger and W. D. Stevenson Jr.,” Power System Analysis”, McGraw Hill.
10. Deshpande MV; “Electric Power System Design”, TMH.

List of Experiments:-

1. To study the Thermal Power Station.
2. To study the Hydro Power Station.
3. To study the Nuclear Power Station.
4. To study & draw Towers used in Transmission lines.
5. To study & draw the different types of insulator.
6. To study & design Electrical Power Transmission line.
7. Determination of Transmission Parameters of a transmission line.

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CONTROL SYSTEM (BTEX-0504)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0504	CONTROL SYSTEM	3	1	2	6	80	25	20	100	50	15	50	100	200	3 hrs.

UNIT-I **Marks : 16**

Modeling of dynamic systems: Electrical, Mechanical and hydraulic systems, Concept of transfer function, Open and closed loop systems, Signal flow graph, Mason's formula, Components of control systems: Error detectors (Synchros & Potentiometer), Servomotors (AC &DC), techo generators, power amplifier, steeper motors.

UNIT-II **Marks : 16**

Time – domain analysis of closed loop systems: Test signals, time response of first and second order systems, Time domain performance specifications, Steady state error & error constants Feedback control actions: Proportional, derivative and integral control ,state space representation ,controllability , observability

UNIT-III **Marks : 16**

Solution of state equation: Eigen values & eigenvectors digitalization state transitive matrix, stability Routh-Hurwit stability analysis. Characteristics equation of closed loop system root loci, construction of loci, Effect of adding,

UNIT-IV **Marks : 16**

Frequency, Domain analysis, Bode plots, Effect of adding, poles and Zeros, Polar plot, Nyquist stability analysis, Relative stability : Gain and phase margins.

UNIT-V **Marks : 16**

Frequency- Domain compensation : lead, lag, Lag-lead compensation, Design of compensatingnetworks.

Reference Books

1. I.J. Nagrath and M. Gopal, "Control system Engineering", New Age International.
2. Modern Control Systems by Roy Chaudhary. PHI
3. K. Ogata, Modern Control Engineering, PHI.
4. B.C. Kuo, Automatic Control systems, PHI
5. Gopal M., Control System : Principles & Design, TMH.
6. Stefani, Shahian, Savant, Hostettler, “Designof feedback control System’s”, Oxford.

List of Experiments:-

1. Time response of second order system.
2. Characteristics of Synchros.
3. Effect of feedback on servomotors.
4. Determination of transfer function of A-C servomotor
5. Determination of transfer function of D-C motor.
6. Formulation of PI & PD controller and study of closed loop responses of 1^{st} and 2^{nd} order dynamic systems.
7. State space model for classical transfer function using MATLAB.
8. Simulation of transfer function using operational amplifier.
9. Design problem: Compensating Networks of lead and lag.
10. Temperature controller using PID.
11. Transfer function of a DC generator.
12. Characteristics of AC servomotor.
13. Use of MATLAB for root loci and Bode plots of type-1, type-2 systems.
14. Study of analog computer and simulation of 1^{st} order and 2^{nd} order dynamic equations.
15. Formulation of proportional control on 1^{st} order and 2^{nd} order dynamic systems.
16. Feed back control of 3^{rd} order dynamic Systems
17. Study of lead and lag compensating networks.
18. Effect of adding poles & zeros on root loci and bode plots of type-1, type-2 systems through MATLAB

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MICROPROCESSORS AND MICROCONTROLLERS (BTEX-0505)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0505	MICROPROCESSORS AND MICROCONTROLLERS	3	1	2	6	80	25	20	100	50	15	50	100	200	3 hrs.

UNIT- I **Marks : 16**

Introduction to microprocessors and microcomputer, architecture of 8086, Pin Configuration, interrupts, minimum mode and maximum mode, Memory segmentation, Comparative study of Salient features of 8086, 80286 and 80386.

UNIT- II **Marks : 16**

Instruction set of 8086, Addressing mode, Assembler directives & operations, assembly and machine language programming, subroutine call and returns, Concept of stack, Stack structure of 8086, timings and delays.

UNIT- III **Marks : 16**

Architecture and modes of operation- PPI 8255, Programmable interval timer 8254, USART 8251, DMA controller (8257) Architecture.

UNIT- IV **Marks : 16**

Mode, instruction set of 8051 and Intel family of 8 bit microcontrollers, Architecture of 8051, Pin description, I/O configuration, interrupts, Memory organization, Addressing programming.

UNIT- V **Marks : 16**

8051 interfacing to ADC and DAC, Stepper motor interfacing, Timer/ counter functions, 8051 based thyristers firing circuit, 8051 connections to RS-232, 8051 Serial communication , Serial communication modes, Serial communication programming.

Reference Books

1. Kenneth J. Ayala**,** The 8086 microprocessor: programming and interfacing the PC,Indian - edition , CENGAGE Learning.

2. Muhammad Ali Mazidi and Janice Gillespie Mazidi, The 8051 Microcontroller and Embedded Systems,Pearson education, 2005.
3. Kenneth J. Ayala**,** The 8051 Microcontroller Architecture, III edition, CENGAGE Learning.
4. V.Udayashankara and M.S.Mallikarjunaswamy, 8051 Microcontroller Hardware,Software & Applications, McGraw – Hill, 2009.

List of Experiments:-

A. Introduction

1. Introduction to 8086 & 8051 kit, hardware features & modes of operation.
2. Technique of programming & basic commands of kit.
3. Instruction set of 8086 & 8051.

B. Assembly language programming of 8086 & 8051.

1. Write a program to add two 8-bit numbers.
2. Write a program to add two 16-bit numbers.
3. Write a program for 8-bit decimal subtraction.
4. Write a program to find 1's complement and then 2's complement of a 16-bit numbers.
5. Write a program to find larger of two numbers.
6. Write a program to shift an 8-bit number left by 2-bits.
7. Write a program to multiply two 16-bit numbers.
8. Write a program for factorial of given number by recursion.
9. Write a program to square of an 8-bit number.
10. Write a program to generate a square wave of 2 KHz Frequency on input pin

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Semester-VI

ELECTROMAGNETIC THEORY (BTEX-0601)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0601	ELECTROMAGNETIC THEORY	3	1	-	4	80	25	20	100	-	-	-	100	100	3 hrs.

UNIT- I **Marks : 16**

Cartesian, cylindrical & spherical co-ordinate systems, scalar & vector fields, gradient, divergence & curl of a vector field, Divergence theorem & Stokes's theorem, concept of vectors. Electrostatic Fields – Coulomb's law, electric field intensity due to different charge distribution viz. line charge, sheet charge, Field due to continuous volume, Gauss law, applications of Gauss law, Gauss law in point form.

UNIT- II **Marks : 16**

Laplace's & Poisson's equations, solution of Laplace's equation, Electric dipole, dipole moment, potential & electric field intensity due to dipole, Behavior of conductors in an electric field. polarization, Boundary value conditions for electric Field, Capacitance & Capacitances of various types of capacitors, Energy stored and energy density in static electric field, Current density, conduction & convection current density ohms law in point form, Equation of continuity.

UNIT- III **Marks : 16**

Static Magnetic Field, Biot-Savart's law, Magnetic Field intensity due to straight current carrying filament, circular, square and solenoidal current carrying wire, Relationship between magnetic flux, flux density & magnetic Field intensity; Ampere's circuital law and its applications, Ampere's circuital law in point form, Magnetic force, Lorentz Force on straight and long current carrying conductors in magnetic field, force between two long & parallel current carrying conductors. Magnetic Boundary conditions.

UNIT- IV **Marks : 16**

Scalar magnetic potential and its limitations, Vector magnetic potential and its properties, vector magnetic potential due to different simple configurations; determination of self & mutual inductances, self inductance of solenoid, toroid coils, mutual inductance between a straight long wire & a square loop. Faraday's Law, transformer & motional EMFs, Displacement current, Maxwell's equations as Generalization of circuit equations, Maxwell's equations in differential & integral form.

UNIT- V **Marks : 16**

Electro Magnetic Waves : Uniform plane wave in time domain in free space, Sinusoid ally time varying uniform plane wave in free space Uniform plane wave in dielectrics and conductors, Pointing Vector theorem, instantaneous, average and complex poynting vector, power loss in a plane conductor, energy storage, Polarization of waves, surface impedance, transmission line analogy.

Reference Books

1. William H. Hayt; EngineeringElectromagnetic; TMH.
2. John D. Kraus; Electromagnetic; TMH.
3. Jordan Balmian; Electromagnetic wave & Radiating System; PHI.
4. David K. Cheng; Fields and Wave Electromagnetic; Addison Wesley.
5. S.P. Seth; Electromagnetic Field ;Dhanpat Rai & Sons
   Note: Field plotting of electromagnetic systems on a PC using standard softwares. Application for low and high frequency devices. Suggested softwares, GEMINI(Infolytica), ANSYS, ANSOFT, NISA
6. Mathew N.O Sadiku; Elements of Electromagnetic; Oxford.
7. P.V. Gupta; Electromagnetic Fields; Dhanpat Rai.
8. N.N. Rao; Element of Engineering Electromagnetic; PHI.
9. Mathew N.O Sadiku; Elements of Electromagnetic; Oxford.
10. P.V. Gupta; Electromagnetic Fields; Dhanpat Rai.
11. N.N. Rao; Element of Engineering Electromagnetic; PHI.

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INDUSTRIAL ELECTRONICS (BTEX-0602)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0602	INDUSTRIAL ELECTRONICS	3	1	2	6	80	25	20	100	50	15	50	100	200	3 hrs.

UNIT- I **Marks : 16**

Power Supplies: Power supply, rectifiers (half wave, full wave), performance parameters of power supplies, filters (capacitor, inductor, inductor-capacitor, pi filter), bleeder resistor, voltage multipliers. Regulated power supplies (series and shunt voltage regulators, fixed and adjustable voltage regulators, current regulator), switched regulator (SMPS), comparison of linear and switched power supply, switch mode converter (flyback, buck, boost, buk-boost, cuk converters).

UNIT- II **Marks : 16**

Thyristers: Silicon controlled rectifies (SCR), constructional features, principle of operation, SCR terminology, turn-on methods, turn-off methods, triggering methods of SCR circuits, types of commutation, comparison of thyristers and transistors, thermal characteristics of SCR, causes of damage to SCR, SCR overvoltage protection circuit, series and parallel operation of sCRs, Line commutated converters (half wave rectifier with inductive and resistive load, single phase and three phase full wave rectifiers).

UNIT- III **Marks : 16**

Other members of SCR family: Triacs, Diacs, Quadracs, recovery characteristics, fast recovery diodes, power diodes, power transistor, power MOSFET, Insulated gate bipolar transistor (IGBT), loss of power in semiconductor devices, comparison between power MOSFET, power transistor and power IGBT.

UNIT- IV **Marks : 16**

Applications of OP-AMP: Basics of OP-AMP, relaxation oscillator, window comparator, Op-comp as rectangular to triangular pulse converter and vice- versa, Wien bridge oscillator, function generator, frequency response of OP-AMP, simplified circuit diagram of OP-AMP, power supplies using OP-AMP, filters (low-pass, high pass) using OP-AMP.

UNIT- V **Marks : 16**

Programmable Logic Controller (PLC): Functions, applications, advantages and disadvantages of PLC over conventional relay controllers, comparison of PLC with process control computer system, factors to be considered in selecting PLC, functional block diagram of PLC, microprocessor in PLC, memory, input and output modules (interface cards), sequence of operations in a PLC, status of PLC, event driven device, ladder logic language, simple process control applications of PLC, Programming examples.

Reference Books

1. Singh and Khanchandani: Power Electronics, TMH
2. Bhimbra: Power Electronics, Khanna Publishers
3. Moorthi: Power Electronics, Oxford University Press.
4. Webb: Programmable Logic Controllers- Principles and Applications, PHI Learning.
5. Petruzulla: Programmable Logic Controllers, TMH.
6. Bishwanath Paul: Industrial Electronics and control, PHI Learning.
7. Rashid: Power Electronics- Circuits, devices and applications, Pearson Education.

List of Experiments:-

1. Study the relaxation oscillator using Op-Amp.
2. Study of Op-Amp as a comparator.
3. Study the V-I characteristics of half wave rectifier with inductive and resistive load .
4. Study of SMPS.
5. Study the V-I characteristics of Diacs.
6. Study the V-I characteristics of Triacs.
7. Study the V-I characteristics of SCR.

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POWER SYSTEM-II (BTEX-0603)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0603	POWER SYSTEM-II	3	1	2	6	80	25	20	100	50	15	50	100	200	3 hrs.

UNIT- I **Marks : 16**

General - Problems associated with modern interconnected power Systems, deregulation, power systems restructuring, distributed generation, congestion, available transfer capacities, pricing of energy and transmission services.

UNIT- II **Marks : 16**

Power flow studies - Formulation of static power flow equations and solutions using Gauss-Seidel, Newton Raphson and FDLF methods, comparison of these methods, Economic operation of power system - Economic dispatch, Emission dispatch, line loss, ITL.

UNIT- III **Marks : 16**

Coherency, control area, modeling of speed control mechanism, load damping, block diagrammatic representation of single and two area interconnected system, static and dynamic response, block diagram representation of voltage regulators.

UNIT- IV **Marks : 16**

Difference in control strategy over MW - f control, characteristics of an excitation system, DC AC and static excitation system

UNIT- V **Marks : 16**

Steady state, dynamic and transients stability, Swing equation ,equal area criterion, solution of swing equation using step by step method modified of improving transient stability.

Reference Books

1. Reactive power Control in Electric Systems-by T.J.E. Miller, John Wiley & Sons.
2. Electrical Power Systems-by C.L. Wadhwa New Age International (P) Limited Publishers,2nd edition 1998.Elgerd O.I.,
3. Electric Energy Systems Theory", TMH, New Delhi, Second Edition 1983.
4. Prabha Kundur, "Power system stability and control", Mc-Graw Hill Inc, New York, 1993.
5. Taylor C.W., "Power System Voltage Stability", Mc-Graw Hill Inc, New York, 1993.
6. Nagrath IJ, Kothari D.P., "Power System Engineering", Tata Mc-Graw Hills, New Delhi1994.
7. Weedy B.M. "Electric Power System" John Wiley and Sons, 3rd edition.
8. P.S.R. Murthy, "Power System Operation and Control", B S Publ-ication
9. Power Generation, Operation and Control by A.J. wood and B.F. Wollenberg John Wiley & Sons Inc. 1984.
10. Modern Power System Analysis-by I.J. Nagrath & D.P. Kothari Tata Mc Graw – Hill Publication Company Ltd 2nd edition.
11. A Chakrawarti Power System Analysis:Operation and Control PHI Learning 3rd edition

List of Experiments:-

1. To develop a program in Matlab for information of Y-bus matrix for N bus system.
2. Load flow solution for 3-bus system using Gauss- Seidel, Newton Raphson and FDLF Methods up to 3 iteration.
3. Load flow solution for 6-bus and 30-bus system in Matlab using Newton
4. Raphson method.
5. Assessment of transient stability of a single machine system.
6. Effect of compensation on voltage profile of 6-bus system.
7. Study of any software tools (PSCAD, EDSA, Mi POWER, ETAP et

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SWITCHGEAR & PROTECTION(BTEX0604)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0604	SWITCHGEAR & PROTECTION	3	1	2	6	80	25	20	100	50	15	50	100	200	3 hrs.

UNIT- I

Marks : 16

Protective Relay

Requirement of relays, Primary & backup protection, Desirable qualities of relays, Concept of Pickup, reset & drop-off, Drop off/ Pickup ratio, inverse time & definite time charters tics, Attracted armature, Balanced Beam, Induction disc, Induction cup, Moving coil & moving Iron, Rectifier , Thermal,Pilot & negativesequence, Over current, Over Voltage, Directional, Differential and Distance relays, R-X diagram, Impedance mho & reactance relay.Introduction of static analog & digital relays, Classification of static relays.

UNIT- II

Circuit Breakers **Marks : 16**

Elementary principle of arc quenching, recovery & re-striking voltage, arc quenching devices, description and operation of Bulk oil, Minimum oil, Air break, Air blast, SF6, Vacuum circuit breakers and DC circuit breakers, their comparative merits, LT Switch gear, HRC fuses, currentlimiting reactor.& their design features, Testing of circuit breaker.

UNIT- III

Fault Analysis **Marks : 16**

Fault Analysis per unit, representation and its advantages, Single line and equivalent impendence diagram representation of power system components. Symmetrical components and its application to power systems, fault analysis, Sequence networks and their interconnection for different types of faults, Effect of fault impedance, Current limiting reactors, its location and application, Short circuit calculation.

UNIT- IV

System Protection **Marks : 16**

Protection of Generators - Earth Fault and Merz Price protection, percentage, differential, Loss of excitation, Prime mover failure, Over current, Turn to turn fault, Negative phase sequence, heating, Reverse power protection schemes,rotor fault protection,stator inter-turn protection

Protection of Transformers

Internal & external fault protection, Differential, Earth fault, Over Current, Overheating, Protection schemes, Protection of transmission lines, Over current, Distance and carrier current protection schemes.

UNIT- V **Marks : 16**

Surge Protection & insulation co-ordination

Switching surges, Phenomena of Lightning, over voltage due to lightning, Protection against lightning, Lightning arrestors, selection of lightning arrestors, Surge absorbers and diverters, Rod gap, Horn gap expulsion type & valve type lightning arrestors, Earthing transformers, Earthwires, Earthing of appliances, insulation co-ordination, Definitions determination of line insulation, insulation level of substation equipment, co-ordination amongst items of substation equipment.

Reference Books

1. CL Wadhwa, Electrical Power systems, New age International.
2. Haddi Saadet, "Power System Analysis, TMH
3. A.R. Bergen, Vijay Vittal, "Power System Analysis, Pearson Education, Asia.
4. Switchgear & protection Sunil S. Rao. Khanna Publication.
5. Ravindra P. Singh, Switchgear & Power System Protection, PHI Learning.
6. B. Ravindran and M Chander, "Power System protection and Switchgear", New Age International.
7. Badrirka, Power System protection and switchgear, TMH.

List of Experiments:-

1. Determination of drop out factor of an instantaneous over current relay.
2. Determination of operating characteristic of IDMT relay.
3. Determination of operating characteristic of differential relay.
4. Study and operation of gas actuated protective relay.
5. Study and operation of static over current relay.
6. Analysis of power system faults (Symmetrical & Asymmetrical) using MATLAB.
7. Study of SF6 circuit breaker
8. Protection simulation study of generator, Transformer, Feeder & Motor protection

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ANALOG & DIGITAL COMMUNICATION (BTEX0605)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0605	ANALOG & DIGITAL COMMUNICATION	3	1	2	6	80	25	20	100	50	15	50	100	200	3 hrs.

UNIT- I **Marks : 16**

Time domain and frequency domain representation of signal, Fourier Transform and its properties, Transform ofGate, Periodic gate, Impulse periodic impulse sine and cosine wave, Concept of energy density and power density (Parseval's theorem), Power density of periodic gate and impulse function, impulse response of a system, convolutions, convolution with impulse function, causal and non causal system impulse response of ideal low pass filter, Correlation & Auto correlation

UNIT- II **Marks : 16**

Base band signal, need of modulation, Introduction of modulations techniques, Amplitude modulation, Equation and its frequency domain representation, Bandwidth, Power distribution. AM suppressed carrier waveform equation and frequency domain representation Generation (Balance/Chopper modulator) and synchronous detection technique, errors in synchronous detection, Introduction to SSB and VSB Transmission Angle modulation, Frequency and phase modulation equation and their relative phase and frequency deviations, modulation index frequency spectrum, NBFM and WBFM, Bandwidth comparison of modulation techniques

UNIT- III **Marks : 16**

Sampling of signal, sampling theorem for low pass and Band pass signal, Pulse amplitude modulation (PAM), Time division, multiplexing (TDM). Channel Bandwidth for PAM-TDM signal Type of sampling instantaneous, Natural and flat top, Aperture effect, Introduction to pulse position and pulse duration modulations, Digital signal, Quantization, Quantization error, Pulse code modulation, signal to noise ratio, Companding, Data rate and Baud rate, Bit rate, multiplexed PCM signal, Differential PCM (DPCM), Delta Modulation (DM) andAdaptive Delta Modulation (ADM), comparison of various systems

UNIT- IV **Marks : 16**

Digital modulations techniques, Generation, detection, equation and Bandwidth of amplitude shift keying (ASK) Binary Phase Shift keying (BPSK), Differential phase shift keying (DPSK), offset and non offset quadrature phase shift keying (QPSK), M-Ary PSK, Binary frequency Shift Keying (BFSK), M-Ary FSK Quadrature Amplitude modulation (QAM), MODEM, Introduction to probability of error.

UNIT- V **Marks : 16**

Information theory and coding- Information, entropies (Marginal and conditional), Model of a communication system, Mathematical representation of source, channel and receiver characteristics, Mutual information, channel capacity efficiency of noise free channel Binary symmetric channel (BSC) Binary erasure channel (BEC), Repetition of signal, NM symmetric Binary channel, Shannon theorem, Shanon-Hartley theorem (S/N-BW trade off)Source encoding code properties; Shanon, Fano and Huffman coding methods and their efficiency error control coding, Minimum Hamming distance, Linear Block Code, Cyclic code and convolution codes. Line Encoding: Manchester coding, RZ, NRZ coding.

Reference Books

1. Singh & Sapre, Communication System, TMH
2. Taub & shilling, Communication System, TMH
3. Hsu; Analog and digital communication; TMH
4. B.P. Lathi, Modern Digital and analog communication system,
5. Simon Haykins, Communication System. John Willy
6. Wayne Tomasi, Electronic Communication system.
7. Martin S. Roden, Analog & Digital Communication System; Discovery Press.
8. Frank R. Dungan, Electronic Communication System, Thomson/Vikas.

List of Experiments:-

1. Study of sampling process and signal reconstruction and aliasing.
2. Study of PAM PPM and PDM
3. Study of PCM transmitter and receiver.
4. Time division multiplexing (TDM) and De multiplexing
5. Study of ASK PSK and FSK transmitter and receiver.
6. Study of AM modulation and Demodulation techniques (Transmitter and Receiver) Calculate of parameters
7. Study of FM modulation and demodulation (Transmitter and Receiver) & Calculation of parameters
8. To construct and verify pre emphasis and de-emphasis and plot the wave forms.
9. Study of super heterodyne receiver and characteristics of ratio radio receiver.
10. To construct frequency multiplier circuit and to observe the waveform
11. Study of AVC and AFC

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Semester-VII

POWER QUALITY (BTEX-0701)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0701	POWER QUALITY	3	1	-	4	80	25	20	100	-	-	-	3	100	3 hrs.

UNIT- I **Marks : 16**

Introduction, power quality -voltage quality, power quality evaluations procedures term and definition: General classes of power quality problem, causes & effect of power quality disturbances.

UNIT- II **Marks : 16**

Voltage sags and interruption: sources of sags and interruption, estimating voltages sag performance, fundamental principles of of protection, monitoring sags

UNIT- III **Marks : 16**

Transients over voltages: sources of transient over voltages, principles of over voltages protection, utility capacitor switching transients, fundamentals of harmonics and harmonics distortion, harmonics sources from commercial load and from industrial loads

UNIT- IV **Marks : 16**

Applied harmonics : harmonics distortion evalutions, principles for controlling harmonics, harmonics studies devices for controlling harmonic distortion, filters, passive input filter standards of harmonics

UNIT- V **Marks : 16**

Electro-magnetic compatibility, constant frequency control, constant tolerance band control, variable tolerance band control, discontinuous current control.

Reference Books

1. Power Quality- by R.C. Duggan
2. Power System harmonics –by A.J. Arrillga
3. Power electronic converter harmonics –by Derek A. Paice

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DIGITAL SIGNAL PROCESSING (BTEX -0702)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0702	DIGITAL SIGNAL PROCESSING	3	1	-	4	80	25	20	100	-	-	-	3	100	3 hrs.

UNIT- I **Marks : 16**

Introduction to Digital Signal Processing, Discrete time signals & systems, linear shift invariant systems, stability and causality, Linear-constant coefficient difference equations, Frequency domain representation of discrete time signals and systems, properties of the Discrete Time Fourier transform (DTFT), Sampling and discrete time processing of continuous-time signals.

UNIT- II **Marks : 16**

Applications of z-transforms, solution of difference equations of digital filters, System function, stability criterion, frequency response of stable systems, and one sided Z-transform and its applications.

UNIT- III **Marks : 16**

Discrete Fourier series: Properties of discrete Fourier series, DFS representation of periodic sequences. Discrete Fourier Transforms: Properties of DFT: Fast Fourier Transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms. Inverse FFT.

UNIT- IV **Marks : 16**

IIR DIGITAL FILTERS: Analog filter approximations - Butterworth and Chebyshev, Design of IIR Digital filters from analog filters, Bilinear transformation method, step & impulse invariance techniques, Spectral Transformations, Realization of IIR digital filters - direct, canonic, cascade & parallel forms.

UNIT- V **Marks : 16**

FIR DIGITAL FILTERS: Characteristics of FIR Digital Filters frequency response, Design of FIR Digital Filters using Window Techniques. Comparison of IIR and FIR filters, Realization of FIR digital filters - direct, linear phase, cascade & parallel forms.

Reference Books

1. John G. Proakis Digital Signal Processing: Principles, Algorithms, And Applications,
2. Ludeman Fundamental of Digital Signal Processing, wiley india
   A. Antoniou, Digital Filters Analysis & Design, TMH
3. Anand Kumar Digital Signal Processing ,PHI
4. S.K. Mitra, Digital Signal Processing, TMH
5. Oppenheim & Schaffer, Digital Signal Processing, PHI.
6. J Cavacchi Digital Signal Processing Wiley India

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ELECTRICAL DRIVES (BTEX-0703)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0703	ELECTRICAL DRIVES	3	1	2	6	80	25	20	100	50	15	50	100	200	3 hrs.

UNIT- I **Marks : 16**

Control of D.C. motors by converters:- Introduction to Thyristers Controlled Drives, single phase semi and fully controlled converters and three semi and fully controlled converters connected to d.c. separately excited and d.c. series motors-continuous current operation, Output voltage and current waveforms, Speed and Torque expression, Speed-Torque Characteristics, Problems on converter fed d.c. motors.

UNIT- II **Marks : 16**

Four quadrant operation of D.C. Drives.: Introduction to Four quadrant operation, Motoring operations, Electric braking, Plugging, dynamic and regenerative braking operations. Four quadrant operation of D.C. motor by Dual converters-Closed loop operation of DC motor (Block diagram only) Control of D.C. Motors by Choppers:-Single quadrant, Two-quadrant and four quadrant chopper fed d.c. separately excited and series excited motors, Continuous current operation, Output voltage and current waveforms-Speed torques expressions-Speed torque characteristics, Problems on Chopper fed d.c. motors, Closed loop operation (Block diagram only)

UNIT- III **Marks : 16**

Control of Induction Motors on stator side:-Control of Induction Motor by AC Voltage controllers- Waveforms, Speed torque characteristics, Variable frequency control of induction motor by Voltage Source, Current Source inverters and cycloconverters, PWM control Comparison of VSI & CSI operations, Speed- torque Characteristics, Numerical problems on induction motor drives, Closed loop operation of induction motor drives. (Block diagram only)

UNIT- IV **Marks : 16**

Control of Induction Motors from rotor side:-Static rotor resistance control, Slip power recovery static Scherbius Drive, Static Kramer Drive, Their performance and speed torque characteristics advantages-application-problems.

UNIT- V **Marks : 16**

Control of Synchronous Motors:- Separate control & Self control of synchronous motors, Operation of self controlled synchronous motors by VSI, CSI and Cycloconverters. Load commutated CSI fed Synchronous motor, Operation, Waveform, Speed torque Characteristics, Application, Advantage, Numerical problems, Closed loop operation of synchronous motors drives. (Block diagram only)

Reference Books

1. S.B. Dewan, G.R. Slemon, A. Straughen "Power semiconductor Controlled Drives.
2. B.K. Bose "Power Electronic control of AC Drives". PHI Learning.
3. Ned Mohan Electrical Drive Wiley India.
4. V. Subramanyam "Thyristor control of Electric Drive" Tata Mc Graw Hill Pub.
5. N.K. De , P.K. Sen "" PHI Electric Drives.
6. G.K. Dubey "Fundamentals of Electrical Drives"-. Narosa Publications.
7. Gopal K. Dubey "Power semiconductor Controlled Drives"- PHI.

List of Experiments:-

1. Fed D.C. separately excited motor.
2. Study the braking in d.c drive.
3. Study the braking in a.c drive. Study of single phase semi fully controlled converters connected to D.C. separately excited D.C. motor.
4. Study of Three phase fully controlled converters connected to D.C. separately excited D.C. motor.
5. Study of Four quadrant operation of D.C. Drives.
6. Study the Closed loop operation of synchronous motors drives.
7. Study the Variable frequency control of induction motor.
8. Study the four quadrant chopper.

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RELIABILITY ENGINEERING (BTEX 0704(A))

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX - 0704(A)	Reliability Engineering	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs.

UNIT- I **Marks : 16**

Introduction to reliability and indices. Review of probality theory. Density and distribution function of continuous and discrete random variable.

UNIT- II **Marks : 16**

Component reliability, hazard function, failure laws, exponential failure law, wears in period and its importance. Safety and reliability, replacement, methods of reliability improvement.

UNIT- III **Marks : 16**

Reliability evaluation of series, parallel, and series–parallel network. Complex network reliability evaluation using event, space, decomposition, tie-set, cut-set and, Satand by system and load sharing system, multi state models.

UNIT- IV **Marks : 16**

Markov process, State diagram, Availability and unavailability function. Evaluation of time dependent and limiting state probabilities. MTTF calculation. Concept of frequency and durations. State enumeration method for evaluating failure frequency, MUT, MDT, frequency Balance approach.

UNIT- V **Marks : 16**

Reliability testing, estimation of reliability function, failure function and MTTF from grouped and ungrouped dates, censoring and accelerations, parametric methods.

Reference Books

1. Introduction to reliability engineering –E.E.Lewis, John Wiely and Sons, 1987.
2. Reliability and maintainability engineering, C.E. Ebeling, TMH, 2006.
3. Reliability Engineering : Probability Models and maintanance methods –Joel A.Nochlas,Taylor and Prancis 2005.
4. Reliability evaluation of engineering system: concept and techniques-R. Billinton, R.N.Allon, Pitman, 1984.

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EHV A.C. AND D.C. TRANSMISSION (BTEX0704(B))

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0704(B)	EHV A.C. AND D.C. TRANSMISSION	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs.

UNIT- I **Marks : 16**

Constitution of EHV a.c. and d.c. links, Kind of d.c. links, Limitations and Advantages of a.c. and d.c. transmission, Principal application of a.c. and d.c. transmission, Trends in EHV a.c. and d.c. transmission, Power handling capacity. Converter analysis garetz circuit, firing angle control, is overlapping.

UNIT- II **Marks : 16**

FACTS devices, basic types of controller, series controller, static synchronous series compensator(SSSC), thyristor-controlled series capacitor(TCSC), thyristor controlled series reactor(TCSR), shunt controller (STATCOM), static VAR compensator(SVC), series series controller, combined series-shunt controller, unified power flow controller (UPFC), thyristor controlled phase shifting transformer(TCPST).

UNIT- III **Marks : 16**

Components of EHV D.C. system, converter circuits, rectifier and inverter valves, Reactive power requirements, harmonics generation, adverse effects, Classification, Remedial measures to suppress, filters, Ground return. Converter faults & protection harmonics mis operation, Commutation failure, Multi terminal D.C. lines.

UNIT- IV **Marks : 16**

Control of EHV D.C. system desired features of control, control characteristics, Constant current control, and Constant extinction angle control. Ignition Angle control. Parallel operation of HVAC & DC system. Problems & advantages.

UNIT- V **Marks : 16**

Travelling waves on transmission systems, their shape, Attenuation and distortion, effect of junction and termination on propagation of traveling waves. Over voltages in transmission system. Lightning, switching and temporary over voltages: Control of lighting and switching over voltages

Reference Books

1. S. Rao,- "EHV AC & DC Transmission" Khanna pub.
2. Kimbark,-" HVDC Transmission" john willy & sons pub.
3. Arrillaga,- "HVDC Transmission"2nd Edition ,IEE londan pub.
4. Padiyar, -"HVDC Transmission" 1st Edition, New age international pub.
5. T.K. Nagsarkar,M.S. Sukhiza, -"Power System Analysis", Oxford University
6. Narain.G. Hingorani, l. Gyugyi-"Undustanding of FACTS concept and technology", john

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SCADA SYSTEMS AND APPLICATIONS (BTEX-0704 (C))

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX - 0704(C)	SCADA SYSTEMS AND APPLICATIONS	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs.

UNIT- I **Marks : 16**

Introduction to SCADA and PLC: SCADA: Data acquisition system, evaluation of SCADA, communication technologies, monitoring and supervisory functions. PLC: Block diagram, programming languages, Ladder diagram, Functional Block diagram, Applications, Interfacing of PLC with SCADA.

UNIT- II **Marks : 16**

SCADA system components: Schemes, Remote Terminal Unit, Intelligent Electronic Devices, Communication Network, SCADA server.

UNIT- III **Marks : 16**

SCADA Architecture-Various SCADA Architectures, advantages and disadvantages of each system, single unified standard architecture IEC 61850 SCADA / HMI Systems.

UNIT- IV **Marks : 16**

SCADA Communication-Various industrial communication technologies- wired and wireless methods and fiber optics, open standard communication protocols.

UNIT- V **Marks : 16**

Operation and control of interconnected power system-Automatic substation control, SCADA configuration, Energy management system, system operating states, system security, state estimation,SCADA applications Utility applications, transmission and distribution sector operation, monitoring analysis and improvement. Industries oil gas and water. Case studies, implementation, simulation exercises.

Reference Books

1. Stuart A Boyer: SCADA supervisory control and data acquisition.
2. Gordan Clark, Deem Reynders, Practical Modem SCADA Protocols.
3. Sunil S. Rao, Switchgear and Protections, Khanna Publication.

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HIGH VOLTAGE ENGINEERING (BTEX-0705(A))

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0705 (A)	High Voltage Engineering	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs.

UNIT- I **Marks : 16**

Introduction:-Introduction to HV technology, advantages of transmitting electrical power at high voltages, need for generating high voltages in laboratory. Important applications of high Voltage.

UNIT- II **Marks : 16**

Breakdown phenomena:- Classification of HV insulating media, Properties of important HV insulating media. Gaseous dielectrics: Ionizations: primary and secondary ionization processes. Criteria for gaseous insulation breakdown based on Townsend's theory, Limitations of Townsend's theory. Streamer's theory breakdown in non uniform fields. Corona discharges. Paschen's law and its significance. Time lags of Breakdown. Breakdown in solid dielectrics: Intrinsic Breakdown, avalanche breakdown, thermal breakdown, and electro mechanic breakdown. Breakdown of liquids dielectric dielectrics: Suspended particle theory, electronic Breakdown, cavity breakdown (bubble's theory), electro Convection breakdown.

UNIT- III **Marks : 16**

Generation of HV AC DC and Impulse Voltage and current: - HV AC-HV transformer; Need for cascade connection and working of transformers units connected in cascade, Series resonant circuit- principle of operation and advantages. Tesla coil. HV DC- voltage doublers circuit, cock croft- Walton type high voltage DC set, Introduction to standard lightning and switching impulse voltages. Analysis of single stage impulse generator-expression for Output impulse voltage, multistage impulse generator Components of multistage impulse generator. Triggering of impulse generator by three electrode gap arrangement. Triggering gap and oscillograph time sweep circuits. Generation of switching impulse voltage. Generation of high impulse current.

UNIT- IV **Marks : 16**

Measurement of high voltages: - Electrostatic voltmeter-principle, construction and limitation. Generating voltmeter- Principle, construction. Series resistance micro ammeter for HV DC measurements. Standard sphere gap measurements of HV AC, HV DC, and impulse voltages; Factors affecting the measurements. Potential dividers-resistance dividers capacitance dividers mixed RC potential dividers. Surge current measurement.

UNIT- V **Marks : 16**

High voltage tests on electrical apparatus:-Definitions of technologies, tests on isolators, circuit breakers, cables insulators and transformers.

Reference Books

1. E. Kuffel and W.S. Zaengl, "High voltage engineering fundamentals", 2nd edition, Elsevier, press, 2005.
2. M.S.Naidu and Kamaraju, "High Voltage Engineering", 3rd edition, THM, 2007.
3. L. L. Alston, "High Voltage technology", BSB Publication, 2007.
4. Rakosh Das Begamudre, Extra High voltage AC transmission engineering, Wiley Easternlimited, 1987.
5. Transmission and distribution reference book-Westing House.
6. C.L.Wadhwa, High voltage engineering, New Age International Private limited, 1995.

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DIGITAL IMAGE PROCESSING (BTEX-0705 (B))

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0705 (B)	DIGITAL IMAGE PROCESSING	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs.

UNIT- I **Marks : 16**

Digital Image Processing (DIP):-Introduction, examples of fields that use DIP, fundamental steps in DIP, components of an image processing system. Digital Image Fundamentals: elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels.

UNIT- II **Marks : 16**

Image Transforms:-Two-dimensional (2D) impulse and its shifting properties, 2D continuous Fourier Transform pair, 2D sampling and sampling theorem, 2D Discrete Fourier Transform (DFT), properties of 2D DFT. Other transforms and their properties: Cosine transform, Sine transform, Walsh transform, Hadamard transform, Haar transform, Slant transform, KL transform.

UNIT- III **Marks : 16**

Image Enhancement:-Spatial domain methods: basic intensity transformation functions, fundamentals of spatial filtering, smoothing spatial filters (linear and non-linear), and sharpening spatial filters (unsharp masking and high boost filters), and combined spatial enhancement method. Frequency domain methods: basics of filtering in frequency domain, image smoothing filters (Butterworth and Gaussian low pass filters), image sharpening filters (Butterworth and Gaussian high pass filters), selective filtering.

UNIT- IV **Marks : 16**

Image Restoration:-Image degradation/restoration, noise models, restoration by spatial filtering, noise reduction by frequency domain filtering, linear position invariant degradations, estimation of degradation function, inverse filtering, Wiener filtering, image reconstruction from projection.

UNIT- V **Marks : 16**

Image Compression:-Fundamentals of data compression: basic compression methods: Huffman coding, Golomb coding, LZW coding, Run-Length coding, Symbol based coding. Digital image watermarking, representation and description- minimum perimeter polygons algorithm (MPP).

Reference Books

1. Jain Anil K., “Fundamentals of Digital Image Processing”, PHI Learning
2. Rafael, C. Gonzlez., and Paul, Wintz, “Digital Image Processing”, Addison- Wesley Publishing Company.
3. Sosenfeld, and Kak, A.C., “Digital Image Processing”, Academic Press.
4. William K. Pratt., “Digital Image Processing”, John Wiley and Sons.
5. Tamal Bose Digital signal processing wiley india

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OPTICAL COMMUNICATION (BTEX-0705(C))

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0705 (C)	OPTICAL COMMUNICATION	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs.

UNIT- I **Marks : 16**

Introduction to optical communication principles of light transmission optical fiber modes and configurations, Mode theory for circular wave-guides, Single-mode fibers, Multimode fibers, Numerical aperture, Mode field Diameter, V-number, fiber materials, Fiber fabrication techniques.

UNIT- II **Marks : 16**

Optical sources, LED'S, LASER diodes, Model reflection noise, Power launching and coupling, population inversion, fiber splicing, optical connectors, Photo-detectors, PIN, Avalanche detector, Response time, Avalanche multiplication noise.

UNIT- III **Marks : 16**

Signal degradation in optical fibers, Attenuation losses, Signal distortion in optical wave guides, Material dispersion, Wave guide dispersion, Chromatic dispersion, Inter-modal distortion, Pulse broadening in Graded index fibers, Mode coupling, Advance fiber designs: dispersion shifted, Dispersion flattened, Dispersion compensating fibers, Design optimization of single mode fibers.

UNIT- IV **Marks : 16**

Coherent optical fiber communication, Modulation techniques for Homodyne and Heterodyne systems, Optical filter link design. Rise time budget and link power budget, Long haul systems bit error rate, line coding, NRZ, RZ, Block Codes eye pattern.

UNIT- V **Marks : 16**

Advance system and techniques, wavelength division multiplexing, optical amplifiers semiconductor amplifier, EDFA, Comparison between semiconductor and optical amplifier, Gain band width, Photonic switching, Optical Networks. Optical fiber bus, Ring topology, Star architectures, FDDI, SON-ET.

Reference Books

1. Frams J. & V.K. Jam, Optical Communication Systems.
2. Ghatak A.K., & Thyagarajan, K., Optical Communication. TMH
3. Liu- Principles & Application of Optical Communication 1st ed., TMH
4. G. Keiser- Optical Fiber Communication 4th ed., TM

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PROJECT WORK–VII (BTEX-0706)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
(BTEX -0706)	PROJECT WORK–VII	-	-	6	6	-	-	-	-	100	30	50	150	150	3 hrs.

The Major Project Work provides students an opportunity to do something on their own and under the supervision of a guide. Each student shall work on an approved project, which may involve fabrication, design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work involves sufficient work so that students get acquainted with different aspects of manufacture, design or analysis. The students also have to keep in mind that in final semester they would be required to implement whatever has been planned in the Major Project in this semester. It is possible that a work, which involves greater efforts and time may be taken up at this stage and finally completed in final semester, but partial completion report should be submitted in this semester and also evaluated by an external examiner. At the end of semester, all students are required to submit a synopsis.

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INDUSTRIAL TRAINING (BTEX-0707)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
(BTEX -0707)	INDUSTRIAL TRAINING	-	-	2	2	-	-	-	-	50	15	50	100	100	3 hrs.

SCHEME OF STUDIES

Duration: 2 weeks after the VI semester in the summer break, Assessment in VII semester.

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Semester-VIII

COMPUTER APPLICATIONS TO POWER SYSTEM (BTEX-0801)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0801	COMPUTER APPLICATIONS TO POWER SYSTEM	3	1	2	6	80	25	20	100	50	15	50	100	200	3 hrs.

UNIT- I **Marks : 16**

Transmission line models, regulating transformer, line load ability, capability curves of alternator. Models of power system components, network model using graph theory, formation of Z bus,

UNIT- II **Marks : 16**

Transmission line models, regulating transformer, line load ability, capability curves of alternator. Control of load bus voltage using reactive power control variable, SVC & SVS, Regulated shunt compensation, series and shunt compensation, Uniform series and shunt compensation and effect on Models of power system components, network model using graph theory, formation of Z bus, load ability of transmission lines.

UNIT- III **Marks : 16**

Sensitivity analysis- General sensitivity relations, generation shift distribution factors, line outage distribution factors, compensated shift factors, sensitivity associated with voltage-VAR, sensitivities relating load bus voltage changes in terms of PV bus voltage changes, sensitivity relating changes in reactive power generation for changes in PV Bus Voltage.

UNIT- IV **Marks : 16**

Power system security - Security functions, Security level, contingency analysis, security control, economic dispatch using LP formulation, pre-contingency and post- contingency, corrective rescheduling.

UNIT- V **Marks : 16**

Voltage stability - Difference between voltage and angle stability, PV Curve for voltage stability assessment, proximity and mechanism, modal analysis using reduced Jacobian, participation factor, effect of series and shunt compensation on voltage stability , effect of load models.

Reference Books

1. Computer Techniques in Power Systems Analysis- Pai M.A. Tata Mc Graw Hill.
2. Computer Aided Power Systems Analysis Kusic G.L. 2nd Edition, CRC Press
3. Modern Power Systems Analysis Nagrath I.J. and Kothari D.P. Tata Mc Graw Hill.
4. Power System Analysis Grainger J.J. & Stevnson W.D. Mc Graw Hill.
5. Power System Stability and control -P Kundur, IEEE Press 1994.
6. Advance Power Systems Analysis and Dynamics Singh L.P. John Wiley.
7. Computer Modeling of Electrical Power Systems, Arrillaga J. watson N R Wiley India
8. A Chakrawarti Power System Analysis: Operation and Control PHI Learning 3rd edition
9. Power Generation, Operation and Control by A.J. wood and B.F. Wollenberg John Wiley & Sons Inc. 1984.

Experiment List:-

1. Drive the formation of Z-bus.
2. Drive the formation of Y-bus.
3. Study the Transmission line models.
4. Study the capability curves of alternator.
5. Study the SVC & SVS.
6. Study the generation shift distribution factors.
7. Study the line outage distribution factors.

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COMPUTER-AIDED DESIGN OF ELECTRICAL MACHINES (BTEX-0802)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0802	COMPUTER-AIDED DESIGN OF ELECTRICAL MACHINES	3	1	2	6	80	25	20	100	50	15	50	100	200	3 hrs.

UNIT- I **Marks : 16**

Introduction: Design problem-Mathematical programming methods, computer aided design- Mathematical formulation of the problem. Programming techniques (LP & NLP only), Methods of solution, Unconstrained optimization problems, constrained optimization problems.

UNIT- II **Marks : 16**

Introduction: Design problem-Mathematical programming methods, computer aided design- Mathematical formulation of the problem. Programming techniques (LP & NLP only), Methods of solution, Unconstrained optimization problems, constrained optimization problems.

Optimal design of DC machine:-Design of armature, Windings and field systems, Selection of variables for optimal design, Formulation of design equations, Objective function, Constraint functions, Algorithms for optimal design.

UNIT- III **Marks : 16**

Optimal design of power transformer:-Design of magnetic circuit, Design of windings, Selection of variables for optimal design, Formulation of design equations, Objective function, Constraint functions, Algorithms for optimal design

UNIT- IV **Marks : 16**

Optimal design for 3-phase alternator:-Design of stator, windings, Design of Field systems for salient pole and non-salient pole machines, Selection of variables for optimal design, Formulation of design equations, Objective function, Constraint functions, Algorithms for optimal design.

UNIT- V **Marks : 16**

Optimal design of 3-phase induction motor:-Design of stator, Windings Design of squirrel cage rotor, Design of slip ring rotor, Selection of variables for optimal design, Formulation of design equations, Objective functions Constraint functions, Algorithms for optimal design.

Reference Books

1. Electrical Machine Design- by A.K. Sawhney, Dhanpat Rai & Sons.
2. Principles of Electrical Machine Design with Computer Programmes by- S.K. Sen, Oxford & IBH Publishing Co.
3. Performance and Design of A.C. Machines-M.G. Say, Affiliated East West Press Pvt. Ltd., New Delhi.
4. Design and Testing of Electrical Machines,MV Deshpandey PHI Learning
5. Computer- Aided Design of Electrical Equipment- by Dr. M. Ramamoorthy-Affiliated East-West press Pvt. Ltd. New Delhi.

Experiment List:

1. To study of various methods of CAEMD.
2. Design to obtain the complete dimension of various part of machine.
3. To study the optimal design of 1 phase transformer.
4. To study the optimal design of 3 phases induction motor for stator and rotor design.
5. To study the optimal design of field winding of dc machine.
6. To study the optimal design of DC machine for constraint and unconstraint function.
7. To study the optimal design of Synchronous machine

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ADVANCED POWER ELECTRONICS (BTEX-0803(A))

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0803 (A)	ADVANCED POWER ELECTRONICS	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs.

UNIT-I **Marks : 16**

Introduction to various power electronics supplies. Performance parameters for power electronics supplies and their measurement. Device selection, Control circuits. Switch mode power supplies, Square wave switching, resonant mode operation of Power supplies, Ferro resonant, Linear and the switchers.

UNIT-II **Marks : 16**

DC to DC Converters: Analysis and design of buck, boost, buck-boost and cuk converters, two quadrant and full bridge converters. Isolated converters i.e., fly back, forward and bridge topology. Design of D.C. inductor. Concept of integrated magnetic, converter control, averaged model, state-space model.

UNIT-III **Marks : 16**

DC to Controlled AC: Controlled inversion, three phase full bridge inverters. 180° mode and 120° mode operation, harmonic analysis, PWM control of VSI, current mode control of PWM VSI, space vector modulation, three phase current sourced PWM CSI.

UNIT-IV **Marks : 16**

AC Choppers: Modeling and analysis of AC choppers, harmonics control using symmetrical and asymmetrical waveform pattern.

UNIT-V **Marks : 16**

Soft switching DC to DC converters, zero current switching topologies, zero voltage switching topologies, generalized switching cell, ZCT and ZVT DC converters.

Reference Books

1. "Power Electronics Circuits", Issa Batarseh, John Wiley & Sons Inc., 2004.
2. "Power Electronics:", L.Umanad, Wiley India.
3. "Power Electronics: Converters, Applications, and Design", Ned Mohan, John Wiley & Sons Inc., 2001.
4. "Power Electronics: Devices and Circuits", Jagannathan, PHI Learning 2012
5. "Power Electronic Systems Theory and Design", Jai P Agrawal, Pearson Education Asia, 2001

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FUZZY LOGIC & NEURAL NETWORK (BTEX-0803(B))

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0803 (B)	FUZZY LOGIC & NEURAL NETWORK	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs.

UNIT-I **Marks : 16**

Fuzzy system introduction, Fuzzy relation, Membership function, Fuzzy matrices and entropy, Fuzzy operation and composition.

UNIT-II **Marks : 16**

Fuzzy Variables, Linguistic variables, measures of fuzziness, concepts of defuzzification, Fuzzy control applications.

UNIT-III **Marks : 16**

Fundamentals of Artificial Neural networks- Biological prototype – Artificial neuron, Activation functions, Single layer and multiplayer networks. Training Artificial neural networks, Preceptrons, Exclusive or Problem – Linear seperability, Storage efficiency, Preceptron learning, perceptron training algorithms. Back propagation, Training algorithm, network configurations, Network paralysis, Local minima, temporal instability.

UNIT-IV **Marks : 16**

Counter propagation networks, Kohonen layer, Training the kohonen layer, Pre processing the inputted vectors, Initialising the Wright vectors, Statistical properties, Training the grosberg layer. Full counter propagation networks, Applications. Statistical methods, Boltzman training, Cauchy training, Artificial specific heat methods, Applications to general non-linear optimization problems. Back propagation and cauchy training.

UNIT-V **Marks : 16**

Hopfield nets, recurrent networks, Stability, Associative memory, Thermodynamic systems, Statistical Hopfiled networks, Applications. Bi-directional associative memories, retrieving on stored association, encoding the associations.

Reference Books

1. Laurence Fausett “Fundamentals of Neural Networks”, Prentice Hall.
2. Zmmermann H.J. “Fuzzy Set Theory and its Applications”, Allied Publishers Ltd.
3. Klir G.J. and Folger T., “Fuzzy Sets, Uncertainty and Information”, Prentice Hall.
4. Limin Fu. “Neural Networks in Computer Intelligence”, McGraw Hill.
5. Zuroda J.M. “Introduction to Artificial Neural Systems”, Jaico Publishing

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FACTS (BTEX-0803(C))

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0803(C)	FACTS	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs.

UNIT- I **Marks : 16**

Basic Issues Involved in Bulk Power Transmission, Review of basics of power transmission networks-control of power flow in AC transmission line- Analysis of uncompensated AC Transmission line- Passive reactive power compensation, Principle of Transmission system compensation, Need for FACTS controllers- types of FACTS controllers and Benefits.

UNIT- II **Marks : 16**

Voltage control by SVC – Advantages of slope in dynamic characteristics- Influence of SVC on system voltage, Design of SVC voltage regulator, Modeling of SVC for power flow and stability studies, Applications- Enhancement of transient stability, Steady state power transfer, Enhancement of Power system damping, Prevention of voltage instability

UNIT- III **Marks : 16**

Concepts of Controlled Series Compensation –Analysis of TCSC-GCSC , Different modes of operation, Modeling of TCSC and GCSC for load flow studies- modeling TCSC and GCSC for stability studies- Applications of TCSC and GCSC, SSR mitigation.

UNIT- IV **Marks : 16**

Static synchronous compensator(STATCOM)- Static synchronous series compensator(SSSC)- Operation of STATCOM and SSSC-Power flow control with STATCOM and SSSC- Modeling of STATCOM and SSSC for power flow studies –operation of Unified and Interline power flow controllers(UPFC and IPFC).

UNIT- V **Marks : 16**

FACTS Controller interactions – SVC–SVC interaction - co-ordination of multiple controllers using linear control techniques – Quantitative treatment of control coordination.

Reference Books

1. A.T.John, Flexible AC Transmission System, Institution of Electrical and Electronic Engineers (IEEE), 1999.
2. NarainG.Hingorani, Laszio. Gyugyl, Understanding FACTS Concepts and Technology of
3. Flexible AC Transmission System, Standard Publishers, Delhi, 2001.
4. V. K.Sood, HVDC and FACTS controllers- Applications of Static Converters in Power
5. System, Kluwer Academic Publishers, 2004.
6. Mohan Mathur, R., Rajiv. K. Varma, Thyristor – Based FACTS Controllers for Electrical Transmission Systems, IEEE press and John Wiley & Sons, Inc, 2002.
7. K.R.Padiyar, FACTS Controllers in Power Transmission and Distribution, New Age International (P) Ltd., Publishers, New Delhi, Reprint, 2008.

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POWER SYSTEM ECONOMICS (BTEX-0804(A))

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0804(A)	POWER SYSTEM ECONOMICS	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs.

UNIT -I **Marks : 16**

Power System Fundamentals:-Regulation and Deregulation, condition for deregulation, problems with regulation, risk management, congestion management, ATC, screening curve.

UNIT -II **Marks : 16**

Competetions in Power Market:-What is competition, efficiency of perfect competition, marginal cost in power market, role of marginal cost, working with marginal cost, results of marginal cost.

UNIT –III **Marks : 16**

Market Power and Structure:-Define market power, price quality outcomes, three stages of market power, using price quality outcomes to show power, monopoly in power auction, market power on demand side.

UNIT -IV **Marks : 16**

Restructure:-Fundamental restructure system, transmission pricing, restructure models, OASIS, structure of OASIS, transfer capability of OASIS.

UNIT -V **Marks : 16**

Designing and Testing Market Rules:-Design for competitive prices, testing of market design, designing to reduce market power.

Reference Books

1. Electric Power Systems weedy,cory, wily india 2nd edition
2. Power system economics-designing for electricity-steven stoft. (IEEE press & WILEY-INTERSCIENCE).

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SOFT COMPUTING TECHNIQUES AND APPLICATIONS (BTEX-0804(B))

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0804 (B)	SOFT COMPUTING TECHNIQUES AND APPLICATIONS	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs.

UNIT- I **Marks : 16**

Review of probability theory: Random variable, distribution functions, function of random variable. generation of random digit, and random variants from various distribution function, Monte Carlo simulation, sampling distributions station evolution using MCS, confidence interval, coefficient of variation.

UNIT- II **Marks : 16**

Evolution ANN, artificial neurons, activation functions, ge - rule, and back Propagation rule of training, RBF and FLN network.

UNIT- III **Marks : 16**

Drawback of classical optimization techniques, genetic algorithm; binary and real parameter GA, constraints handling in GA.

UNIT- IV **Marks : 16**

Evolution strategies (ES), two members non- recombinative ES, multi member ES, recombinative ES. Optimization based on swarm intelligence particle, swarm optimization and its variants.

UNIT- V **Marks : 16**

Application of soft computing techniques to problem of electrical engg. E.g. economic dispatch, reliable optimization, ANN traing using evolutionary algorithms.

Reference Books

1 Computer Techniques in Power Systems Analysis- Pai M.A. Tata Mc Graw Hill.
2 Computer Aided Power Systems Analysis Kusic G.L. 2nd Edition, CRC Press
3 Modern Power Systems Analysis Nagrath I.J. and Kothari D.P. Tata Mc Graw Hill.
4 Power System Analysis Grainger J.J. & Stevnson W.D. Mc Graw Hill.
5 Power System Stability and control -P Kundur, IEEE Press 1994.
6 Advance Power Systems Analysis and Dynamics Singh L.P. John Wiley.
7 R.Y. Rubinstein Simulation and the Monte Carlo method, John Wiley & Sons 1st Edition.
8 Paul. L. Mayer-Introducing probability and statical application, Addition Weslay

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Advanced Control System (BTEX-0804(C))

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX-0804 (C)	Advanced Control System	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs.

UNIT- I **Marks : 16**

Review of Linear Control System: Modelling through differential equations and difference equations, State space method of description and its solution, Discretization of continuous-time state space model, Laplace and z-domain analyses of control systems, Controllability, Observability & Stability, Bode & Nyquist analysis, Root Loci, Effect of load disturbance upon control actions.

UNIT- II **Marks : 16**

Development of feedback control laws through state space technique, Modal control, Pole placement problem.

UNIT- III **Marks : 16**

Variable Structure Control and its applications. Examples on variable structure control.

UNIT- IV **Marks : 16**

Control of nonlinear dynamics: Lyapunov based control function, Phase plane technique, Lyapunov Stability analysis.

UNIT- V **Marks : 16**

Optimal Control: Calculus of variation, Euler-Lagrange equations, Boundary conditions, Transversality condition, Bolza problem, Pontyagin's maximum principle.

Reference Books

1 Automatic Control System – B.C. Kuo, PHI, New York, 1975.
2 Modern Control Engineering: K. Ogata,PHI. New Delhi, 1992.
3 Digital Control Systems – B. C. Kuo, Oxford Pub.
4 Discrete-Time Control Systems – K. Ogata. PHI. New Delhi
5 Advanced Control Systems N Sarkar PHI Learning
6 Control System Engineering S NISE Wiley Ind

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PROJECT WORK-VIII (BTEX-0805)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX--805	Project Work-VIII	-	-	6	6	-	-	-	-	150	45	100	250	250	3 hrs.

GUIDELINES

The objectives of the course 'Major Project' are To provide students with a comprehensive experience for applying the knowledge gained so far by studying various courses. To develop an inquiring aptitude and build confidence among students by working on solutions of small industrial problems. To give students an opportunity to do something creative and to assimilate real life work situation in institution. To adapt students for latest developments and to handle independently new situations. To develop good expressions power and presentation abilities in students. The focus of the Major Project is on preparing a working system or some design or understanding of a complex system using system analysis tools and submit it the same in the form of a write-up i.e. detail project report. The student should select some real life problems for their project and maintain proper documentation of different stages of project such as need analysis, market analysis, concept evaluation, requirement specification, objectives, work plan, analysis, design, implementation and test plan. Each student is required to prepare a project report and present the same at the final examination with a demonstration of the working system (if any).

The faculty and student should work according to following schedule:

i) Each student undertakes substantial and individual project in an approved area of the subject and supervised by a member of staff.

ii) The student must submit outline and action plan for the project execution (time schedule) and the same be approved by the concerned faculty.

iii) At all the steps of the project, students must submit a written report of the same.

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SIMULATION LAB-II (BTEX -806)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTEX--806	SIMULATION LAB-II	-	-	2	2	-	-	\-	-	50	15	50	100	100	3 hrs.

1. Study of various Electrical Toolbox i.e Power System,Power Electronics, Control system, Electrical Measurement ,Flexible AC Transmission.
2. Developing Simulation Models for single and three phase Rectifier, Inverter, and Converter for different load models.
3. Developing Simulation Models using FACTs Devices i.e STATCOM, SVC, TCSC, SSSC, IPFC, UPFC in power system transmission lines.

REFERENCE

1. Shailendra Jain "Modeling **and Simulation** using **MATLAB Simulink"** wiley india & son