B. Tech. (EE) : Syllabus Revision in 2016-17.

S. No	Course Code	Session 2015-16	Session 2016-17	Remark Syllabus Change/ new course
1	BT101	**Engineering Physics I** **UNIT-I** Atomic Structure and Solid State: Atomic energy levels and electronic configuration, Intermolecular forces and binding, phases of matter, crystal structure simple cubic , body centered cubic and face centered cubic structures, energy bands in solids , band structure of metals, semiconductors and insulators. **UNIT-II** Semiconductor Physics: Extrinsic and intrinsic semiconductors, Fermi levels of undoped and doped semiconductors, p-n junction, depletion region, forward and reverse biased p-n junction, volt-Ampere characteristics of a diode , effect of temperature on diode characteristics, Zener diode , tunnel diode, photodiode and LEDs , their structure and characteristics. **UNIT-III**	**Engineering Physics I** UNIT-I Atomic Structure and Solid State: Atomic energy levels and electronic configuration, Intermolecular forces and binding, phases of matter, crystal structure simple cubic , body centered cubic and face centered cubic structures, energy bands in solids , band structure of metals, semiconductors and insulators. UNIT-II Semiconductor Physics: Extrinsic and intrinsic semiconductors, Fermi levels of undoped and doped semiconductors, p-n junction, depletion region, forward and reverse biased p-n junction, volt-Ampere characteristics of a diode , effect of temperature on diode characteristics, Zener diode , tunnel diode, photodiode and LEDs , their structure and characteristics. UNIT-III Theory of Relativity : Absolute and relative frames of reference, Galilean transformations, importance of Michelson-Morley experiment, postulates of special theory of relativity, Lorentz transformations, time dilation and length contraction, velocity addition , mass-energy relationship, elementary ideas about general theory of relativity.	**No Change**

			Theory of Relativity : Absolute and relative frames of reference, Galilean transformations, importance of Michelson-Morley experiment, postulates of special theory of relativity, Lorentz transformations, time dilation and length contraction, velocity addition , mass-energy relationship, elementary ideas about general theory of relativity. **UNIT-IV** Elementary Quantum Mechanics: Wave particle duality, deBroglie waves, experimental evidence of wave nature of matter, Schrodinger wave equation in One dimension, eigen values and eigen functions, physical interpretation of wave function, Heisenberg uncertainty principle, tunneling phenomenon. **UNIT5-V** Oscillation & Waves : Simple harmonic oscillator with example, energy of oscillator, Damping	UNIT-IV Elementary Quantum Mechanics: Wave particle duality, deBroglie waves, experimental evidence of wave nature of matter, Schrodinger wave equation in One dimension, eigen values and eigen functions, physical interpretation of wave function, Heisenberg uncertainty principle, tunneling phenomenon. UNIT5-V Oscillation & Waves : Simple harmonic oscillator with example, energy of oscillator, Damping oscillator,viscous & solid friction damping,Qualityfactor,Resonance standing waves,elastic waves,	

		oscillator,viscous & solid friction damping,Qualityfactor,Resonance standing waves,elastic waves,		
2	**BT102**	**INTRODUCTION TO COMPUTER FUNDAMENTAL AND IT** **UNIT-I** **Computer System**: Basics of computer systems, history, types and Generation of computer, capability and limitations of computer systems. Hardware organization: Anatomy of a digital computer, CPU.Internal architecture of CPU.Memory Units: Memory Hierarchy, Primary Memory, Secondary Memory, cache memory. Storage Devices, Input and Output Devices. **UNIT-II** **Operating Systems**: DOS Internal, External commands, Windows (2000 and NT) , Overview of architecture of Windows, tools and system utilities including registry , partitioning of hard disk , Overview of	**INTRODUCTION TO COMPUTER FUNDAMENTAL AND IT** **UNIT-I** **Computer System**: Basics of computer systems, history, types and Generation of computer, capability and limitations of computer systems. Hardware organization: Anatomy of a digital computer, CPU.Internal architecture of CPU.Memory Units: Memory Hierarchy, Primary Memory, Secondary Memory, cache memory. Storage Devices, Input and Output Devices. **UNIT-II** **Operating Systems**: DOS Internal, External commands, Windows (2000 and NT) , Overview of architecture of Windows, tools and system utilities including registry , partitioning of hard disk , Overview of Linux architecture , File system , file and permissions , concept of user and group , installation of rpm and deb based packages. **UNIT-III** **Number system & Conversions:** decimal, binary, octal and hexadecimal number systems and their inter conversions, 1's and 2's complement representation, negative numbers and their representation, BCD, EBCDIC , ASCII and Unicode. Binary Arithmetic operations: addition, subtraction, multiplication, division.	**No Change**

			Linux architecture , File system , file and permissions , concept of user and group , installation of rpm and deb based packages. **UNIT-III** **Number system & Conversions:** decimal, binary, octal and hexadecimal number systems and their inter conversions, 1's and 2's complement representation, negative numbers and their representation, BCD, EBCDIC , ASCII and Unicode. Binary Arithmetic operations: addition, subtraction, multiplication, division. **UNIT-IV** **Networking Basics** - Uses of a Network and Common types of Networks, Network topologies and protocols, Network media and hardware, Overview of Database Management System. **UNIT-IV** **Data Processing:** Introduction to MS	**UNIT-IV** **Networking Basics** - Uses of a Network and Common types of Networks, Network topologies and protocols, Network media and hardware, Overview of Database Management System. **UNIT-IV** **Data Processing:** Introduction to MS office, MS-Power Point and MS-Excel, Introduction to Electronic Spreadsheets, Applications of Electronic Spreadsheets, Types of Spreadsheets, Features of MS-Excel, Starting MS-Excel, Contents of the MS-Excel window, Cell Referencing, Ranges and Functions, Formatting Worksheets and Creating Charts, Data Forms and Printing *Introduction to MS-PowerPoint :* Introduction to MS-PowerPoint, What is a Presentations?, Slides, Working with Slides, Slides Show and Printing Presentation	

		office, MS-Power Point and MS-Excel, Introduction to Electronic Spreadsheets, Applications of Electronic Spreadsheets, Types of Spreadsheets, Features of MS-Excel, Starting MS-Excel, Contents of the MS-Excel window, Cell Referencing, Ranges and Functions, Formatting Worksheets and Creating Charts, Data Forms and Printing *Introduction to MS-PowerPoint :* Introduction to MS-PowerPoint, What is a Presentations?, Slides, Working with Slides, Slides Show and Printing Presentation		
3	**BT103**	**Applied Mathematics I** **UNIT-I** Functions of variables: Geometric representation, limit, continuity and differentiability of functions of several variables , partial and full derivatives, derivatives of composite functions, Euler's theorem on	**Applied Mathematics I** **UNIT-I** Functions of variables: Geometric representation, limit, continuity and differentiability of functions of several variables , partial and full derivatives, derivatives of composite functions, Euler's theorem on homogeneous functions, harmonic functions, directional derivatives, Taylor's formula, maxima and minima of functions, Lagrange's multipliers. **UNIT-II** Asymptotes and curvature: Rolle's	**No Change**

			homogeneous functions, harmonic functions, directional derivatives, Taylor's formula, maxima and minima of functions, Lagrange's multipliers. **UNIT-II** Asymptotes and curvature: Rolle's Theorem, Cauchy's mean value theorem, Taylor and Maclaurin theorems, concavity and convexity of a curve, points of inflexion, asymptotes and curvature. **UNIT-III** Analytical functions: Limit, continuity and differentiability of analytic functions, Cauchy-Reimann equations, complex functions, line integrals, Cauchy's integral theorem, Cauchy's integral formula, power series, zeroes and singularity, residue theorem. **UNIT-IV** Integral calculus: Definite integral as limit of sum, properties of definite integrals, mean value theorem, fundamental theorem,	Theorem, Cauchy's mean value theorem, Taylor and Maclaurin theorems, concavity and convexity of a curve, points of inflexion, asymptotes and curvature. **UNIT-III** Analytical functions: Limit, continuity and differentiability of analytic functions, Cauchy-Reimann equations, complex functions, line integrals, Cauchy's integral theorem, Cauchy's integral formula, power series, zeroes and singularity, residue theorem. **UNIT-IV** Integral calculus: Definite integral as limit of sum, properties of definite integrals, mean value theorem, fundamental theorem, evaluation of definite integrals, reduction formula. **UNIT-V** Differential equations: Order and degree of a differential equation, general and particular solutions, solution of differential equations by separation of variables method, integrating factor method, homogeneous differential equations of first order and their solutions, solution of linear differential equation $dy/dx+f(x)y=Q(x)$ and their application in electrical, nuclear and mechanical systems.	

		evaluation of definite integrals, reduction formula. **UNIT-V** Differential equations: Order and degree of a differential equation, general and particular solutions, solution of differential equations by separation of variables method, integrating factor method, homogeneous differential equations of first order and their solutions, solution of linear differential equation $dy/dx+f(x)y=Q(x)$ and their application in electrical, nuclear and mechanical systems.		
4	**BT104**	**Introduction to Electrical and Electronic Engineering** **UNIT-I** **Basic Electrical Quantities:** Electromotive force, Electric Power ,Charge, current, voltage, Energy,Electric potential and field, magnetic flux,resistance, capacitance and inductance. Ohm's law, Voltage and current	**Introduction to Electrical and Electronic Engineering** **UNIT-I** **Basic Electrical Quantities:** Electromotive force, Electric Power ,Charge, current, voltage, Energy,Electric potential and field, magnetic flux,resistance, capacitance and inductance. Ohm's law, Voltage and current sources. **UNIT-II** **Network analysis:** Circuit principles, Kirchoff's Laws, Node Voltage and Mesh Current Analysis;Delta-Star and Star-Delta Transformation, Source Conversion. Classification of Network Elements,	**No Change**

			sources. **UNIT-II** **Network analysis:** Circuit principles, Kirchoff's Laws, Node Voltage and Mesh Current Analysis;Delta-Star and Star-Delta Transformation, Source Conversion. Classification of Network Elements, Superposition Theorem, Thevenin's Theorem.Norton Theorem.,MaximumPower Transfer Theorems. **UNIT-III** **AC circuits**: Alternating Quanitities,Introduction, Generation of AC Voltages, Root Mean Square and Average Value of Alternating Currents and Voltages, Form Factor and Peak Factor, Phasor Representation of Alternating Quantities, Single Phase RLC Circuits, Introduction to 3-Phase AC System.Power in a circuit, reactive power, power factor, impedance in ac circuit, series and parallel resonance, Q factor, Introduction to 3-Phase AC System.	Superposition Theorem, Thevenin's Theorem.Norton Theorem.,MaximumPower Transfer Theorems. **UNIT-III** **AC circuits**: Alternating Quanitities,Introduction, Generation of AC Voltages, Root Mean Square and Average Value of Alternating Currents and Voltages, Form Factor and Peak Factor, Phasor Representation of Alternating Quantities, Single Phase RLC Circuits, Introduction to 3-Phase AC System.Power in a circuit, reactive power, power factor, impedance in ac circuit, series and parallel resonance, Q factor, Introduction to 3-Phase AC System. **UNIT-IV** **Transformers:** Faraday's Law of Electromagnetic Induction Basic principle of operation of transformer, construction, working, voltage and current relations, Phasor Diagram of Ideal Transformer.open circuit and short circuit test, transformer losses and efficiency, ferrite core transformers.**Electrical DC Machine:** Principle of DC Machines, Types, Different Parts ofDC Machines **UNIT-V** **Power Supplies:** Half wave, full wave and bridge rectifiers, ripple factor and reduction by use of inductor,capacitor, L and pie section filters, voltage regulation using Zener diode.	

		UNIT-IV **Transformers:** Faraday's Law of Electromagnetic Induction Basic principle of operation of transformer, construction, working, voltage and current relations, Phasor Diagram of Ideal Transformer.open circuit and short circuit test, transformer losses and efficiency, ferrite core transformers.**Electrical** **DC Machine:** Principle of DC Machines, Types, Different Parts ofDC Machines **UNIT-V** **Power Supplies:** Half wave, full wave and bridge rectifiers, ripple factor and reduction by use of inductor,capacitor, L and pie section filters, voltage regulation using Zener diode.		
5	**BT105**	**English and Communication Skills** **UNIT –I** Grammar and Vocabulary: Basic sentence pattern, use of tense, modals, active and passive voice, Direct and Indirect Speech,	**English and Communication Skills** **UNIT –I** Grammar and Vocabulary: Basic sentence pattern, use of tense, modals, active and passive voice, Direct and Indirect Speech, One word substitution, Synonyms and Antonyms and Common Erros in English. **UNIT-II**	**No Change**

			One word substitution, Synonyms and Antonyms and Common Erros in English. **UNIT-II** Phonetics: IPA symbols, Correct pronunciation of commonly used words, sounds (vowel and consonants) **UNIT-III** Literature : Poetry : where the mind is without fear – Rabindra Nath Tagore, Mending wall – Robert Frost, Night of Scorpion – Nissim Ezekiel Essays: of studies: Francis Bascon, what is science? George Orwell. **UNIT-IV** Writing skills : Paragraph writing, Letter writing, covering letter and C.V., Writing E-mails. **UNIT-V** Fundamentals of Communication: (A) Communication: definition and meaning of communication, functions of communication, process of communication. (B) Types of communication: Verbal	Phonetics: IPA symbols, Correct pronunciation of commonly used words, sounds (vowel and consonants) **UNIT-III** Literature : Poetry : where the mind is without fear – Rabindra Nath Tagore, Mending wall – Robert Frost, Night of Scorpion – Nissim Ezekiel Essays: of studies: Francis Bascon, what is science? George Orwell. **UNIT-IV** Writing skills : Paragraph writing, Letter writing, covering letter and C.V., Writing E-mails. **UNIT-V** Fundamentals of Communication: (A) Communication: definition and meaning of communication, functions of communication, process of communication. (B) Types of communication: Verbal and Non verbal communication, Formal and informal communication. (C) Barriers to communication, qualities of good communication, the art of listening.	

		and Non verbal communication, Formal and informal communication. (C) Barriers to communication, qualities of good communication, the art of listening.		
6	**BT106**	**Engineering Chemistry** **UNIT -I** **Water:** The sources of water, common Impurities, soft and hard water, Hardness of water, degrees of hardness and its effects, determination of hardness by various techniques, Municipal Water supply, requisites of drinking water, purification of water by sedimentation, filtration, reverse osmosis (RO), sterilization, chlorination. Water for boilers, corrosion, sludge and scale formation, caustic embitterment, treatment by preheating, lime-soda process, permutit de-ionizer or demineralization.	**Engineering Chemistry** **UNIT -I** **Water:** The sources of water, common Impurities, soft and hard water, Hardness of water, degrees of hardness and its effects, determination of hardness by various techniques, Municipal Water supply, requisites of drinking water, purification of water by sedimentation, filtration, reverse osmosis (RO), sterilization, chlorination. Water for boilers, corrosion, sludge and scale formation, caustic embitterment, treatment by preheating, lime-soda process, permutit de-ionizer or demineralization. **UNIT- II** **Electrochemistry:** Redox reactions; conductance in electrolytic solutions, specific and molar conductivity variations of conductivity with concentration, Kohlrausch's Law, electrolysis and laws of electrolysis (elementary idea), dry cell – electrolytic cells and Galvanic cells; lead accumulator, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells. Relation between Gibbs energy change and EMF of a cell, fuel cells; corrosion.	**No Change**

		UNIT- II **Electrochemistry:** Redox reactions; conductance in electrolytic solutions, specific and molar conductivity variations of conductivity with concentration, Kohlrausch's Law, electrolysis and laws of electrolysis (elementary idea), dry cell – electrolytic cells and Galvanic cells; lead accumulator, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells. Relation between Gibbs energy change and EMF of a cell, fuel cells; corrosion. **Analysis:** Volumetric Analysis, Types of titrations, Theory of indicators. **Spectral Analysis:** Electromagnetic radiation, Lambert-Beer's Law, UV-VIS, IR, NMR instrumentation & applications. **Thermal Methods of Analysis:** principle, working and applications of Thermogravimetry, Differential thermal	**Analysis:** Volumetric Analysis, Types of titrations, Theory of indicators. **Spectral Analysis:** Electromagnetic radiation, Lambert-Beer's Law, UV-VIS, IR, NMR instrumentation & applications. **Thermal Methods of Analysis:** principle, working and applications of Thermogravimetry, Differential thermal analysis and Differential scanning calorimetry. **UNIT- III** **Fuels:** The need of fuel, origin and classification of fuels, Solid fuels, coal and its constituents, calorific value and its determination, coke: carbonization process, various types of coke ovens. **Liquid Fuels:** advantages, petroleum and its refining, synthetic petrol, reforming of gasoline, knocking, octane number and anti knocking agents, cracking. Gaseous Fuels advantages, composition and calorific value of coal gas and oil gas and its determination. **Lubricants:** Need of Classification, types of lubricants, their properties and uses, lubricants, viscosity and viscosity index and flash points, cloud and pour point, emulsification **UNIT- IV** **Phase Rule:** Statement, definition of terms involved, application to one component system (water-sulphur system), two component systems (Ag-Pbsystems). **Polymers:** Plastics, preparation, properties and uses of polyethylene, bakelite, terylene and nylon, Rubber; natural rubber, synthetic rubber such as butyl and neoprene rubbers, vulcanization process and its advantages. **Corrosion:** its significance, theories of	

			analysis and Differential scanning calorimetry. **UNIT- III** **Fuels:** The need of fuel, origin and classification of fuels, Solid fuels, coal and its constituents, calorific value and its determination, coke: carbonization process, various types of coke ovens. **Liquid Fuels:** advantages, petroleum and its refining, synthetic petrol, reforming of gasoline, knocking, octane number and anti knocking agents, cracking. Gaseous Fuels advantages, composition and calorific value of coal gas and oil gas and its determination. **Lubricants:** Need of Classification, types of lubricants, their properties and uses, lubricants, viscosity and viscosity index and flash points, cloud and pour point, emulsification **UNIT- IV** **Phase Rule:** Statement,	corrosion, Galvanic cell and concentration cell, pitting and stress corrosion, protection techniques. **UNIT-V** **Explosives:** Introduction, classification of explosives, preparation of commercially important explosives, blasting fuses, uses and abuses of explosives. **Cement:** properties, Portland cement and its manufacture, chemistry of setting and hardening of cement, RCC structures. **Refractories:** definition, classification, properties of silica and fireclay refractories, **Glass:** preparation, properties and uses.	

			definition of terms involved, application to one component system (water-sulphur system), two component systems (Ag-Pbsystems). **Polymers:** Plastics, preparation, properties and uses of polyethylene, bakelite, terylene and nylon, Rubber; natural rubber, synthetic rubber such as butyl and neoprene rubbers, vulcanization process and its advantages. **Corrosion:** its significance, theories of corrosion, Galvanic cell and concentration cell, pitting and stress corrosion, protection techniques. **UNIT-V** **Explosives:** Introduction, classification of explosives, preparation of commercially important explosives, blasting fuses, uses and abuses of explosives. **Cement:** properties, Portland cement and its manufacture, chemistry of setting		

		and hardening of cement, RCC structures. **Refractories:** definition, classification, properties of silica and fireclay refractories, **Glass:** preparation, properties and uses.		
7	**BT107**	**Electrical and Electronics Lab-I** **List of Experiments** 1. Identification, Study & Testing of various electronic components: (a) Resistances-Various types, Colour coding (b) Capacitors-Various types, Coding, (c) Inductors (d) Diodes (e) Transistors (f) SCRs (g) ICs (h) Photo diode (i) Photo transistor (j) LED (k) LDR (l) Potentiometers. 2. Study of symbols for various Electrical & Electronic Components, Devices, Circuit functions etc. 3. Study of Analog & digital multi-meters. 4. Study of Function/ Signal generators. 5. Study of Regulated d. c. power supplies (constant voltage and constant current operations). 6. Study of analog CRO, measurement of time period, amplitude and frequency. 7. Perform half wave rectifier experiment and effect of filters on output. 8. Perform bridge rectifier experiment and measure the effect of filter	**Electrical and Electronics Lab-1** **List of Experiments** 1. Identification, Study & Testing of various electronic components: (a) Resistances-Various types, Colour coding (b) Capacitors-Various types, Coding, (c) Inductors (d) Diodes (e) Transistors (f) SCRs (g) ICs (h) Photo diode (i) Photo transistor (j) LED (k) LDR (l) Potentiometers. 2. Study of symbols for various Electrical & Electronic Components, Devices, Circuit functions etc. 3. Study of Analog & digital multi-meters. 4. Study of Function/ Signal generators. 5. Study of Regulated d. c. power supplies (constant voltage and constant current operations). 6. Study of analog CRO, measurement of time period, amplitude and frequency. 7. Perform half wave rectifier experiment and effect of filters on output. 8. Perform bridge rectifier experiment	**No Change**

		output. 9. Application of diode as clipper and clamper. 10. Soldering & desoldering practice.	and measure the effect of filter output. 9. Application of diode as clipper and clamper. 10. Soldering & desoldering practice.	
8	**BT108**	**Engineering Physics Lab-I** **List of Experiments** 1. To study the charging of a condenser to plot a graph of voltage (V) across it against time (T) and to determine the time constant from this graph 2. To study the discharging of a condenser to plot a graph of voltage (V) across it against time (T) and to determine the time constant from this graph. 3. To determine the specific resistance of a material and difference between two small resistances using "Carey Foster's Bridge ". 4. To determine band gap of a semiconductor- diode. 5. To study the Zener diode as a constant voltage regular. 6. To verify Malus Law (Cosine square law) for plane polarized light with the help of a Photo voltaic cell. 7. To determine the transmission coefficient by using Lummer Brodhum Photometer. 8. To determine minimum deviation angle for different	**Engineering Physics Lab-I** **List of Experiments** 1. To study the charging of a condenser to plot a graph of voltage (V) across it against time (T) and to determine the time constant from this graph 2. To study the discharging of a condenser to plot a graph of voltage (V) across it against time (T) and to determine the time constant from this graph. 3. To determine the specific resistance of a material and difference between two small resistances using "Carey Foster's Bridge ". 4. To determine band gap of a semiconductor- diode. 5. To study the Zener diode as a constant voltage regular. 6. To verify Malus Law (Cosine square law) for plane polarized light with the help of a Photo voltaic cell. 7. To determine the transmission coefficient by using Lummer Brodhum Photometer. 8. To determine minimum deviation angle for different light using prism and spectrometer. 9. To determine the profile of He -Ne Laser beam.	**No Change**

		light using prism and spectrometer. 9. To determine the profile of He -Ne Laser beam. 10. To study the variation of thermo e.m.f. of iron copper thermo couple with temperature. 11. To determine the wavelength of sodium light using Michelson Interferometer. 12. To determine the curie temperature of Monel metal 13. The determination of viscosity.	10. To study the variation of thermo e.m.f. of iron copper thermo couple with temperature. 11. To determine the wavelength of sodium light using Michelson Interferometer. 12. To determine the curie temperature of Monel metal 13. The determination of viscosity.	
9	**BT109**	**IT FUNDAMENTAL LAB** **LIST OF EXPERIMENTS** 1. Dismantling a PC Part -1. 2. Dismantling a PC Part -2. 3. Internal and External commands of DOS. 4. System utilities of windows. 5. Understanding and Working knowledge of Linux/Unix OS. 6. Understanding of File system of Linux. 7. Creating user and group. 8. Understanding and Working knowledge of MS Office, Power Point and Excel: Editing and Reviewing, Drawing, Tables, Graphs, Templates.	**IT FUNDAMENTAL LAB** **LIST OF EXPERIMENTS** 1. Dismantling a PC Part -1. 2. Dismantling a PC Part -2. 3. Internal and External commands of DOS. 4. System utilities of windows. 5. Understanding and Working knowledge of Linux/Unix OS. 6. Understanding of File system of Linux. 7. Creating user and group. 8. Understanding and Working knowledge of MS Office, Power Point and Excel: Editing and Reviewing, Drawing, Tables, Graphs, Templates.	**No Change**
10	**BT110**	**Engineering Chemistry Lab** **List of Experiments**	**Engineering Chemistry Lab** **List of Experiments**	**No Change**

		1. To determine the strength of a given unknown copper sulphate solution (Iodometrically) with titrate Hypo (sodium thio sulphate) solution. 2. To determine the strength of a given unknown FAS solution with titrate potassium dichromate solution using N-phenyl anthranilic acid (internal indicator). 3. To determine the strength of a given unknown potassium dichromate solution (Iodometrically) with titrate Hypo (sodium thio sulphate) solution. 4. Determine the percentage of available chlorine in a given sample of bleaching powder. 5. Determine the amount of free chlorine in a given water sample. 6. To determine the viscosity and viscosity index of a given sample of lubricating oil using Redwood viscometer No.1 7. To determine the flash and fire point of a given sample of lubricating oil	1. To determine the strength of a given unknown copper sulphate solution (Iodometrically) with titrate Hypo (sodium thio sulphate) solution. 2. To determine the strength of a given unknown FAS solution with titrate potassium dichromate solution using N-phenyl anthranilic acid (internal indicator). 3. To determine the strength of a given unknown potassium dichromate solution (Iodometrically) with titrate Hypo (sodium thio sulphate) solution. 4. Determine the percentage of available chlorine in a given sample of bleaching powder. 5. Determine the amount of free chlorine in a given water sample. 6. To determine the viscosity and viscosity index of a given sample of lubricating oil using Redwood viscometer No.1 7. To determine the flash and fire point of a given sample of lubricating oil using Pensky Marten's apparatus. 8. Determine the cloud and pour point of a given sample of lubricating oil. 9. Determination of hardness of water by complexometric method (using EDTA). 10. Determine the pH of an acid (strength of an acid) pH – metrically. 11. Determine the strength of a given unknown HCl solution by titrating it against NaOH solution (Conductometric analysis). 12. To estimation the amount of sodium	

		using Pensky Marten's apparatus. 8. Determine the cloud and pour point of a given sample of lubricating oil. 9. Determination of hardness of water by complexometric method (using EDTA). 10. Determine the pH of an acid (strength of an acid) pH – metrically. 11. Determine the strength of a given unknown HCl solution by titrating it against NaOH solution (Conductometric analysis). 12. To estimation the amount of sodium hydroxide and sodium carbonate in the given alkali mixture solution (or in water sample) by titrating against an intermediate hydrochloric acid using phenolphthalein and methyl orange indicator.	hydroxide and sodium carbonate in the given alkali mixture solution (or in water sample) by titrating against an intermediate hydrochloric acid using phenolphthalein and methyl orange indicator.	
11	**BT111**	**Engineering workshop** **FITTING AND SHEET METAL SHOP** 1. Finishing of two sides of a square piece by filing and to cut a Square notch using hacksaw. 2. To drill three holes and Tapping on the given specimen. 3. Tin smithy for making	**Engineering workshop** **FITTING AND SHEET METAL SHOP** 1. Finishing of two sides of a square piece by filing and to cut a Square notch using hacksaw. 2. To drill three holes and Tapping on the given specimen. 3. Tin smithy for making mechanical joint	**No Change**

		mechanical joint and soldering of joint **WELDING SHOP** 4. To prepare Lap Joint with the help of Arc welding 5. To prepare Butt Joint with the help of arc Welding 6. Gas welding practice by students on mild steel flat **MACHINE SHOP PRACTICE** 7. Job on lathe M/C with centering and one step turning 8. Job on lathe M/C with grooving and chamfering operations	and soldering of joint **WELDING SHOP** 4. To prepare Lap Joint with the help of Arc welding 5. To prepare Butt Joint with the help of arc Welding 6. Gas welding practice by students on mild steel flat **MACHINE SHOP PRACTICE** 7. Job on lathe M/C with centering and one step turning 8. Job on lathe M/C with grooving and chamfering operations	
12	**BT201**	**Engineering Physics II** **UNIT-I** **Electric and Magnetic Fields** :Coulomb's law, Gauss's law, electrostatic potential and field due to discrete and continuous charge distributions, dipole and quadrupole moments, dielectric polarization, electrostatic energy, conductors and capacitors, Biot-Savart law, Ampere's law, magnetic induction due to current carrying conductors, force on a	**Engineering Physics II** **UNIT-I** **Electric and Magnetic Fields** :Coulomb's law, Gauss's law, electrostatic potential and field due to discrete and continuous charge distributions, dipole and quadrupole moments, dielectric polarization, electrostatic energy, conductors and capacitors, Biot-Savart law, Ampere's law, magnetic induction due to current carrying conductors, force on a charged particle in electric and magnetic field, Faraday's law of electromagnetic induction. **UNIT-II** **Thermodynamics**: Work-Thermodynamic definition of work, examples, displacement work, path dependence of displacement work, thermal equilibrium, Zeroth law , definition of temperature, heat/work	**No Change**

			charged particle in electric and magnetic field, Faraday's law of electromagnetic induction. **UNIT-II** **Thermodynamics**: Work-Thermodynamic definition of work, examples, displacement work, path dependence of displacement work, thermal equilibrium, Zeroth law , definition of temperature, heat/work interaction systems , First law and its consequences, isothermal and adiabatic processes, reversible, irreversible and quasi-static processes. Second law and entropy. Carnot engine and cycle. Absolute temperature scale. **UNIT-III** **Optical phenomena** : Principle of superposition, coherent and incoherent sources, temporal and spatial coherence, interference phenomena(Newton's	interaction systems , First law and its consequences, isothermal and adiabatic processes, reversible, irreversible and quasi-static processes. Second law and entropy. Carnot engine and cycle. Absolute temperature scale. **UNIT-III** **Optical phenomena** : Principle of superposition, coherent and incoherent sources, temporal and spatial coherence, interference phenomena(Newton's ring and Michelson interferometer), diffraction of waves, diffraction from single and diffraction grating, polarization : types of polarization , Malus law, quarter and half wave plates, optical activity, specific rotation. **UNIT-IV** **Lasers and Holography** : Spontaneous and stimulated emission (Einstein A and B coefficients), population inversion, basic principles of operation of He-Ne, Ruby and semiconductor lasers. **Optical Fibers** : Types of optical fibers and their characteristics, characteristics of step, graded , mono mode and multi mode fibers, numerical aperture and its measurement, fiber optical communication. Principles and applications of holography **UNIT-V** **Magnetic Materials**: Magnetization-origin of magnetic moment, classification of magnetic materials- die, Para and ferromagnetism, hysteresis curve, soft and hard magnetic materials. Superconductivity: General properties of superconductors, Meissonier effect, penetration depth, type I and Type II	

			ring and Michelson interferometer), diffraction of waves, diffraction from single and diffraction grating, polarization : types of polarization , Malus law, quarter and half wave plates, optical activity, specific rotation. **UNIT-IV** **<u>Lasers and Holography</u>** : Spontaneous and stimulated emission (Einstein A and B coefficients), population inversion, basic principles of operation of He-Ne, Ruby and semiconductor lasers. **<u>Optical Fibers</u>** : Types of optical fibers and their characteristics, characteristics of step, graded , mono mode and multi mode fibers, numerical aperture and its measurement, fiber optical communication. Principles and applications of holography **UNIT-V** **<u>Magnetic Materials</u>**: Magnetization- origin of magnetic moment, classification of	superconductors, flux quantization, magnetic levitation, high temperature superconductors, superconducting materials, Cooper pairs and postulates of BCS theory.	

		magnetic materials- die, Para and ferromagnetism, hysteresis curve, soft and hard magnetic materials. Superconductivity: General properties of superconductors, Meissonier effect, penetration depth, type I and Type II superconductors, flux quantization, magnetic levitation, high temperature superconductors, superconducting materials, Cooper pairs and postulates of BCS theory.		
13	**BT202**	**INTRODUCTION TO COMPUTER PROGRAMMING** **UNIT I** Concept of algorithms, Flow Charts, Overview of the compiler (preferably GCC) , Assembler, linker and loader , Structure of a simple Hello World Program in C ,Overview of compilation and execution process in an IDE (preferably Code Block) **UNIT II**	**INTRODUCTION TO COMPUTER PROGRAMMING** UNIT I Concept of algorithms, Flow Charts, Overview of the compiler (preferably GCC) , Assembler, linker and loader , Structure of a simple Hello World Program in C ,Overview of compilation and execution process in an IDE (preferably Code Block) UNIT II Programming using C: Preprocessor Directive, C primitive input output using get char and put char , simple I/O Function calls from library , data type in C including enumeration , arithmetic, relational and	**No Change**

			Programming using C: Preprocessor Directive, C primitive input output using get char and put char , simple I/O Function calls from library , data type in C including enumeration , arithmetic, relational and logical operations, conditional executing using if, else, switch and break .Concept of loops , for, while and do-while , Storage Classes: Auto, Register, Static and Extern **UNIT III** Arrays and Strings: Declaring an array, Initializing arrays, accessing the array elements, working with multidimensional arrays, declaring and initializing string variables, arithmetic operations on characters. Pointers: Declaring and initializing pointers, pointer expressions, pointer increment and scale factor, pointers and arrays, pointers and strings. **UNIT IV**	logical operations, conditional executing using if, else, switch and break .Concept of loops , for, while and do-while , Storage Classes: Auto, Register, Static and Extern UNIT III Arrays and Strings: Declaring an array, Initializing arrays, accessing the array elements, working with multidimensional arrays, declaring and initializing string variables, arithmetic operations on characters. Pointers: Declaring and initializing pointers, pointer expressions, pointer increment and scale factor, pointers and arrays, pointers and strings. UNIT IV Functions: Defining functions, passing arguments to functions, returning values from functions, reference arguments, variables and storage classes, static functions, pointers and functions. Structures: Declaring and initializing a structure, accessing the members of a structure, nested structures, array of structures, using structures in functions, pointers and structures. UNIT V: File Handling in C Using File Pointers, fopen( ), fclose( ), Input and Output using file pointers, Character Input and Output with Files , String Input / Output Functions , Formatted Input / Output Functions, Block Input / Output Functions, Sequential Vs	

		Functions: Defining functions, passing arguments to functions, returning values from functions, reference arguments, variables and storage classes, static functions, pointers and functions. Structures: Declaring and initializing a structure, accessing the members of a structure, nested structures, array of structures, using structures in functions, pointers and structures. **UNIT V:** File Handling in C Using File Pointers, fopen( ), fclose( ), Input and Output using file pointers, Character Input and Output with Files , String Input / Output Functions , Formatted Input / Output Functions, Block Input / Output Functions, Sequential Vs Random Access Files , Positioning the File Pointer.	Random Access Files , Positioning the File Pointer.	

14	**BT203**	**ENGINEERING MECHANICS** **Unit I** Force System: Introduction, force, principle of transmissibility of force, resultant of a force system, resolution of a force, moment of force about a line. Varigon's theorem, couple, resolution of force into force and a couple, properties of couple and their application to engineering problems. Lami's theorem. Force body diagram. **Unit II** Centroid & Moment of Inertia: Location of centroid and center of gravity, Moment of inertia, Parallel axis and perpendicular axis theorem, Radius of gyration, M.I of composite section, Polar Moment of inertia, Lifting Machines: Mechanical advantage, Velocity Ratio, Efficiency of machine, Ideal machine, Ideal effort and ideal load, Reversibility of machine, Law of machine, Lifting machines; System of Pulleys, Wheel and differential axle, differential pulley Block, **Unit III** Friction: Types of Friction, Laws of friction, Angle of	**ENGINEERING MECHANICS** **Unit I** Force System: Introduction, force, principle of transmissibility of force, resultant of a force system, resolution of a force, moment of force about a line. Varigon's theorem, couple, resolution of force into force and a couple, properties of couple and their application to engineering problems. Lami's theorem. Force body diagram. **Unit II** Centroid & Moment of Inertia: Location of centroid and center of gravity, Moment of inertia, Parallel axis and perpendicular axis theorem, Radius of gyration, M.I of composite section, Polar Moment of inertia, Lifting Machines: Mechanical advantage, Velocity Ratio, Efficiency of machine, Ideal machine, Ideal effort and ideal load, Reversibility of machine, Law of machine, Lifting machines; System of Pulleys, Wheel and differential axle, differential pulley Block, **Unit III** Friction: Types of Friction, Laws of friction, Angle of repose, Ladder, Wedge, Belt Friction. Belt Drive: Types of belts, Types of belt drives, Velocity ratio, Effect of slip on Velocity ratio, Length of belt, Ratio of tensions and power transmission by flat belt drives.	**No Change**

			friction, Angle of repose, Ladder, Wedge, Belt Friction. Belt Drive: Types of belts, Types of belt drives, Velocity ratio, Effect of slip on Velocity ratio, Length of belt, Ratio of tensions and power transmission by flat belt drives. **Unit IV** Kinematics of Particles and Rigid Bodies: Velocity, Acceleration, Types of Motion, Equations of Motion, Rectangular components of velocity and acceleration, Angular velocity and Angular Acceleration, Radial and transverse velocities and accelerations, Projectiles motion on plane and Inclined Plane, Relative Motion. Newton's laws, Equation of motion in rectangular Coordinate, radial and transverse components, Equation of motion in plane for a rigid body, D'Alembert principle. **Unit V** Work, Energy and Power: Work of a force, weight, spring force and couple, Power, Efficiency, Energy, Kinetic energy of rigid body, Principle of work and energy, Conservative and Nonconservative Force, Conservation of energy. Impulse and	**Unit IV** Kinematics of Particles and Rigid Bodies: Velocity, Acceleration, Types of Motion, Equations of Motion, Rectangular components of velocity and acceleration, Angular velocity and Angular Acceleration, Radial and transverse velocities and accelerations, Projectiles motion on plane and Inclined Plane, Relative Motion. Newton's laws, Equation of motion in rectangular Coordinate, radial and transverse components, Equation of motion in plane for a rigid body, D'Alembert principle. **Unit V** Work, Energy and Power: Work of a force, weight, spring force and couple, Power, Efficiency, Energy, Kinetic energy of rigid body, Principle of work and energy, Conservative and Nonconservative Force, Conservation of energy. Impulse and Momentum: Linear and angular momentum, Linear and angular impulse, Principle of momentum for a particle and rigid body, Principle of linear impulse and momentum for a Particle and rigid body, Principle of angular momentum and Impulse, Conservation of angular	

			Momentum: Linear and angular momentum, Linear and angular impulse, Principle of momentum for a particle and rigid body, Principle of linear impulse and momentum for a Particle and rigid body, Principle of angular momentum and Impulse, Conservation of angular		
15	**BT204**	**Digital Electronics** **UNIT I** **BASIC LOGIC GATES & BOOLEAN ALGEBRA:** Features of logic algebra, postulates of Boolean algebra. Theorems of Boolean algebra. Boolean function. Derived logic gates: Exclusive-OR, NAND, NOR gates, their block diagrams and truth tables. Logic diagrams from Boolean expressions and vice-versa. Converting logic diagrams to universal logic. Positive, negative and mixed logic. Logic gate conversion. **UNIT II** **DIGITAL LOGIC GATE CHARACTERISTICS:** TTL logic gate characteristics. Theory & operation of TTL	**Digital Electronics** **UNIT I** **BASIC LOGIC GATES & BOOLEAN ALGEBRA:** Features of logic algebra, postulates of Boolean algebra. Theorems of Boolean algebra. Boolean function. Derived logic gates: Exclusive-OR, NAND, NOR gates, their block diagrams and truth tables. Logic diagrams from Boolean expressions and vice-versa. Converting logic diagrams to universal logic. Positive, negative and mixed logic. Logic gate conversion. **UNIT II** **DIGITAL LOGIC GATE CHARACTERISTICS:** TTL logic gate characteristics. Theory & operation of TTL NAND gate circuitry. Open collector TTL. Three state output logic. TTL subfamilies. MOS & CMOS logic families. Realization of logic gates in RTL, DTL, ECL, C-MOS & MOSFET. Interfacing logic families to one another. **UNIT III** **MINIMIZATION TECHNIQUES:** Minterm, Maxterm, Karnaugh Map, K map upto 4 variables. Simplification of logic functions with K-map, conversion of truth tables in	**No Change**

			NAND gate circuitry. Open collector TTL. Three state output logic. TTL subfamilies. MOS & CMOS logic families. Realization of logic gates in RTL, DTL, ECL, C-MOS & MOSFET. Interfacing logic families to one another. **UNIT III** **MINIMIZATION TECHNIQUES:** Minterm, Maxterm, Karnaugh Map, K map upto 4 variables. Simplification of logic functions with K-map, conversion of truth tables in POS and SOP form. Incomplete specified functions. Variable mapping. Quinn-Mc Klusky minimization techniques. **UNIT IV** **COMBINATIONAL SYSTEMS:** Combinational logic circuit design, half and full adder, subtractor. Binary serial and parallel adders. BCD adder. Binary multiplier. Decoder: Binary to Gray decoder, BCD to decimal, BCD to 7-segment decoder.	POS and SOP form. Incomplete specified functions. Variable mapping. Quinn-Mc Klusky minimization techniques. **UNIT IV** **COMBINATIONAL SYSTEMS:** Combinational logic circuit design, half and full adder, subtractor. Binary serial and parallel adders. BCD adder. Binary multiplier. Decoder: Binary to Gray decoder, BCD to decimal, BCD to 7-segment decoder. Multiplexer, demultiplexer, encoder. Octal to binary, BCD to excess-3 encoder. Diode switching matrix. Design of logic circuits by multiplexers, encoders, decoders and demultiplexers. **UNIT V** **SEQUENTIAL SYSTEMS:** Latches, flip-flops, R-S, D, J-K, Master Slave flip flops. Conversions of flip-flops. Counters : Asynchronous (ripple), synchronous and synchronous decade counter, Modulus counter, skipping state counter, counter design. Ring counter. Counter applications, Registers: buffer register, shift register.	

		Multiplexer, demultiplexer, encoder. Octal to binary, BCD to excess-3 encoder. Diode switching matrix. Design of logic circuits by multiplexers, encoders, decoders and demultiplexers. **UNIT V** **SEQUENTIAL SYSTEMS:** Latches, flip-flops, R-S, D, J-K, Master Slave flip flops. Conversions of flip-flops. Counters : Asynchronous (ripple), synchronous and synchronous decade counter, Modulus counter, skipping state counter, counter design. Ring counter. Counter applications, Registers: buffer register, shift register.		
16	**BT205**	**Applied Mathematics II** **UNIT I** Vector spaces, linear dependence of vectors, basis and linear transformations, scalar and vector fields, level surfaces, directional derivatives, gradient, divergence and curl of fields, Green, Gauss	**Applied Mathematics II** **UNIT I** Vector spaces, linear dependence of vectors, basis and linear transformations, scalar and vector fields, level surfaces, directional derivatives, gradient, divergence and curl of fields, Green, Gauss and Stokes theorems. **UNIT II** Matrix algebra, rank of a matrix, adjoint and inverse of a matrix, Solution of algebraic	**No Change**

			and Stokes theorems. **UNIT II** Matrix algebra, rank of a matrix, adjoint and inverse of a matrix, Solution of algebraic equations using matrix algebra , consistency conditions, eigenvalues and eigenvectors , Hermitian matrices. **UNIT III** Numerical solution of matrix equations using Gauss, Gauss-Seidel, LU decomposition and other iterative methods. **UNIT IV** Convergence of improper integrals, tests of convergence, elementary properties of beta and gamma functions, differentiation under integral sign, Leibnitz rule, integrals dependent on a parameter, trapezoidal and Simpson's integration rules, applications in engineering. **UNIT V** Numerical methods; round off and truncation errors, approximations, order	equations using matrix algebra , consistency conditions, eigenvalues and eigenvectors , Hermitian matrices. **UNIT III** Numerical solution of matrix equations using Gauss, Gauss-Seidel, LU decomposition and other iterative methods. **UNIT IV** Convergence of improper integrals, tests of convergence, elementary properties of beta and gamma functions, differentiation under integral sign, Leibnitz rule, integrals dependent on a parameter, trapezoidal and Simpson's integration rules, applications in engineering. **UNIT V** Numerical methods; round off and truncation errors, approximations, order of convergence, Newton's forward and backward interpolation formula, central difference interpolation, solutions of polynomial equations using bisection, Newton-Raphson and Regula-falsi methods.	

		of convergence, Newton's forward and backward interpolation formula, central difference interpolation, solutions of polynomial equations using bisection, Newton-Raphson and Regula-falsi methods.		
17	**BT206**	**Environmental Sciences** **UNIT I** **Ecosystem and Biodiversity:** Components and types of ecosystem, Structure and functions of Ecosystem, Values, Type and levels of Biodiversity, Causes of extension, and Conservation methods of biodiversity. **UNIT II** **Air Pollution:** Definition, different types of Sources, effects on biotic and abiotic components and Control methods of air pollution. **UNIT III** **Water pollution:** Definition, different types of Sources, effects on biotic and	**Environmental Sciences** **UNIT I** **Ecosystem and Biodiversity:** Components and types of ecosystem, Structure and functions of Ecosystem, Values, Type and levels of Biodiversity, Causes of extension, and Conservation methods of biodiversity. **UNIT II** **Air Pollution:** Definition, different types of Sources, effects on biotic and abiotic components and Control methods of air pollution. **UNIT III** **Water pollution:** Definition, different types of Sources, effects on biotic and abiotic components and treatment technologies of water pollution. **UNIT IV** **Noise Pollution:** Introduction of noise pollution, different Sources, effects on abiotic and biotic environment and Control measures. **UNIT V** **Non Conventional energy sources:** Introduction, Renewable Sources of Energy: Solar energy, wind energy, Energy from	**No Change**

		abiotic components and treatment technologies of water pollution. **UNIT IV** **Noise Pollution:** Introduction of noise pollution, different Sources, effects on abiotic and biotic environment and Control measures. **UNIT V** **Non Conventional energy sources:** Introduction, Renewable Sources of Energy: Solar energy, wind energy, Energy from ocean, energy from biomass, geothermal energy and Nuclear Energy.	ocean, energy from biomass, geothermal energy and Nuclear Energy.	
18	**BT207**	**Electrical and Electronics Lab-II** **List of Experiment:** 1. To verify the truth tables of basic logic gates: AND, OR, NOR, NAND, NOR. Also to verify the truth table of Ex-OR, Ex-NOR. 2. To verify the truth table of OR, AND, NOR, Ex-OR, Ex-NOR realized using NAND & NOR gates. 3. To realize an SOP and POS expression. 4. To realize adder and Subtractor using universal gates. 5. To verify the truth table of Encoder and decoder.	**Electrical and Electronics Lab-II** **List of Experiment:** 1. To verify the truth tables of basic logic gates: AND, OR, NOR, NAND, NOR. Also to verify the truth table of Ex-OR, Ex-NOR. 2. To verify the truth table of OR, AND, NOR, Ex-OR, Ex-NOR realized using NAND & NOR gates. 3. To realize an SOP and POS expression. 4. To realize adder and Subtractor using universal gates. 5. To verify the truth table of Encoder and decoder. 6. To verify the truth table of	**No Change**

		6. To verify the truth table of multiplexer and demultiplexer. 7. To study and perform Various types of Flip-Flops. 8. To study and perform various types of counters. 9. To study and perform various types of shift registers. 10. To study and perform various types of Multivibrators. 11. To study and perform Schmitt Trigger.	multiplexer and demultiplexer. 7. To study and perform Various types of Flip-Flops. 8. To study and perform various types of counters. 9. To study and perform various types of shift registers. 10. To study and perform various types of Multivibrators.	
19	**BT208**	**Engineering Physics Lab-II** **List of Experiments:** 1. Conversion of a Galvanometer in to an ammeter and calibrate it. 2. Conversion of a Galvanometer in to voltmeter and calibrate it. 3. To determine the value of "g" by using compound pendulum. 4. To determine Plank's constant using LED. 5. To measure the Numerical Aperture (NA) of an optical fiber. 6. To determine the profile of He-Ne Laser beam. 7. To determine the wavelength of different lights using diffraction grating and spectrometer. 8. To determine the wavelength of sodium light by Newton's ring method. 9. To determine the specific rotation of glucose using Polarimeter. 10. To determine minimum deviation angle for different light using prism and spectrometer. 11. To study of detergent on surface tension of water by observing capillary rise 12. To determine the speed of sound in air at room temperature using a resonance	**Engineering Physics Lab-II** **List of Experiments:** 1. Conversion of a Galvanometer in to an ammeter and calibrate it. 2. Conversion of a Galvanometer in to voltmeter and calibrate it. 3. To determine the value of "g" by using compound pendulum. 4. To determine Plank's constant using LED. 5. To measure the Numerical Aperture (NA) of an optical fiber. 6. To determine the profile of He-Ne Laser beam. 7. To determine the wavelength of different lights using diffraction grating and spectrometer. 8. To determine the wavelength of sodium light by Newton's ring method. 9. To determine the specific rotation of glucose using Polarimeter. 10. To determine minimum deviation angle for different light using prism and spectrometer. 11. To study of detergent on surface tension of water by observing capillary rise 12. To determine the speed of sound in air at room temperature using a resonance tube by two resonance position.	**No Change**

		tube by two resonance position.		
20	**BT209**	**COMPUTER PROGRAMMING LAB** **LIST OF EXPERIMENTS** 1 Write a program to calculate the area & perimeter of rectangle. 2 Write a program to calculate the area and circumference of a circle for a given radius. 3 Write a program to calculate simple interest for a given principal/amount. 4 Write a program to convert temperature given in ◦C to temperature in ◦F. 5 Write a program to find profit and loss (in percentage) of a given cost price and selling price. 6 Write a program to find out the maximum among the three given numbers. 7 Write a program to calculate the factorial of a given number. 8 Write a program to print the list of first 100 odd number. 9 Write a program to calculate the sum of the digits of a number and display it in reverse order. 10 Write a program to generate a Fibonacci series. 11 Write a program to generate the following series: 1 2 1 2 3 1 2 3 4 1 2 3 4 5 12 Write a program to generate the following series: 0 1 0 1 0 0 1 0 1 0 1 0 1 0 13 Write a program using a function to check whether the given number is prime or not. 14 Write a program to check whether the given string is a palindrome or not. 15 Write a program to find the length	**COMPUTER PROGRAMMING LAB** **LIST OF EXPERIMENTS** 1 Write a program to calculate the area & perimeter of rectangle. 2 Write a program to calculate the area and circumference of a circle for a given radius. 3 Write a program to calculate simple interest for a given principal/amount. 4 Write a program to convert temperature given in ◦C to temperature in ◦F. 5 Write a program to find profit and loss (in percentage) of a given cost price and selling price. 6 Write a program to find out the maximum among the three given numbers. 7 Write a program to calculate the factorial of a given number. 8 Write a program to print the list of first 100 odd number. 9 Write a program to calculate the sum of the digits of a number and display it in reverse order. 10 Write a program to generate a Fibonacci series. 11 Write a program to generate the following series: 1 2 1 2 3 1 2 3 4 1 2 3 4 5 12 Write a program to generate the following series: 0 1 0 1 0 0 1 0 1 0 1 0 1 0 13 Write a program using a function to check whether the given number is prime or not. 14 Write a program to check whether the given string is a palindrome or not. 15 Write a program to find the length of a string, reverse the string and copy one string to another by using library	**No Change**

		of a string, reverse the string and copy one string to another by using library function. 16 Write a program to swap two variables a & b using pointers. 17 Write a program to enter a line of text from keyboard and store it in the file. User should enter file name. 18 Write a recursive program for tower of Hanoi problem 19 Write a menu driven program for matrices to do the following operation depending on whether the operation requires one or two matrices • Addition of two matrices • Subtraction of two matrices • Finding upper and lower triangular matrices • Transpose of a matrix • Product of two matrices. 20 Write a program to copy one file to other, use command line arguments. 21 Write a program to perform the following operators an Strings without using String functions • To find the Length of String. • To concatenate two string. • To find Reverse of a string. • To Copy one sting to another string. 22 Write a Program to store records of an student in student file. The data must be stored using Binary File.Read the record stored in "Student.txt" file in Binary code.Edit the record stored in Binary File.Append a record in the Student file. 23 Write a programmed to count the no of Lowercase, Uppercase numbers and special Characters presents in the contents of File.	function. 16 Write a program to swap two variables a & b using pointers. 17 Write a program to enter a line of text from keyboard and store it in the file. User should enter file name. 18 Write a recursive program for tower of Hanoi problem 19 Write a menu driven program for matrices to do the following operation depending on whether the operation requires one or two matrices • Addition of two matrices • Subtraction of two matrices • Finding upper and lower triangular matrices • Transpose of a matrix • Product of two matrices. 20 Write a program to copy one file to other, use command line arguments. 21 Write a program to perform the following operators an Strings without using String functions • To find the Length of String. • To concatenate two string. • To find Reverse of a string. • To Copy one sting to another string. 22 Write a Program to store records of an student in student file. The data must be stored using Binary File.Read the record stored in "Student.txt" file in Binary code.Edit the record stored in Binary File.Append a record in the Student file. 23 Write a programmed to count the no of Lowercase, Uppercase numbers and special Characters presents in the contents of File.	
21	**BT210**	**Engineering Drawing** **Engineering Drawing** Sheet 1 Orthographic Projections (3 Problems) Sheet 2 Riveted joints: Lap joints, butt joints, chain riveting, zig-zag riveting Sheet 3 Screw fasteners, different threads, Nuts & bolts locking devices, set screws, Sheet 4 Scale, plain scales, diagonal scales, scale of chords	**Engineering Drawing** **Engineering Drawing** Sheet 1 Orthographic Projections (3 Problems) Sheet 2 Riveted joints: Lap joints, butt joints, chain riveting, zig-zag riveting Sheet 3 Screw fasteners, different threads, Nuts & bolts locking devices, set screws, Sheet 4 Scale, plain scales, diagonal scales, scale of chords	**No Change**

		Sheet 5 Conic Sections: Construction of ellipse, parabola and hyperbola Sheet 6 Engineering Curves: Cycloid, Epicycloids, Hypo-cycloid, Involutes, Archemedian and logarithmic spirals Sheet 7 Projection of points and lines, True inclinations and true length of straight lines, Traces of straight lines Sheet 8 Projection of planes and solids: Projection of planes, Projection of polyhedra, Pyramids.	Sheet 5 Conic Sections: Construction of ellipse, parabola and hyperbola Sheet 6 Engineering Curves: Cycloid, Epicycloids, Hypo-cycloid, Involutes, Archemedian and logarithmic spirals Sheet 7 Projection of points and lines, True inclinations and true length of straight lines, Traces of straight lines Sheet 8 Projection of planes and solids: Projection of planes, Projection of polyhedra, Pyramids.	
22	**BT211**	**Communication Skills Lab** 1. Introducing yourself. 2. Role Plays. 3. Word Formation. 4. Listening and Speaking Skills. 5. Words often mis-spelt and Mis-Pronounced. 6. One word for many. 7. Synonyms and Antonyms. 8. Seminar Presentation. 9. Group Discussion. 10. Job Interview.	**Communication Skills Lab** 1. Introducing yourself. 2. Role Plays. 3. Word Formation. 4. Listening and Speaking Skills. 5. Words often mis-spelt and Mis-Pronounced. 6. One word for many. 7. Synonyms and Antonyms. 8. Seminar Presentation. 9. Group Discussion. 10. Job Interview.	**No Change**
23	**BTEE301**	**Applied Mathematics-III** **UNIT1** **Differential Equations** - linear differential equations of higher order with constant coefficients. Second Order ODE with Variable Coefficients, Homogeneous form, Exact Equations, Change of Dependent variable, Change of Independent Variable, Normal form, Variation of Parameters. **UNIT 2** **Series Solutions -** Solution in series of second order LDE with variable coefficients (CF only). **PARTIAL DIFFERENTIAL EQUATION-** Partial differential equation of first order, Lagrange's form, standard forms, Charpit's method **UNIT 3** **Laplace Transform - Laplace**	**Electronic Devices & Circuits** **UNIT-1** Semiconductor Physics: Mobility and conductivity, charge densities in a semiconductor, Fermi Dirac distribution, Fermi-Dirac statistics and Boltzmann approximation to the Fermi-Dirac statistics, carrier concentrations and Fermi levels in semiconductor. Generation and recombination of charges, diffusion and continuity equation, transport equations, Mass action Law, Hall effect. **UNIT-2** Junction Diodes: Formation of homogenous and hetrojuntion diodes and their energy band diagrams, calculation of contact potential and depletion width, V-I characteristics, Small signal models of diode, Diode as a circuit element, diode parameters and load line concept, C-V characteristics and dopant profile. Applications of diodes in rectifier, clipping, clamping circuits and voltage	**New course**

		transform with its simple properties, Laplace transform of unit step function and periodic function, Convolution Theorem, inverse Laplace transform, applications to the solution of ordinary and partial differential equations having constant coefficient with special reference to heat equation and wave equation. **UNIT 4** **Statistics-** Standard deviation, moments, skewness, kurtosis, Curve fitting methods-method of least squares, fitting of a straight line, parabola. Correlation and regression, line of regression. **Fourier Series -** Expansion of simple functions in Fourier series. Half range series, Change of intervals, Harmonic analysis. **UNIT 5** **Fourier Transform -** Complex form of Fourier Transform and its inverse, Fourier sine and cosine transform and their inversion. Applications of Fourier transform to solution of partial differential equations having constant co-efficient with special reference to heat equation and wave equation.	multipliers.Transient behavior of PN diode.Breakdown diodes, Schottky diodes, and Zener diode as voltage regulator.Construction, characteristics and operating principle of UJT. **UNIT-3** Transistors: Characteristics, Current Components, Current Gains: alpha and beta. Variation of transistor parameter with temperature and current level, Operating point, Hybrid model, DC model of transistor, h-parameter equivalent circuits.CE, CB and CC configuration DC and AC analysis of single stage CE, CC (Emitter follower) and CB amplifiers AC & DC load line, Ebers-Moll model.Biasing & stabilization techniques.Thermal runaway, Thermal stability. **UNIT-4** JFET & MOSFET:Construction and operationofJFET & MOSFET, noise performances of FET, parasitic of MOSFET, small signal models of JFET & MOSFET Biasing of JFET's & MOSFET's. Low frequency single stage CS and CD (source follower) JFET amplifiers.FET as voltage variable resistor and active load. **UNIT-5** Small Signal Amplifiers at Low Frequency: Analysis of BJT and FET multistage amplifier, DC and RC coupled amplifiers. Frequency response of single and multistage amplifier, mid-band gain, gains at low and high frequency. Analysis of DC and differential amplifiers, Miller's Theorem, use of Miller and bootstrap configuration.Cascade and cascade configuration of multistage amplifiers (CE-CE, CE-CB, CS-CS and CS-CD), Darlington pair.	
24	**BTEE302**	**Circuit Analysis-I** **Unit I** **Coupled Circuit**:- Conductively coupled circuit, mutual impedance, magnetic coupling, mutual inductance, coefficient of magnetic coupling, transferred impedance, transformer equivalent inductively and conductively coupled circuits.	**Circuit Analysis-I** **UNIT-I** Introduction: Introduction to circuit elements and their characteristics. Current and voltage reference. Response of single element, double element and triple element circuits. Resonance, selectivity & Q-factor in ac circuits. Network Analysis: Network voltages. Mesh & node systems of network equations and their comparison. Graph of network,	**Syllabus Change**

		Unit II **Network theorem** :- Thevenin's theorem, Norton's theorem, superposition, reciprocity, compensation, millman's, tellegen's, maximum power transfer and miller's theorem. **Unit III** **Graph Theory**:- Introduction, concept of graph of the networks, trees and their properties, incidence matrix, fundamental tie set matrix, fundamental cut set matrix, equilibrium equation on loop and node bases and their solutions. **Unit IV** **Poly phase Circuit**:- Star and delta combination, four wire star connection, balanced three phase voltages and unbalanced impedances, power and reactive volt-amperes in 3phase system, power relation in 3phase circuits. Power factor, resonance, resonance between parallel R-C and R-L circuit, selectivity and bandwidth, physical interpretation of selectivity. **Unit V** **Time Domain and Frequency Domain Analysis**:- response of networks to step, ramp, impulse, pulse and sinusoidal inputs, time domain and frequency domain analysis of circuits, sifting theorem, initial and final value theorem, special signal waveforms with lapalace transform & application to circuit operation.	tree, incidence matrix, fundamental circuit functions, cut sets, f-circuits analysis and f-cut set analysis, node and node pair analysis. Duality. Method of obtaining dual network. **UNIT-II** Network Theorems:Thevenis's, Norton's, Superposition, Reciprocity, Compensation, Millman's theorem Tellegen's, Maximum power transfer and Miller`s theorems in DC & AC Circuits. **UNIT-III** Polyphase Circuits: General Circuit Relations: Three Phase Star, Three Phase Delta, Star and Delta Combination, Four Wire Star Connection.Balanced and unbalanced Three Phase Voltages, currents and Impedances. Power and Reactive Volt-Amperes in a 3-Phase System Power Relations in AC Circuits: Instantaneous Power in AC Circuits, Power Factor, Apparent Power, Reactive Power, Power Triangle, Complex Power. **UNIT-IV** Non-Sinusoidal Waves: Complex Periodic Waves and Their Analysis By Fourier Series. Different Kinds of Symmetry, Determination of Co-Efficient. Average and Effective Values of a Non-Sinusoidal Wave, Power in a Circuit of Non-Sinusoidal Waves of Current and Voltage Form Factor, Equivalent Sinusoidal Wave and Equivalent Power Factor. Response of Linear Network to Non-Sinusoidal Periodic Waves. **UNIT-V** Time Domain and Frequency Domain Analysis: Response of networks to step, ramp, impulse, pulse and sinusoidal inputs. Time domain and frequency domain analysis of circuits. Shifting theorem, initial and final value theorems. Special signal waveforms with Laplace transform & applications to circuit operations.	
25	**BTEE303**	Electrical Machine-I **Unit I** **Energy conversion** : Principal of Electromechanical energy conversion, Energy stored in a magnetic field system , Singly and Doubly excited system . **Unit II** **DC generators**: Construction ,Type of dc generators , Emf	Liner Integrated Circuits **UNIT-I** OPERATIONAL AMPLIFIERS: Basic differential amplifier analysis, Basic structure and principle of operation, Single ended and double ended configurations ,, calculation of differential gain, common mode gain, Op-amp configurations	**New course**

		equation , lap& wave windinas , Armature reaction , Commutations , Methods of improving commutations demagnetizing and cross magnetizing mmf , Inter poles characteristics , Parallel operation,. **Unit III** **DC motor**: Principal ,Back emf , Types , Production of torque , Armature reaction & inter poles characteristics of shunt, Series & compound motor ,DC motor starting , Speed control of dc motor , Armature voltage and Field Current.Control method, ward Leonard method , Breaking, losses and Efficiency, Direct & Indirect test ,Swin burne test , Hopkinsim Test, Field & Retardation Test, **Unit IV** **Transformer** : Construction , Theory and operation , Emf equation , Phasor diagram , Equivalent circuit , Open and Short Circuit test , Back to Back test , Voltage regulation and Efficiency ,Autotransformers, Three winding Transformers, Parallel Operation Of Single Phase and Three Phase Transformer, Three Phase Transformer Connections, Phasor groups , Three phase to Two Phase and Six Phase Conversion , Harmonics and Excitation Phenomenon , Inrush Corrent Phenomena . **Unit V** **Cross Field Machines**: Principal of Operation of Rosenberg generators, Amplidyne and Metadyne .	with feedback, Op-amp parameters, Inverting and Non-Inverting configuration, Comparators, Adder. **UNIT-II** OPERATIONAL AMPLIFIER APPLICATIONS: Integrator, Differentiator, Voltage to frequency & Frequency to voltage converters. Oscillators: Phase shift, Wien bridge, Quadrature, precision rectifier, half and full wave rectifiers, square wave, triangular wave, sawtooth oscillators. Voltage controlled oscillators. **UNIT-III** **ACTIVE FILTERS**: Low pass, high pass, band pass and band reject filters, All pass filter, Switched capacitor filter, Butterworth filter design, Chebyshev Filter design. **UNIT-IV** **LINEAR ICs**: Four quadrant multiplier & its applications, Basic blocks of linear IC voltage regulators, Three terminal voltage regulators, Positive and negative voltage regulators. , A/D and D/A converters, analog switches, The 555 timer as astable and monostable multivibrators. Zero crossing detector, Schmitt trigger and its applications. **UNIT-V** **Non- linear Applications of OP-AMP**: log and antilog amplifiers, and multipliers. Solution of differential equation and analog computer PHASE-LOCKED LOOPS: Operating Principles of PLL, Linear Model of PLL, Lock range, Capture range, Applications of PLL as FM detector, FSK demodulator, AM detector, frequency translator, phase shifter, tracking filter, signal synchronizer and frequency synthesizer, Building blocks of PLL, LM 565 PLL.	
26	**BTEE304**	Electronic Measurements & Instrumentation **UNIT 1** MEASUREMENTS AND ERRORS - Measurements - significance of measurements - methods of measurement – instruments and measurement systems - classification of instruments – elements of	Object Oriented Programming UNIT-I Introduction: Review of structures in C, accessing members of structures using structure variables, pointer to structures, passing structures to functions Structures as user defined data types. UNIT-II Introduction to Programming Paradigms:	**Code Change**

			measurement system. Accuracy and precision - significant figures - types of errors - probability of errors - limiting errors. Repeatability, Systematic & random errors, modeling of errors, standard deviation, Gaussian error analysis, Combination of errors. **UNIT 2** ELECTRONIC INSTRUMENTS FOR MEASUREMENTS - DC Voltmeter, DC Ammeter, Ohm meter, Multimeter, AC meters,Electrodynamometer , Watt hour meter ,digital voltmeter , component measuring system Q meter , vector impedance meter, frequency meters.RF Power & Voltage Measurements. D'Arsonaval, Vibration and Ballistic galvanometers.Introduction to shielding & grounding **UNIT 3** BRIDGE MEASUREMENT - Introduction, Wheatstone Bridge, Kelvin Bridge, AC Bridges, Maxwell's inductance and capacitance bridges, Hay Bridge, Schering Bridge, unbalanced conditions - Wein Bridge, Wagner ground connection. Sources and Detectors. Anderson bridge, Heaviside bridge, DeSauty bridge Sources of errors in bridge measurements and their minimization. **UNIT 4** TRANSDUCERS - Classification of transducers , Selection Criteria, Characteristics, Construction, Working Principles, selecting transducers , strain gauges , displacement transducers , capacitive and inductive transducers, LVDT , oscillation transducer - piezoelectric, potentiometer, velocity transducers temperature transducers , optical transducers, RTD, Thermocouples, Thermistors, RVDT, Bourdon Tubes, Bellows. Diaphragms, Load Cell, Ultrasonic Flow Meters. **UNIT 5** SIGNAL GENERATION AND DISPLAY INSTRUMENTS - Sine wave generators, Frequency synthesized signal generators,	(Process oriented and Object oriented). Concept of object, class, objects as variables of class data type, difference in structures and class in terms of access to members, private and public Basics of C++: Structure of C++ programs, introduction to defining member functions within and outside a class, keyword *using*, declaring class, creating objects, constructors & destructor functions, Initializing member values with and without use of constructors, simple programs to access & manipulate data members, *cin* and *cout* functions. Dangers of returning reference to a private data member, constant objects and members function, composition of classes, friend functions and classes, using *this* pointer, creating and destroying objects dynamically using *new* and *delete* operators. Static class members, container classes and iterators, proxy classes. Members of a class, data & function members. Characteristics of OOP- Data hiding, Encapsulation, data security. UNIT-III Operator Overloading: Fundamentals, Restrictions, operator functions as class members v/s as friend functions. Overloading stream function, binary operators and unary operators.Converting between types. UNIT-IV Inheritance: Base classes and derived classes, protected members, relationship between base class and derived classes, constructors and destructors in derived classes, public, private and protected inheritance Relationship among objects in an inheritance hierarchy, abstract classes, virtual functions and dynamic binding, virtual destructors. UNIT-V Multiple inheritance, virtual base classes, pointers to classes and class members, multiple class members. Templates, exception handling.	

		Sweep frequency generators,Frequency - selective wave analyser,harmonic distortion analyzer, spectrum analyzer, logic analyzer, dual trace oscilloscope, digital storage oscillator , XY plotter. CRT Construction, Basic CRO circuits, CRO Probes, Oscilloscope Techniques of Measurement of frequency, Phase Angle and Time Delay, Multi beam, multi trace, sampling Oscilloscopes.		
27	**BTEE305**	**Generation of Electric Power** **Unit-1** **Conventional Energy Generation Methods**: **(i) Thermal Power plants:** Basic schemes and working principle. **(ii) Gas Power Plants:** open cycle and closed cycle gas turbine plants, combined gas & steam plants – basic schemes. **(iii) Hydro Power Plants:** Classification ofhydroelectric plants. Basic schemes of hydroelectric and pumped storage plants. **(iv) NuclearPower Plants:** Nuclear fission and Nuclear fusion. Fissile and fertile materials. Basic plantschemes with boiling water reactor, heavy water reactor and fast breeder reactor. Efficienciesof various power plants. **Unit-2** **New Energy Sources**: Impact of thermal, gas, hydro and nuclear power stations onenvironment. Green House Effect (Global Warming). Renewable and non-renewable energysources. Conservation of natural resources and sustainable energy systems. Indian energy scene. Introduction to electric energy generation by wind, solar and tidal. **Unit-3** **(i) Loads and Load curves:** Types of load, chronological load curve, load duration curve, energy load curve and mass curve. Maximum demand, demand factor, load factor, diversity factor, capacity factor and utilization. **(ii) Power factor improvement**: Causes and effects of low power factor and advantages of power factor improvement. Power factor improvement using shunt	**Electrical Machines-I** UNIT-I (I)Magnetic circuits:Magnetic circuits, magneto motive force magnetic field strength, permeability, reluctance, analogy between electric and magnetic-circuits, B-H curve, hysteresis, series and parallel magnetic circuits, practical magnetic circuits, permanent magnet and their applications. (ii)Electromechanical energy conversion: Basic principles, conservation of energy, physical phenomenon involved in conversion, energy balance, energy stored in magnetic field. UNIT-II DC Generators: Introduction, construction, types, emf equation, lap and wave windings, armature reaction, commutation, methods of improving commutation, equalizer rings Demagnetizing and cross magnetizing ampere turns, various characteristics of shunt, series and compound generators, voltage build up, losses and efficiency, condition for maximum efficiency. UNIT-III DC Motors: Introduction, principals, back-emf, torque of motor, types, characteristics of shunt, series and compound motors, speed control (field and armature control methods), basic idea of solid state devices in controlling of DC motors Starting of DC motors, three point and four point starters, losses and efficiency, testing (brake test and swimburnes test), electric braking of DC motors, Applications. UNIT-IV Transformer: Construction, Principal, Types, emf equation, no load and short circuit test, equivalent circuits, back-to-back	**Title change code change**

		capacitors and synchronous condensers. **Unit-4** **Power Plant Economics: (i)** Capital cost of plants, annual fixed and operating costs of plants, generation cost and depreciation. Effect of load factor on unit energy cost. Role of load diversity in power system economics. **(ii)** Calculation of most economic power factor when (a) kW demand is constant and (b) kVA demand is constant. **(iii) Energy cost reduction:** off peak energy utilization, co-generation, and energy conservation. **Unit-5** **(i) Tariffs:** Objectives of tariffs. General tariff form. Flat demand rate, straight meter rate, block meter rate. Two part tariff, power factor dependent tariffs, three-part tariff. Spot (time differentiated) pricing. **(ii) Selection of Power Plants:** Comparative study of thermal, hydro, nuclear and gas power plants. Base load and peak load plants. Size and types of generation units, types of reserve and size of plant. Selection and location of power plants.	(Sumpner's test), phasor diagram, Voltage regulation Efficiency, Condition for maximum efficiency, all day efficiency, parallel operation , auto-transformer, basic idea of welding transformer, current and potential transformer,separation of losses. UNIT V Polyphase Transformer: Construction,Various connections and groups, choice of connections, open delta connection, Scott connection, three phase to two phase conversion and vice-versa, Applications, Parallel operation and its conditions Three to six phase conversion.Excitation phenomenon in transformers, magnetizing harmonic currents and their effects,switching currents in transformers, inrush of magnetizing current.Three winding transformer. S. No. Name of authors'/books/publisher Year of pub. 1 A. E. Fitzgerald, C. Kingsley Jr and Umans, Electric Machinery, 6th Edition McGraw Hill, International Student Edition.2002 2 Kothari & Nagrath, Electric Machines, 3/e, TMH 2004	
28	**BTEE306**	**Object Oriented Programming** **Unit I:** Evolution of Programming Paradigms; Structured versus Object-Oriented Development; Elements of Object Oriented Programming – encapsulation, data hiding, data abstraction, inheritance, polymorphism, message communication; Popular OOP Languages, Merits and Demerits of Object Oriented Methodology. **Unit II:** Overview of C++; Class specification, class objects; Inline functions; Nesting of member functions, function overloading; Arrays within a class, arrays of objects, returning objects; Static data members, static member functions; Friend functions and friend classes; Constructors and Destructors – order of construction and destruction, parameterized constructors,	**Advanced Engineering Mathematics-**I UNIT-I Laplace Transform: Laplace transform with its simple properties, applications to the solution of ordinary and partial differential equations having constant coefficients with special reference to wave and diffusion equations, digital transforms. UNIT-II Fourier Transform: Discrete Fourier transform, Fast Fourier transform, Complex form of Fourier transform and its inverse applications Fourier transform for the solution of partial differential equations having constant coefficients with special reference to heat equation and wave equation. UNIT-III Fourier Series: Expansion of simple functions in Fourier series, half range series, change of interval, harmonic analysis.	**Title change code change**

		constructor overloading, constructors with default arguments, copy constructor, dynamic initialization of objects **Unit III:** Operator Overloading – rules for overloading, overloading unary & binary operators, overloading binary operators using friends; Type Conversions – basic to class type, class to basic type, class to class type; Inheritance – forms of inheritance, inheritance and member accessibility, constructors and destructors in derived classes, constructor invocation and data members initialization, virtual base classes, nested and inner classes. **Unit IV:** Concept of dynamic binding; Pointers to objects; this pointer; Pointers to derived classes; Virtual functions, pure virtual functions; Object Slicing; Abstract classes, Smart pointers; Managing Console I/O Operations – C++ stream classes, unformatted I/O operations, formatted console I/O operations, managing output with manipulators; File handling – classes for file stream operations, file modes, file pointers and their manipulations, sequential and random access to a file, saving and retrieving of objects. **Unit V:** Generic programming with templates - function templates, class templates; Exception handling model and constructs; Standard Template Library(STL) overview, container classes; Namespace; Runtime typecasting.	Calculus of Variation: Functional, strong and weak variations, simple variation problems, Euler's equation UNIT-IV Complex Variables: Analytic functions, Cauchy–Riemann equations, Elementary conformal mapping with simple applications Line integral in complex domain, Cauchy's theorem, Cauchy's integral formula. UNIT-V Complex Variables: Taylor's series, Laurent's series, poles, Residues. Evaluations of simple definite real integrals using the theorem of residues.Simple contour integration. S. No. Name of authors'/books/publisher Year of pub. 1 M. Ray, J. C. Chaturvedi & H.C. Sharma, Differential Equations, Students friends & company 2011 2 Chandrika Prasad, Mathematics for Engineers, Prasad Mudralaya 2012. Reference Books S. No. Name of authors'/books/publisher Year of pub. 1 Bird, Higher Engineering Mathematics, ELSEVIER. 2004 2 Jeffrey, Advanced Engineering Mathematics, ELSEVIER. 2001 3 Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudralaya 2006 4 Ervin Kreyzig, Advanced Engineering Maths, Wiley. 2005	
29	**BTEE307**	**Electrical Machine Lab – I** 1. Speed control of D.C. shunt motor by (a) field current control method& plot the curve for speed vs field current(b) armature voltage control method. 2. Speed control of D.C. motor by ward leonard method and to plot curve for speed vs applied armature voltage. 3. To determine the efficiency of D.C. shunt motor by loss swenmarion method. 4. To determine the efficiency of two identical D.C. machine by	**Electronic Devices Lab** 1. Study the following devices: (a) Analog & digital multimeters (b) Function/ Signal generators (c) Regulatedd. c. power supplies (constant voltage and constant current operations) (d) Study of analog CRO,measurement of time period, amplitude, frequency & phase angle using Lissajous figures. 2. Plot V-I characteristic of P-N junction diode & calculate cut-in voltage, reverse saturation current and static & dynamic resistances.	**New course**

		hopkinos's regenerative test. 5. To perform O.C. & S.C. a one phase transformer & determine the parameter of its equivalent ckt its voltage regulation &efficiency. 6. To perform back to back test on two identical I phase transformer & find their efficiency process of equivalent circuit. 7. To perform parallel operation of two 1 phase transformer & determine their load sharing. 8. To determine the efficiency & voltage regulation of single phase transformer by direct loading. 9. To perform OC & SC test on a 3 phase transformer find its efficiency & parameter of its equivalent circuit. To study and perform of 3 phase transformer for its varios connection i.e. star/star, star/delta, delta delta , delta/delta & find magnitude of 3rd harmonic current.	3. Plot V-I characteristic of zener diode and study of zener diode as voltage regulator. Observe the effect of load changes and determine load limits of the voltage regulator. 4. Plot frequency response curve for single stage amplifier and to determine gain bandwidth product. 5. Plot drain current - drain voltage and drain current – gate bias characteristics of field effect transistor and measure of Idss&Vp. 6. Application of Diode as clipper & clamper. 7. Plot gain- frequency characteristic of two stage RC coupled amplifier & calculate its bandwidth and compare it with theoretical value. 8. Plot gain- frequency characteristic of emitter follower & find out its input and output resistances. 9. Plot input and output characteristics of BJT in CB, CC and CE configurations. Find their h-parameters. 10. Study half wave rectifier and effect of filters on wave. Also calculate theoretical & practical ripple factor. 11. Study bridge rectifier and measure the effect of filter network on DC voltage output and ripple factor.	
30	**BTEE308**	**Electronic Measurement & Instrumentation Lab** 1. Measurement of strain/ force with the help of strain gauge load cell 2. Measurement of displacement with the help of LVDT 3. Plot V-I characteristics & measure open circuit voltage & short circuit current of a solar panel. 4. Measure unknown inductance capacitance resistance using following bridges (a) Anderson Bridge (b) Maxwell Bridge 5. To measure unknown frequency & capacitance using Wein's bridge. 6. Measurement of the distance with the help of ultrasonic transmitter & receiver. 7. Draw the characteristics of the following temperature transducers: (a) RTD (Pt-100) (b) Thermistors (c) Thermocouple	**Electrical Circuit Lab** 1. Draw the circuit symbols. 2. Verify theorems for A. C. & D. C. circuits. 3. PSPICE Programs for Circuit Analysis: a. DC: Analysis resistor networks to determine node voltages, components voltages, and component currents. b. DC: Analysis of resistor networks that have several voltage and current sources and variable load resistors. c. Transient: Analysis of RC & RL circuits to produce tables of component voltage & current levels for a given set of time instants & to produce graphs of voltages & currents versus time. d. AC: Analysis of impedance networks to determine the magnitude & phase of node voltages, components voltages and component currents. 4. Determine the magnitude & phase and component voltages and	**Syllabus Change** **Code Change**

		8. Study the working of Q-meter and measure Q of coils 9. Measure the speed of a Table Fan using stroboscope. 10. Study the working of DIGITAL STORAGE CRO 11. Study of Phase shift Oscillator.	currents in resonant circuits & produce.voltage and current verses frequency graphs. 5. Programs for Circuit Analysis: a. Calculate the resistance of a conductor, given its dimensions & resistivity or determine the change in conductor resistance when the temp changes. b. D.C.: Analysis of resistor networks to determine all junction voltages, component voltages, and component currents.Transient: c. Analysis RC & RL circuits to produce tables of component voltage & current levels for agiven set of time instants. 6. Convert Y-connected resistor networks to delta-connected circuits.	
31	**BTEE309**	**Object Oriented Programming Lab** 1) Define a class to represent a bank account. Include the following members: *Data members : Name of the depositor, Account number, Type of account, Balance amount in the account.* *Member functions : To assign initial values, To deposit an amount, To withdraw an amount after checking the balance, To display name and balance.* Write a main program to check the working. 2) Create two classes **DM** and **DB** which store the values of distances. **DM** stores distances in metres and centimetres and **DB** in feet and inches. Write a program that can read values for the class objects and add one object of **DM** with another object of **DB**. Use a friend function to carry out the addition operation. The object that stores the results may be a **DM** object or **DB** object, depending on the units in which the results are required. The display should be in the format of feet and inches or metres and centimetres depending on the object of display. 3) Write a function power() to raise a number m to a power n. The function takes a **int** value for m and **int** value for n, and returns the result correctly. Use a default value of 2 for n to make the function to calculate squares	**Electronics Engineering Design Lab** To design the following circuits, assemble these on bread board and test them. Simulation of these circuits with the help of appropriate software. 1 .Op-Amp characteristics and get data for input bias current measure the output-offset voltage and reduce it to zero and calculate slew rate. 2 .Op-Amp in inverting and non-inverting modes. 3 .Op-Amp as scalar, summer and voltage follower. 4 .Op-Amp as differentiator and integrator. 5 .Design LPF and HPF using Op-Amp 741 6 .Design Band Pass and Band reject Active filters using Op-Amp 741. 7 .Design Oscillators using Op-Amp (i) RC phase shift (ii) Hartley (iii) Colpitts 8 .Design (i) Astable (ii) Monostable multivibrators using IC-555 timer 9 .Design Triangular & square wave generator using 555 timer. 10 .Design Amplifier (for given gain) using Bipolar Junction Transistor.	**New course**

		when this argument is omitted. Write a main() the gets the values of m and n from the user to test the function. Write another function that takes a **double** value for m. Both the functions should have the same name. Use the concept of function overloading. 4) Define a class String that could work as a user-defined string type. Include constructors that will enable to create an uninitialized string *String s1; // string with length 0* And also to initialize an object with a string constant at the time of creation like *String s2("Well done!");* Include a function that adds two strings to make a third string. Note that the statement *s2 = s1;* will be perfectly reasonable expression to copy one string to another. 5) Write a program to implement stack operations using OOP concepts. 6) Create a class Float Obj that contains one float data member. Overload all the four arithmetic operators so that they operate on the objects of Float Obj. 7) Write a program to implement operator overloading for complex number operations. 8) Write a program for matrix multiplication using the concept of friend operator overloading. 9) Write a program to implement the inheritance property by using the example of bank, where **Bank** is a base class and **Saving** and **Current** are two classes derived from bank. Member functions like deposit( ), withdraw( ), and display( ) should be implemented. 10) Create a base class called **shape**. Use this class to store two double type values that could be used to compute the area of figures. Derive two specific classes called **triangle** and **rectangle** from the base **shape**. Add to the base class, a member function **get_data( )** to initialize base class		

		data members and another member function **display_area( )** to compute and display the area of figures. Make **display_area( )** as a virtual function and redefine this function in the derived classes to suit their requirements. Using these three classes design a program that will accept dimensions of a triangle or rectangle interactively and display the area. 11) Write a program to demonstrate how to read and write class object.		
32	**BTEE310**	**Electrical Circuit Lab** 1. Verification of Tellegens Theorem. 2. Verification of Thevenin's and Norton's Theorem. 3. Verification of compensation Theorem. 4. Verification of Maximum Power Transfer theorem. 5. Verification of Reciprocity theorem. 6. Measurement of self inductance of a coil. 7. Verification of Miller's Theorem. 8. Transient response of RL and RC circuits for DC input. 9. Frequency response of series and parallel resonance circuits. 10. Frequency response of single tuned coupled circuits. 11. Verification of Millman's Theorem	**C++ Programming Lab** 1. To write a simple program for understanding of C++ program structure without any CLASS declaration. Program may be based on simple input output, understanding of keyword using. 2. Write a C++ program to demonstrate concept of declaration of class with public & private member, constructors, object creation using constructors, access restrictions, defining member functions within and outside a class. Scope resolution operators, accessing an object's data members and functions through different type of object handle name of object, reference to object, pointer to object, assigning class objects to each other. 3. Program involving multiple classes (without inheritance) to accomplish a task. Demonstrate composition of class. 4. Demonstration Friend function friend classes and this pointer. 5. Demonstration dynamic memory management using new & delete & static class members. 6. Demonstration of restrictions an operator overloading, operator functions as member function and/ or friend function, overloading stream insertion and stream extraction, operators, overloading operators etc. 7. Demonstrator use of protected members, public & private protected classes, multi-level inheritance etc. 8. Demonstrating multiple inheritance, virtual functions, virtual base classes, abstract classes.	**New course**
33	**BTEE311**	**Humanities & Social Science Unit I**	Humanities & Social Science Unit 1	**No Change**

		India: Brief history of Indian Constitution, farming features, fundamental rights, duties, directive principles of state. History of Indian National Movement, socio economic growth after independence. **Unit II** Society: Social groups- concept and types, socialization- concept and theory, social control: concept, social problem in contemporary India, status and role. **Unit III** The Fundamentals of Economics: meaning, definition and importance of economics, Logic of choice, central economic problems, positive and normative approaches, economic systems-socialism and capitalism. **Unit IV** Microeconomics: Law of demand supply, utility approach, indifference curves, elasticity of demand and supply and applications, consumer surplus, Law of returns to factors and returns to scale. **Unit V** Macroeconomics: concepts relating to National product–National income and its measurement, Simple Keynesian theory, simple multiplier, money and banking. Meaning, concept of international trade, determination of exchange rate, Balance of payments.	India: Brief history of Indian Constitution, farming features, fundamental rights, duties, directive principles of state. History of Indian National Movement, socio economic growth after independence. Unit 2 Society: Social groups- concept and types, socialization- concept and theory, social control: concept, social problem in contemporary India, status and role. Unit 3 The Fundamentals of Economics: meaning, definition and importance of economics, Logic of choice, central economic problems, positive and normative approaches, economic systems-socialism and capitalism. Unit 4 Microeconomics: Law of demand supply, utility approach, indifference curves, elasticity of demand and supply and applications, consumer surplus, Law of returns to factors and returns to scale. Unit 5 Macroeconomics: concepts relating to National product–National income and its measurement, Simple Keynesian theory, simple multiplier, money and banking. Meaning, concept of international trade, determination of exchange rate, Balance of payments.	
34	**BTEE401**	**Analog Electronics** **UNIT 1** **Field Effect Transistors & UJT**: FET Construction & characteristics of JFET - parameters of JFET The Pinch-off voltage, The FET Small-Signal model, MOSFET-depletion & enhancement modes, Equivalent circuits and biasing of JFET's & MOSFET's. Low frequency Common Source and Common Drain, Common Gate JFET amplifiers. FET as a voltage variable resistor. Construction, theory of operation & characteristics of PUT (Programmable UJT).	**Analog Electronics** **UNIT-I** **Feedback Amplifiers:** Classification, Feedback concept, Feedback Topologies, Transfer gain with feedback, General characteristics of negative feedback amplifiers Analysis of voltage-series, voltage-shunt, current-series and current-shunt feedback amplifier. Stabilitycriterion. Compensation techniques, miller compensation. **UNIT-II** **Oscillators &Multivibrators:** Classification. Criterion for oscillation.Tuned collector, Hartley, Colpitts, RC Phase shift,	**Syllabus Change**

		UNIT 2 **FEEDBACK AMPLIFIERS:** Classification, Feedback concept, Transfer gain with feedback, General characteristics of negative feedback amplifiers. Effect of feedback on noise, distortion, gain, input and output impedance of the amplifiers, Analysis of voltage-series, voltage-shunt, current-series and current-shunt feedback amplifier. Stability criterion. **UNIT 3** **Small Signal Amplifiers At Low & High Frequency:** **At Low Frequency:** Analysis of FET, Temperature compensation methods, Analysis of Direct Coupled amplifiers and differential amplifiers frequency response and midband gain, gains at low and high frequency. Miller's Theorem. Cascading Transistor amplifiers, Darlington pair. Source follower. **At High frequency** equivalent circuits for BJT and FET amplifiers, Calculation of Lower and Higher cutoff frequencies, Hybrid Pi model, conductances and capacitances of hybrid Pi model, high frequency analysis of CE amplifier, gain-bandwidth product. Emitter follower at high frequencies. **UNIT 4** **Power Amplifiers:** Power amplifier circuits, Class A output stage, class B output stage and class AB output stages, class C amplifiers, push pull amplifiers with and without transformers. Complementary symmetry & quasi complimentary symmetry amplifiers MOSFET Power amplifiers, Thermal stability of Power amplifiers, heat sink design. **UNIT 5** **Tuned Amplifier -** Band Pass Amplifier, Parallel resonant Circuits, Band Width of Parallel resonant circuit. Analysis of Single Tuned Amplifier, Primary & Secondary Tuned Amplifier with BJT & FET. Double Tuned Transformer Coupled Amplifier. Stagger Tuned Amplifier. Pulse Response of such Amplifier. Shunt Peaked Circuits for Increased Bandwidth. Instability	Wien Bridge and crystal oscillators Astable, monostable and bistablemultivibrators. Schmitt trigger. Blocking Oscillators **UNIT-III** **High Frequency Amplifiers:** Hybrid Pi model, conductances and capacitances of hybrid Pi model, high frequency analysis of CE amplifier Gain bandwidth product, unity gain frequency fT.Emitter follower at high frequencies. **UNIT-IV** **Tuned Amplifier**: Band pass amplifier, Parallel resonant circuits, Band Width of Parallel resonant circuit. Analysis of Single Tuned Amplifier, Primary & Secondary Tuned Amplifier with BJT & FET Double Tuned Transformer Coupled Amplifier. Stagger Tuned Amplifier. Pulse Response of such Amplifier. Class C tuned amplifiers, Shunt Peaked Circuits for Increased Bandwidth. **UNIT-V** **Power Amplifiers:** Classification, Power transistors & power MOSFET (DMOS, VMOS). Output power, power dissipation and efficiency analysis of Class A, class B, class AB, class C, class D and class E amplifiers as output stages. Pushpull amplifiers with and without transformers. Complementary symmetry & quasi complimentary symmetry amplifiers	

		of tuned amplifiers, stabilization techniques, neutralization, Class C tuned amplifiers and their applications. Efficiency of Class C tuned Amplifier.		
35	**BTEE402**	**Circuit Analysis-II** **Unit I** **Attenuators**:- Introduction , lattice attenuator, T- type and ∏ type attenuator , L- type attenuator ,ladder type and balanced attenuator. **Unit II** **Two Port Networks** :- Introduction , two port parameters (impedance, admittance, hybrid ,ABCD, inverse transmission parameters, inverse hybrid parameters) , interrelationship between the parameters, interconnections of two port networks, the ladder network, image impedance , image transfer fuction. **Unit III** **Network Functions And Fourier Series**:-Necessary condition for driving point function, & transfer fuction , pole &zeros,, time domain behavior from pole and zero plot , procedure for finding network fuctoins for general two terminal pair network, trigonometric furrier series, evaluation of fourier coefficients, wave form symmetry, exponential form of foyrier series. **Unit IV** **Network Synthesis**:- Hurwitz polynomial, positive real fuction, reactive network, foster I and II form & cauer I and II form **Unit V** **Filters**:- Constant k filters , the m-derived filters, image impedance of m- derieved half(or L) sections, composite filters, band pass& band elimination filters, lattice filters , barless's bisections theorem	**Circuit Analysis-II** **UNIT-I** **Impedance and Admittance Functions:** The concept of complex frequency, transform impedance and admittance,series and parallel combinations **UNIT-II** **Network Functions:** Terminals and terminal pairs, driving point impedance transfer functions, poles and zeros. Restrictions on pole and zero location in splane. Time domain behavior from pole and zero plot. Procedure for finding network functions for general two terminal pair networks **UNIT-III** **Network Synthesis:** Hurwitz polynomial, positive real functions, reactive networks. Separation property for reactive networks. The four-reactance function forms, specification for reactance function. Foster form of reactance networks. Cauer form of reactance networks. Synthesis of R-L and R-C networks in Foster and Cauer forms. **UNIT-IV** **Two Port General Networks:** Two port parameters (impedance, admittance, hybrid, ABCD parameters) and their inter relations. Equivalence of two ports. Transformer equivalent, inter connection of two port networks. The ladder network, image impedance, image transfer function, application to L-C network, attenuation and phase shift in symmetrical T and pi networks. **UNIT-V** **Two Port Reactive Network (Filters):** Constant K filters. The m-derived filter. Image impedance of m-derived half (or L) sections, composite filters. Bands pass and band elimination filters. The problem of termination, lattice filters, Barlett's bisection theorem. Introduction to active filters.	**No Change**

36	**BTEE403**	**Electric Machines-II** **Unit I** **Polyphase Induction Mechines**: Construction, principle of operation , slip, phasor diagram, equivalent circuits, expression for torque, and output power ,slip torque characteristics, effect of variation of supply voltage and rotor resistance on the characteristics , Circle digram. Predetermination of characteristics from the circuit diagram,Drawing circle diagram from design parameters and no load and blocked rotor test data. Starting of Induction motors, Direct on line starter, Star-Delta starter and autotransformer starter for cage induction motor by varying supply voltage, supply frequency and pole changing, speed control of slip ring induction motor by varying rotor resistance. **Unit II** **Special Machines :** High torque induction motor, double cage and deep bar rotor construction. Mains operated and self excited induction generators. Hysteresis motor,Reluctance motor and stepper motor, brushless motors. **Unit III** **Single Phase Induction Motors**: Principle of operation, double revolving field theory, Equivalent circuit, performance calculations and characteristics, Starting methods, Maximuma starting torque conditions in single- phase induction motors. **Unit IV** **Synchronous Machine**: types of Exciters for synchronous machines, MMF and short circuit characteristics, Leakage reactances, Synchronous reactance, Phasor digram under loaded conditions, Load characteristics, Predetermination of regultation by EMF and Portier triangle methods for non-salient pole aternators. Steady state power flow equations, Power angle characteristics, Constant excitation and constant power output, Circle diagram for synchronous machines. Two reation theory for sailent pole alternators and pre-determination	**Electrical Measurements** **UNIT-I** **Measuring Instruments:** Moving coil, moving iron, electrodynamic and induction instruments-construction, operation, torque equation and errors. Applications of instruments for measurement of current, voltage, single-phase power and singlephase energy. Errors in wattmeter and energy meter and their compensation and adjustment. Testing and calibration of single-phase energy meter by phantom loading. **UNIT-II** **Polyphase Metering:** Blondel's Theorem for n-phase, p-wire system. Measurement of power and reactive kVA in 3-phase balanced and unbalanced systems: Onewattmeter, two-wattmeter and three-wattmeter methods. 3-phase induction type energy meter. Instrument Transformers: Construction and operation of current and potential transformers. Ratio and phase angle errors and their minimization. Effect of variation of power factor, secondary burden and frequency on errors. Testing of CTs and PTs. Applications of CTs and PTs for the measurement of current, voltage, power and energy. **UNIT-III** **Potentiometers:** Construction, operation and standardization of DC potentiometers– slide wire and Crompton potentiometers. Use of potentiometer for measurement of resistance and voltmeter and ammeter calibrations. Volt ratio boxes. Construction, operation and standardization of AC potentiometer – in-phase and quadrature potentiometers. Applications of AC potentiometers.. **UNIT-IV** **Measurement of Resistances:** Classification of resistance. Measurement of medium resistances – ammeter and voltmeter method, substitution method, Wheatstone bridge method. Measurement of low resistances – Potentiometer method and Kelvin's double bridge method. Measurement of high resistance: Price's Guard-wire method. Measurement of earth resistance. **UNIT-V**	**Syllabus change** **Code change** **Title change**

		for regulation, slip test, V cures, inverted V cures, compounding curves for synchronous motor.Synchronizing motor, Synchronous condenser. **Unit V** **Parallel Operation of Alternators** : Synchronizing, Synchroscope, Parallel operation of alternators, Alternator on infinite bus bar, Effect of change of excitation and prime mover input, Expressions for power developed as a function of torque angle, maximum power.	**AC Bridges:** Generalized treatment of four-arm AC bridges. Sources and detectors. Maxwell's bridge, Hay's bridge and Anderson bridge for self-inductance measurement. Heaviside's bridge for mutual inductance measurement. De Sauty Bridge for capacitance measurement. Wien's bridge for capacitance and frequency measurements. Sources of error in bridge measurements and precautions. Screening of bridge components. Wagner earth device.	
37	**BTEE404**	**Non Conventional Energy Systems** **UNIT-1** **Energy resources and their utilization :** Indian and global energy sources, Energy exploited, Energy planning, Energy parameters (energy intensity, energy-GDP elasticity), Introduction to various sources of energy, Solar thermal, Photovoltaic, Water power, Wind energy, Biomass, Ocean thermal, Tidal and wave energy, Geothermal energy, Hydrogen energy systems, Fuel cells, Decentralized and dispersed generation. 3 **UNIT-2** **Solar energy:** Solar thermal power and it's conversion, Solar collectors, Flat plate, Performance analysis of flat plate collector, Solar concentrating collectors, Types of concentrating collectors, Thermodynamic limits to concentration, Cylindrical collectors, Thermal analysis of solar collectors, Solar thermal energy storage, Applications, Water heating, Space heating & cooling, Solar distillation, solar pumping, solar cooking, Greenhouses, Solar power plants. **Solar photovoltaic system:** Photovoltaic effect, Efficiency of solar cells, Semiconductor materials for solar cells, Solar photovoltaic system, Standards of solar photovoltaic system, Applications of PV system, PV hybrid system. 2 **UNIT-3** **Biogas** Photosynthesis, Bio gas production Aerobic and anaerobic bio-conversion process, Raw materials, Properties of bio gas,	**Generation of Electrical Power** **UNIT-I** **Conventional Energy Generation Methods :**(i) Thermal Power plants: Basic schemes and working principle. (ii) Gas Power Plants: open cycle and closed cycle gas turbine plants, combined gas & steam plants-basic schemes. (iii) Hydro Power Plants: Classification of hydroelectric plants. Basic schemes of hydroelectric and pumped storage plants. (iv) Nuclear Power Plants: Nuclear fission and nuclear fusion. Fissile and fertile materials. Basic plant schemes with boiling water reactor, heavy water reactor and fast breeder reactor. Efficiencies of various power plants **UNIT-II** **New Energy Sources:** Impact of thermal, gas, hydro and nuclear power stations on environment. Green House Effect (Global Warming).Renewable and nonrenewable energy sources Conservation of natural resources and sustainable energy systems. Indian energy scene. Introduction to electric energy generation by wind, solar and tidal. **UNIT-III** **Loads and Load Curves:** Types of load, chronological load curve, load duration curve, energy load curve and mass curve. Maximum demand, demand factor, load factor, diversity factor, capacity factor and utilization. **Power Factor Improvement:** Causes and effects of low power factor and advantages of power factor improvement. Power factor improvement using shunt capacitors and synchronous condensers.	**Code Change**

		Producer gas, Transportation of bio gas, bio gas plant technology & status, Community biogas plants, Problems involved in bio gas production, Bio gas applications, Biomass conversion techniques, Biomass gasification, Energy recovery from urban waste, Power generation from liquid waste, Biomass cogeneration, Energy plantation, Fuel properties, Biomass resource development in ndia. **UNIT-4** **Wind energy** Properties of wind, Availability of wind energy in India, wind velocity, Wind machine fundamentals, Types of wind machines and their characteristics, Horizontal and Vertical axis wind mills, Elementary design principles, Coefficient of performance of a wind mill rotor, Aerodynamic considerations in wind mill design, Selection of a wind mill, Wind energy farms, Economic issues, Recent development. 3 **UNIT-5** **Geothermal energy** Structure of earth's interior, Geothermal sites, earthquakes & volcanoes, Geothermal resources, Hot springs, Steam ejection, Principal of working, Types of geothermal station with schematic representation, Site selection for geothermal power plants. Advanced concepts, Problems associated with geothermal conversion. 2	**UNIT-IV** **Power Plant Economics:** (i) Capital cost of plants, annual fixed and operating costs of plants, generation cost and depreciation. Effect of load factor on unit energy cost. Role of load diversity in power system economics. (ii) Calculation of most economic power factor when (a) kW demand is constant and (b) kVA demand is constant. (iii) Energy cost reduction: off peak energy utilization, co-generation, and energy conservation. **UNIT-V** **(i) Tariffs:** Objectives of tariffs. General tariff form. Flat demand rate, straight meter rate, block meter rate. Two part tariff, power factor dependent tariffs, threepart tariff. Spot (time differentiated) pricing. **(ii) Selection of Power Plants:** Comparative study of thermal, hydro, nuclear and gas power plants. Base load and peak load plants. Size and types of generating units, types of reserve and size of plant. Selection and location of power plants.	
38	**BTEE405**	**Data Base Management System** **UNIT 1** **INTRODUCTION TO DBMS**: Overview and History of DBMS. File System vs. DBMS .Advantage of DBMS Describing and Storing Data in a DBMS. Queries in DBMS. Transaction management and Structure of a DBMS. **UNIT 2** **ENTITY RELATIONSHIP MODEL**: Overview of Data Design Entities, Attributes and Entity Sets, Relationship and Relationship Sets. Features of the ER Model-Key Constraints, Participation Constraints, Weak Entities, Class Hierarchies, Aggregation, Conceptual Data	**Electrical Machines-II** **UNIT-I** **AC Machines Fundamentals:** Introduction, emf equation, mmf of three phase AC winding, production of rotating magnetic field, types of AC windings Concentric, distributed and chorded windings, pitch factor, distribution factor, effect of these factors on induced emf, effect of harmonics. **UNIT-II** **Polyphase Induction Motor**: Introduction. Construction, cage and wound rotors, principal, starting and running torque, condition for maximum torque, equivalent circuits, no load and block rotor test.	**Code change Syllabus Change**

		Base, and Design with ER Model- Entity vs Attribute, Entity vs Relationship Binary vs. Ternary Relationship and Aggregation vs ternary Relationship Conceptual Design for a Large Enterprise. **UNIT 3** **RELATIONAL MODEL:** Relationship Algebra Selection and Projection, Set Operations, Renaming, Joints, Division, Relation Calculus, Expressive Power of Algebra and Calculus. **UNIT 4** **SQL AND TRIGGERS**: The Forms of a Basic SQL Query, Union, Intersection and Except, Nested Queries, Correlated Nested Queries, Set-Comparison Operations, Aggregate Operators, Null Values, Triggers and Active Databases. **UNIT 5** **NORMAL FORMS AND CONCURRENCY CONTROL:** Normalization using Functional Dependency, Multivalued dependency and Join dependency. Concurrency Control: Lock Based Protocols; Time Stamped Based Protocols, Deadlock Handling,.	Torque-slip characteristics, losses and efficiency, circle diagram, starting of cage and wound motors, speed control, cogging and crawling, double cage rotor, induction generator, application. **UNIT-III** (i) **Single Phase Induction Motor:** Introduction, construction, principal, double revolving field theory, equivalent circuit, performance calculations, starting methods, and their types, torque slip characteristics of various types. ii) **Special Machines:** Single phase synchronous motor, series motor, universal motor, Stepper motors variable reluctance, permanent magnet and hybrid stepper motors. **UNIT-IV** **Synchronous Generators (Alternators):** Introduction, Construction, advantages of rotating field, types of rotors, emf equation, excitation systems, equivalent circuit and their phasor diagrams, voltage regulation, synchronous impedance method, mmf method. Zero power factor method, two reaction theory of salient pole rotor, phasor diagram, power developed and power angle characteristics of salient pole machine, determination of Xd and Xq, synchronization, synchronizing power and torque, parallel operation application. **UNIT-V** **Synchronous Motors:** Introduction, construction, principal of operation, starting of synchronous motor, equivalent circuit and phasor diagrams, power and torque, performance calculation, speed torque characteristics, power factor control-effect of change of excitation. V curve and inverted V curve, synchronous condenser and reactors, synchronous phase modifiers, hunting-causes and remedies, applications, synchronous induction motor application.	
39	**BTEE406**	**Random Variable & Stochastic Processes** **UNIT 1** **PROBABILITY:** Introduction to theory of probability, Definitions, sample, space & events, Self, joint & conditional probabilities,	**Advanced Engineering Mathematics-II** **UNIT-I** **Numerical Analysis:** Finite differences - Forward backward and central difference. Newton's forward and backward differences interpolation formulae. Sterling's formulae, Lagrange's interpolation formula.	**Syllabus Change** **Title change** **Code change**

		Statistically dependent & independent events. **UNIT 2** **RANDOM VARIABLES:** Introduction, distribution & density functions, discrete & continuous random variables, special distributions: binominal, Poisson, uniform, exponential, normal, Rayleighs. conditional distribution & density functions. **UNIT 3** **MULTIPLE RANDOM VARIABLES** :Vector random variable, joint distribution functions, joint probability density function(PDF), Statistical independence, distribution & density function of sum of random variable, one function of one random variable ,one function of two random variable, two function of two random variable. **UNIT 4** **OPERATION ON SINGLE & MULTIPLE RANDOM VARIABLES** : Mean & variance, moments, chebyshev's inequality, Central limit theorem, characteristic functions &moment generating function, covariance & correlation coefficient of multiple random variables. **UNIT 5** **STOCHASTIC PROCESSES:** Introduction, random process concept, stationary & independence, ergodicity, correlation, functions.Gaussion Random Process, Transmission of Random process through linear systems. Power spectral Density (PSD), Cross Spectral density, white Gaussion Random process.	Solution of non-linear equations in one variable by Newton Raphson and Simultaneous algebraic equation by Gauss and Regula Falsi method. Solution of simultaneous equations by Gauss elimination and Gauss Seidel methods. Fitting of curves (straight line and parabola of second degree) by method of least squares. **UNIT-II** **Numerical Analysis:** Numerical differentiation, numerical integration trapezoidal rule, Simpson's one-third and one eighth rule. Numerical Integration of ordinary differential equations of first order Picard's method, Euler's & modified Euler's methods. Miline's method and Runga Kutta fourth order method. Simple linear difference equations with constant coefficients. **UNIT-III** **Special Functions:** Bessel's function of first and second kind, simple recurrence relations, orthogonal property of Bessel functions, Transformation, Generating functions Legendre's function of first kind, simple recurrence relations, orthogonal property, Generating functions. **UNIT-IV** **Statistics & Probability:** Elementary theory of probability, Baye's theorem with simple applications, Expected value. Theoretical probability distributions – Binomial, Poisson and Normal distributions. **UNIT-V** **Statistics & Probability:** Lines of regression, co-relation and rank correlation. 4 **Transforms**: Z-transforms, its inverse, simple properties and application to difference equations.	
40	**BTEE407**	**Analog Electronics Lab** 1. Plot and study the characteristics of small signal amplifier using FET. 2. To study and perform experiment of Astable Multivibrator and the frequency variation with different parameters.	**Analog Electronics Lab** 1. Plot gain-frequency characteristics of BJT amplifier with and without negative feedback in the emitter circuit and determine bandwidths, gain bandwidth products and gains at 1kHz with and without negative feedback. 2. Study of series and shunt voltage	**No change**

		3. To study and perform experiment of Bistable Multivibrator and the frequency variation with different parameters. 4. To study and perform experiment of Monostable Multivibrator and the frequency variation with different parameters. 5. To study and perform experiment of Schmitt trigger binary circuit. 6. To study and perform experiment of RC phase shift oscillator. 7. To study and perform experiment of Hartley oscillator. 8. To study and perform experiment of Colpitt oscillator. 9. Plot frequency response curve for single stage amplifier and to determine gain bandwidth product.	regulators and measurement of line and load regulation and ripple factor. 3. Plot and study the characteristics of small signal amplifier using FET. 4. Study of push pull amplifier. Measure variation of output power & distortion with load. 5. Study Wein bridge oscillator and observe the effect of variation in R & C on oscillator frequency. 6. Study transistor phase shift oscillator and observe the effect of variation in R & C on oscillator frequency and compare with theoretical value. 7. Study the following oscillators and observe the effect of variation of C on oscillator frequency: (a) Hartley (b) Colpitts. 8. Design Fabrication and Testing of k-derived filters (LP/HP). 9. Study of a Digital Storage CRO and store a transient on it. 10. To plot the characteristics of UJT and UJT as relaxation. 11. To plot the characteristics of MOSFET and CMOS.	
41	**BTEE408**	**Electric Machine Lab-II** 1. No-load & Blocked rotor tests on three phase Induction motor. 2. Regulation of a three –phase alternator by synchronous impedance & m.m.f. methods. 3. V and Inverted V curves of a three—phase synchronous motor. 4. Determination of Xd and Xq of a salient pole synchronous machine. 5. Sumpner's test on a pair of three phase transformers. 6. Brake test on three phase Induction Motor. 7. Regulation of three-phase alternator by Z.P.F. and A.S.A methods. 8. Efficiency of a three-phase alternator. 9. Measurement of sequence impedance of a three-phase alternator. To perform the heat run test on a delta/delta connected threephase transformer and determine the parameter for its determine the parameter for its equivalent circuit.	**Electrical Measurement Lab** 1. Study working and applications of (i) C.R.O. (ii) Digital Storage C.R.O. & (ii) C.R.O. Probes. 2. Study working and applications of Meggar, Tong-tester, P.F. Meter and Phase Shifter. 3. Measure power and power factor in 3-phase load by (i) Two-wattmeter method and (ii) One-wattmeter method. 4. Calibrate an ammeter using DC slide wire potentiometer. 5. Calibrate a voltmeter using Crompton potentiometer. 6. Measure low resistance by Crompton potentiometer. 7. Measure Low resistance by Kelvin's double bridge. 8. Measure earth resistance using fall of potential method. 9. Calibrate a single-phase energy meter by phantom loading at different power factors. 10. Measure self-inductance using Anderson's bridge. 11. Measure capacitance using De Sauty Bridge.	**Syllabus Change** **Title change** **Code change**

42	**BTEE409**	**Technical Seminar**	**Power System Design Lab** 1. Generating station design: Design considerations and basic schemes of hydro, thermal, nuclear and gas power plants. Electrical equipment for power stations. 2. Auxiliary power supply scheme for thermal power plant. 3. Distribution system Design: Design of feeders & distributors. Calculation of voltage drops in distributors. Calculation of conductor size using Kelvin's law. 4. Methods of short term, medium term and long term load forecasting. 5. Sending end and receiving end power circle diagrams. 6. Instrument Transformers: Design considerations of CTs & PTs for measurement and protection. 7. Substations: Types of substations, various bus–bar arrangements**.** Electricalequipment for substations.	**Code Change**
43	**BTEE410**	**DBMS Lab** 1. Write a program to show two methods of retrieving SQL 2. Write a program show use of cursor type to retrieve multiple record sets 3. Write a SQL statement to read data out of a table 4. Write programs to use "join" and "primary key" 5. Write a program to show a "functional dependency" in database table design 6. Write a program to show difference between group by and order by 7. Write a program to show use of the WHERE clause 8. Write a program to show difference between "join" and "union". 9. Write a program to use the elements of the SELECT query syntax 10. Write a program using the syntax for a CREATE TABLE statement 11. Write a program to use dynamic SQL 12. Write a program to show the difference between delete and truncate commands 13. Write a program to show the difference between a local and a	**Electrical Machines Lab** 1. Speed control of D.C. shunt motor by (a) Field current control method & plot the curve for speed verses field current. (b) Armature voltage control method & plot the curve for speed verses armature voltage. 2. To perform O.C. and S.C. test on a 1-phase transformer and to determine the parameters of its equivalent circuit its voltage regulation and efficiency. 3. To perform back-to-back test on two identical 1-phase transformers and find their efficiency & parameters of the equivalent circuit. 4. To determine the efficiency and voltage regulation of a single-phase transformer by direct loading. 5. To plot the O.C.C. & S.C.C. of an alternator and to determine its Zs, Xd andregulation by synchronous impedance method. 6. To plot the V-curve for a synchronous motor for different values of loads. 7. To perform the heat run test on a delta/delta connected 3-phase transformer and determine the parameters for its equivalent circuit. 8. To perform no load and blocked rotor test on a 3 phase induction motor and to determine the parameters of its equivalent circuits. Draw the circle diagram and compute the following (i) Max. Torque (ii) Current (iii) slips (iv) p.f. (v) Efficiency. 9. To Plot V-Curve and inverted V-Curve of synchronous motor.	**Title change** **Code Change**

		global temporary table	10. To synchronize an alternator across the infinite bus (RSEB) and control load sharing.	
44	**BTEE411**	**GD & Soft Skill**	**Electrical Machine Design Lab** 1. Design of transformers: output of transformer, output equation- volt per turn, core area and weight of iron&copper, optimum design–(i) minimum cost and (ii) minimum losses. Design of core and windings. Design a 3-phase transformer. 2. Design of rotating machines: General concepts. specific loading, output equations –dc machines and acmachines, factor affecting size of rotating machines, choice of specific magnetic and electric loadings. 3. Design of 3-phase induction motors: output equation, choice of air gap flux density and ampereconductors'parameter, main dimensions. Design of a 3-phase squirrel cage induction motor. 4. Design of single phase induction motors: output equation, main dimensions, relative size of single phase and 3-phase induction motors. Design of a single phase capacitor start induction motor. **5.** Design of synchronous machines**:** output equation, choice of specific magnetic and electric loadings, main dimensions, short circuit ratio. Design a 3-phase, 2-pole turbo alternator.	**Code Change**
45	**BTEE 501**	**Industrial Electronics** **UNIT 1** **CHARACTERISTICS OF POWER DEVICES:** Power diodes, power transistor, IGBTS, TRIAC, DIAC, SUS, SBS, and SCS.SCR:- Construction and its characteristics. Methods of turning on and turning off. **UNIT 2** **CONTROLLED RECTIFIERS:** Single and Three phase half wave and full wave controlled rectifiers, three phase bridge rectifier circuits. Double – Y type rectifier with interphase transformer. Effect of flywheel diode **UNIT 3** **CONVERTERS AND INVERTER:** One two and four quadrant converters, Fly back converter, forward/buck converter, Boost converter and buck-boost converter Inverters: - Single phase Tapped and Bridge inverter circuits, 3 phase bridge inverter. Voltage sourced and current sourced inverters. **UNIT 4**	**Power Electronics** UNIT-1. Power Semiconductor Devices:Construction, Principle of operation, Characteristics and applications of Power Transistor& Thyristor. Characteristics of GTO, DIAC, MCT, TRIAC, Power MOSFET and IGBT; Two-Transistor Model of Thyristor, Thyristor Commutation methods. UNIT-2. SCR: Construction and characteristics, specification and ratings, pulse transformer, optical isolators, methods of turn on, triggering circuits for SCR: R, RC, UJT relaxation oscillator. Rating extension by series and parallel connections, string efficiency. Protection of SCR-Protection against over voltage, over current, dv/dt, di/dt, Gate protection. UNIT-3. Converters-I: Single Phase half & full wave converters with RL & RLE load, Single	**Title Change**

		CHOPPERS AND CYCLOCONVERTERS: Basic chopper circuits, 2 and 4 quadrant choppers. Principle of operation of cycloconverter. Single phase to single phase, three phase to single phase and three phase to three phase cycloconverter circuits. **UNIT 5** **MOTOR CONTROL:** Introduction to speed control of DC motors using phase controlled converters and choppers, Basic idea of speed control of three phase induction motors using voltage and frequency control methods.	phase dual converters, Three phase half wave converters. Three phase full converters with RL load, Three phase dual converters. Converters-II: Single and three-phase semi converters with RL & RLE load. Power UNIT-4. Power factor improvement-Extinction angle control, symmetrical angle control, pulse width modulation control and sinusoidal pulse width modulation control. Inversion operation. Effect of load and source impedances. UNIT-5. DC-DC Converters: Step Up/Down Copper, Control strategies, Chopper Configurations, Analysis of type A Chopper Voltage, current and load commutated chopper. Multiphase Chopper DC-DC Converters: Step Up/Down Copper, Control strategies, Chopper Configurations, Analysis of type A Chopper Voltage, current and load commutated chopper. Multiphase Chopper	
46	**BTEE 502**	**Microprocessors & Interfaces** **UNIT 1** INTRODUCTION: Overview of Microprocessor Structure and its operation.CPU, address bus, data bus and control bus. Input/ Output devices, buffers,encoders, latches and memories. Demultiplexing of address/data bus and memory/IO read/write control signals **UNIT 2** 8085 MICROPROCESSOR ARCHITECTURE: Internal data operations and registers, pins and signals, peripheral devices and memory organization, interrupts. CISC and RISC architecture overview. Memory Interfacing, Memory mapped I/O and peripheral mapped I/O 8085 Microprocessor Programming model. Intrduction to 8085 instructions,programming techniques, counters and time delays, stack and subroutines, interrupts of 8085. **UNIT 3** 8085 MICROPROCESSOR INSTRUCTIONS: Classification, format and timing. Instruction set.Programming and debugging,	**MICROPROCESSOR ANDCOMPUTER ARCHITECTURE** UNIT 1 Introduction to 8085 Microprocessor Architecture: CPU, address bus, data bus and control bus. Input/Output devices, buffers,encoders, latches and memories.Internal Data Operations and Registers, Pins and Signals, Peripheral Devices and Memory Organization, Interrupts. UNIT 2 8085 Microprocessor Instructions: Classification, Format and Timing. Instruction Set: 8 Bit and 16 Bit Instructions,Programming and Debugging, Subroutines. UNIT 3 8085 Microprocessor Interfacing: 8259, 8257, 8255, 8253, 8155 chips and their applications. A/D conversion, memory, keyboard and display interface (8279). UNIT 4 8086 Microprocessor: Architecture: Architecture of INTEL 8086 (Bus Interface Unit, Execution unit), register organization, memory addressing, memory segmentation, Operating Modes Instruction Set of 8086: Addressing	**Syllabus Change** **Title change**

		8 bit and 16 bit instructions. **UNIT 4** 8085 MICROPROCESSOR INTERFACING: 8259, 8257, 8255, 8253, 8155 chips and their applications. A/D conversion, memory, keyboard and display interface (8279). **UNIT 5** INTRODUCTION TO 8051 MICROCONTROLLER: General features & architecture of 8051. Memory, timers and interrupts. Pin details. Interfacing and applications.	Modes: Instruction format: Discussion on instruction Set: Groups: data transfer, arithmetic, logic string, branch control transfer, processor control. Interrupts: Hardware and software interrupts, responses and types. UNIT 5 Basic Computer Architecture: Central Processing Unit, memory and input/output interfacing. Memory Classification Volatile and non-volatile memory, Primary and secondary memory, Static and Dynamic memory, Logical, Virtual and Physical memory. Types Of Memory: Magnetic core memory, binary cell, Rom architecture and different types of ROM, RAM architecture, PROM, PAL, PLA, Flash and Cache memory, SDRAM, RDRAM and DDRAM. Memory latency, memory bandwidth, memory seek time.	
47	**BTEE 503**	**Control System** **UNIT 1** **CONCEPTS OF OPEN AND CLOSED LOOP SYSTEMS**: Example and application of open loop and close loop systems. Brief idea of multivariable control system, Brief idea of Z-transform and digital control systems. Representation of physical systems (Electro-mechanical) by differential equations, Determination of transfer function by block diagram, Reduction technique and signal flow graphs techniques. **UNIT 2** **TIME RESPONSE ANALYSIS OF FIRST ORDER & SECOND ORDER SYSTEMS**: Time response analysis of first and second order systems. Transient response analysis steady state error and error constants. **UNIT 3** **FREQUENCY DOMAIN METHODS**: Bode plot, Design specification in frequency domain and their co-relation with time domain. **UNIT 4** **STABILITY OF THE SYSTEM**: Absolute and relative stability. Routh's stability criterion. Root locus method of analysis. Polar plots Nyquist stability criterion. M and sN locii, Nichol's chart.	**Control Systems** UNIT 1 Introduction: Elements of control systems, concept of open loop and closed loop systems, Examples and application of open loop and closed loop systems, brief idea of multivariable control systems. Mathematical Modeling of Physical Systems: Representation of physical system (Electro Mechanical) by differential equations, Determination of transfer function by block diagram reduction techniques and signal flow method, Laplace transformation function, inverse Laplace transformation. UNIT 2 Time Response Analysis of First Order and Second Order System:Characteristic equations, response to step, ramp and parabolic inputs. Transient response analysis, steady state errors and error constants, Transient & steady state analysis of LTI systems UNIT 3 Control System Components: Constructional and working concept of ac servomotor, synchronous and stepper motor Stability and Algebraic Criteria: concept of stability and necessary conditions, Routh-Hurwitz criteria and limitations.Root Locus Technique: The root locus concepts, construction of root loci. UNIT 4 Frequency Response Analysis: Frequency response, correlation between time and	**No change**

		UNIT 5 **STATE VARIABLE ANALYSIS**: Concept of state, state variables and state model. State models for linear continuous time systems.Diagonalization transfer functions. Solutions of state equations. Concept of controllability and observability	frequency responses,polar and inverse polar plots, Bode plots Stability in Frequency Domain: Nyquist stability criterion, assessment of relative stability: gain margin and phase margin, M and N Loci, Nichols chart. UNIT 5 The design problem and preliminary considerations lead, lag and lead-lag networks, design of closed loop systems using compensation techniques in time domain and frequency domain. Brief idea of proportional, derivative and integral controllers.	
48	**BTEE 504**	**Transmission & Distribution of Electric Power** **UNIT 1** (i) **SUPPLY SYSTEM** Basic network of power system transmission and distribution voltage , effect of system voltage on the size of conductor and losses .comparison of dc 2 wire , dc 3 wire , 1 –phase ac and 3 – phase ac (3-wire and 4-wire) system. **(ii) Distribution system**:- Primary and secondary distribution system, feeder, distribution and service main .radial and ring main distribution system , Kelvin's law for conductor size . **Unit 2** Parameter of Transmission lines:- Parameter of single and three phase transmission lines with single and double circuit s, resistance, inductance and capacitance of overhead lines .effect of earth/ lines transposition ,geometric mean radius and distance .inductance and capacitance of lines with symmetrical and unsymmetrical spacing inductance and capacitance of double circuit lines skin and proximity effect .equivalent –circuit and performance of shot and and medium transmission lines . **Unit 3** (i)Generalized ABCD lies constant, equivalent circuit and perform ace of long transmission communication circuit ,power flow thought a transmission line. (ii) corona :- factor affecting	**Data Base Management System** UNIT 1 Introduction, need, purpose and goals of DBMS. DBMS Architecture, Concept of keys, Generalization and specialization, Introduction to relational data model, ER modeling, concept of ER diagram UNIT 2 Database Design: Conceptual Data Base design. Theory of normalization, Primitive and composite data types, concept of physical and logical databases, Data abstraction and data independence, relational algebra and relational calculus. UNIT 3 SQL, DDL and DML. Constraints assertions, views database security. Application Development using SQL: Host Language interface embedded SQL programming. GL's, Forms management and report writers. Stored procedures and triggers. Dynamic SQL, JDBC. UNIT 4 Internal of RDBMS: Physical data organization in sequential, indexed, random and hashed files. Inverted and multi-list structures UNIT 5 (i) Transaction Management: Transaction concept, transaction state, serializability, conflict serializability, views serializability. (ii) Concurrency Control: Lock based protocol. (iii) Deadlock Handling: Prevention detection, recovery. (iv) Recovery System: Log based recovery.	**Code Change**

		corona , corona power loss and effect of corona . **Unit 4** Insulators and cables, Insulators: - Types, voltage distribution in insulator string and grading , improvement of string efficiency . Underground cable: - Types of cables single core , grading of cable thermal rating of cable . **Unit 5** Mechanical design of lines and ground Mechanical designs of transmission of lines – sag and tension calculation for different weather condition –Method of grounding –Peterson coil – substation layout		
49	**BTEE 505**	**High Voltage Engineering** **UNIT I** OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS Causes of over voltages and its effect on power system – Lightning, switching surges and temporary over voltages - protection against over voltages. **UNIT II** ELECTRICAL BREAKDOWN IN GASES, SOLIDS AND LIQUIDS Gaseous breakdown in uniform and non-uniform fields – corona discharges – Vacuum breakdown - conduction and breakdown in pure and commercial liquids – breakdown mechanisms in solid and composite dielectrics **UNIT III** GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS Generation of High DC, AC, impulse voltages and currents. Tripping and control of impulse generators. **UNIT IV** MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS Measurement of High voltages and High currents – digital techniques in high voltage measurement **UNIT V** HIGH VOLTAGE TESTING & INSULATION COORDINATION High voltage testing of electrical	**Transmission & Distribution of Electrical Power** UNIT 1 Supply systems:Basic network of power system. Transmission and distribution voltage, effect of system voltage on size of conductor and losses. Comparison of DC 2- wire, DC 3-wire, 1-phase AC and 3-phase AC (3-wire and 4-wire) systems. Distribution Systems: Primary and secondary distribution systems, feeder, distributor and service mains. Radial and ring- main distribution systems. Kelvin's law for conductor size. UNIT 2 Mechanical Features of Overhead Lines:Conductor material and types of conductor.Conductor arrangements and spacing.Calculation of sag and tension, supports at different levels, effect of wind and ice loading, stringing chart and sag template.Conductor vibrations and vibration dampers. UNIT 3 Parameters of Transmission Lines:Resistance inductance and capacitance of overheadlines, effect of earth, line transposition. Geometric mean radius and distance. Inductance and capacitance of line with symmetrical and unsymmetrical spacing Inductance and capacitance of double circuit lines. Skin and proximity effects.Equivalent circuits and performance of short and medium transmission lines. UNIT 4 Generalized ABCD Line Constants:equivalent circuit and	**Code Change**

		power apparatus – power frequency, impulse voltage and DC testing – International and Indian standards – Insulation Coordination.	performance of long transmission line. Ferranti effect. Interference with communication circuits. Power flow through atransmission line Corona:Electric stress between parallel conductors. Disruptive critical voltage and visual critical voltage, Factors affecting corona. Corona power loss. Effects of corona. UNIT 5 Insulators: Pin, shackle, suspension, post and strain insulators. Voltage distribution acrossan insulator string, grading and methods of improving string efficiency. Underground Cables: Conductor, insulator, sheathing and armoring materials. Types of cables. Insulator resistance and capacitance calculation. Electrostatic stresses and reduction of maximum stresses. Causes of breakdown. Thermal rating of cable. Introduction to oil filled and gas filled cables.	
50	**BTEE506A**	**Materials in Electrical Systems** **UNIT I** **Conducting Materials:** Energy band diagram of conductors, semiconductors and insulators. Conductivity and Resistivity, factors affecting the resistivity, classification of conducting materials, electrical, mechanical and thermal properties and applications of low resistance materials like copper, aluminium, steel, silver, gold, platinum, brass and bronze. Electrical, mechanical and thermal properties and applications of high resistance materials like manganin, constantan, nichrome, mercury, tungsten and carbon. Introduction of super conductors. **UNIT II** **Insulating Materials:** Classification of insulating materials, electrical, physical, thermal, chemical, mechanical properties of insulating materials. Thermoplastic and natural insulating materials, Gaseous and liquid insulating materials, properties and applications of ceramics and synthetic insulating materials. **UNIT III** **Magnetic Materials:** Introduction and classification of magnetic materials, permeability,	**Optimization Techniques** UNIT 1 Introduction: Engineering application of Optimization, Formulation of design problems as mathematical programming problems, classification of optimization problems. UNIT 2 Optimization Techniques: Classical optimization, multivariable with no constraints, unconstrained minimization techniques, Penalty function techniques, Lagrange multipliers and feasibility techniques. UNIT 3 Linear Programming: Graphical method, Simplex method, Duality in linear programming (LP), Sensitivity analysis Applications in civil engineering. UNIT 4 Non Linear Programming Techniques/Method: Unconstrained optimization, one dimensional minimization, golden section, elimination, quadratic and cubic, Fibonacci, interpolation Direct search, Descent, Constrained optimization, Direct and indirect, Optimization UNIT 5 Constrained Optimization Techniques: Direct, complex, cutting plane, exterior penalty function methods for structural engineering problems.	**New Course**

		B-H curve, magnetic saturation, hysteresis loop, coercive force and residual magnetism, concept of eddy current and hysteresis loss **UNIT IV** curie temperature, magnetostriction effect. Soft and hard magnetic materials, ferro and ferri magnetic materials, special purpose magnetic materials. **UNIT V:** **Special Materials and components:** Properties and applications of different materials used in electrical systems like – thermocouples, bimetallic, fusing, and soldering. Introduction to different types of materials used in electromagnetic and electromechanical systems, resistors, capacitors, inductors, special semiconductors used in electrical engineering.		
51	**BTEE506B**	**Switching Theory and Logic Design** **UNIT- I** **Number Systems and Codes**:- Decimal, Binary, Octal and Hexadecimal Number systems, Codes- BCD, Gray Code, Excess-3 Code, ASCII, EBCDIC, Conversion between various Codes. **Switching Theory: -** Boolean Algebra- Postulates and Theorems, De' Morgan's Theorem, Switching Functions- Canonical Forms- Simplification of Switching Functions- Karnaugh Map and Quine Mc-Clusky Methods. **Combinational Logic Circuits**:- Review of basic gates- Universal gates, Adder, Subtractor ,Serial Adder, Parallel Adder- Carry Propagate Adder, Carry Look-ahead Adder, Carry Save Adder, Comparators, Parity Generators, Decoder and Encoder, Multiplexer and De-multiplexer, ALU, PLA and PAL. **UNIT- II** **Integrated circuits: -** TTL and CMOS logic families and their characteristics. Brief introduction to RAM and ROM. **Sequential Logic Circuits**: - Latches and Flip Flops- SR, , D, T and MS-JK Flip Flops, Asynchronous Inputs.	**Principle of Communication Systems** UNIT 1 Noise Effects in Communication Systems: Resistor noise, Networks with reactive elements, Noise temperature, Noise bandwidth, temperature, Noise figure. Noise figure & equivalent noise temperature in cascaded circuits. UNIT 2 Amplitude Modulation: Frequency translation, Recovery of base band signal, Spectrum & power relations in AM systems. Methods of generation & demodulation of AM-DSB, AMDSB/SC and AM-SSB signals. Modulation & detector circuits for AM systems. AM transmitters & receivers. UNIT 3 Frequency Modulation: Phase & freq. modulation & their relationship, Spectrum & bandwidth of a sinusoidally modulated FM signal, phasor diagram, Narrow band & wide band FM. Generation & demodulation of FM signals. FM transmitters & receivers, Comparison of AM, FM & PM. Pre emphasis & de-emphasis. Threshold in FM, PLL demodulator. UNIT 4 Noise in AM and FM: Calculation of signal-to-noise SC, DSB with carrier, Noise calculation of square law demodulator & envelope detector.	**New Course**

		Counters and Shift Registers:- Design of Synchronous and Asynchronous Counters:- Binary, BCD,Decade and Up/Down Counters , Shift Registers, Types of Shift Registers, Counters using Shift Registers- Ring Counter and Johnson Counter. **UNIT- III** **Synchronous Sequential Circuits**:- State Tables State Equations and State Diagrams, State Reduction and State Assignment, Design of Clocked Sequential Circuits using State Equations. **Finite state machine-**capabilities and limitations, Mealy and Moore models-minimization of completely specified and incompletely specified sequential machines, Partition techniques and merger chart methodsconcept of minimal cover table. **UNIT- IV** **Algorithmic State Machine**: Representation of sequential circuits using ASM charts synthesis of output and next state functions, Data path control path partition-based design. **UNIT- V** **Fault Detection and Location:** Fault models for combinational and sequential circuits, Fault detection in combinational circuits; Homing experiments, distinguishing experiments, machine identification and fault detection experiments in sequential circuits.	Calculation of S/N ratio in FM demodulators, Super-heterodyne receivers. UNIT 5 Pulse Modulation Systems: Sampling theorem, Generation and demodulation methods of PAM, PWM, PPM.	
52	**BTEE506C**	**Digital Signal Processing** **UNIT 1** **TRANSFORM ANALYSIS OF LTI SYSTEMS**: Linear Time Invariant Systems(both discrete & continuous), Properties of LTI systems, Response of continuous time LTI system using convolution integral, Response of discrete time LTI system using convolution sum, The frequency response of LTI systems, System functions for systems characterized by Linear Constant Coefficient Difference equations, All-pass system, Minimum-Phase systems, Linear systems with linear phase. **UNIT 2** **TYPES OF TRANSFORM**: The	**Introduction to VLSI** UNIT 1 Introduction to MOS Technology: Basic MOS transistors, Enhancement Mode transistoraction, Depletion Mode transistor action, NMOS and CMOS fabrication. UNIT 2 Basic Electrical Properties of MOS Circuits:I__ versus V__relationship, Aspects of threshold voltage, Transistor Trans conductance gm. The NMOS inverter, Pull up to Pull-down ratio for a NMOS Inverter and CMOS UNIT 3 CMOS Logic Circuits:The inverter, Combinational Logic, NAND Gate NOR gate,	**New Course**

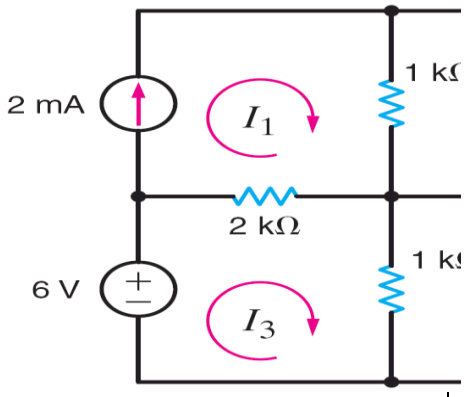
		Discrete Fourier transforms (DFT), Properties of the DFT, and Linear Convolution using DFT. Efficient computation of the DFT: Decimation–in-Time and Decimation-in frequency FFT Algorithms. Discrete cosine transform, Processing of speech signals: Vocoders, linear predictive coders. **UNIT 3** **FILTER DESIGN TECHNIQUES:** Introduction, Filter Design: Magnitude and phase response of digital filters-Linear phase response, IIR filter design by impulse invariance & bilinear transformation. Design of FIR filters by Windowing: Rectangular, Hanning, Hamming & Kaiser. Butterworth & Chebyshev filters. **UNIT 4** **STRUCTURES FOR DISCRETE-TIME SYSTEMS**: Block diagram and signal flow graph representation of Linear Constant Coefficient Difference equations, Basic structures for IIR and FIR systems, Transposed forms. Circular and sectioned convolutions, Matrix representation of digital networks. Digital Filter Structure: Basic IIR and FIR digital filter structure, analysis of finite word length effects, effect of coefficient quantization, round-off errors, and limit cycle in IIR digital filters. **UNIT 5** **MULTI RATE DIGITAL SIGNAL PROCESSING:** Design of practical sampling rate converters, decimator and interpolators, poly-phase decomposition, digital processing of analog signals.	Compound Gates, 2 input CMOS Multiplexer, Memory latches and registers Transmission Gate, Gate delays, CMOS-Gate Transistor sizing, Power dissipation UNIT 4 Basic Physical Design of Simple Gates and Layout Issues: Layout issues for inverter, Layout for NAND and NOR Gates, Complex Logic gates Layout, Layout optimization for performance. UNIT 5 Introduction to VHDL, Verilog & other design tools. VHDL Code for simple Logic gates, flip-flops, shift-registers, Counters, Multiplexers, adders and subtractors.	
53	**BTEE506D**	**Communication Systems** **UNIT- I** **Introduction:** Overview of Communication system, Communication channels, Mathematical Models for Communication Channels **Introduction of random Variables:** Definition of random variables, PDF, CDF and its properties, joint PDF,CDF, Marginalized PDF, CDF, WSS wide stationery, strict sense		**Title Change** **Code Change**

		stationery, non stationery signals, UDF, GDF,RDF, Binomial distribution, White process, Poisson process, Wiener process. **UNIT - II** **Analog Modulation:** Modulation- Need for Modulation, Amplitude Modulation theory: DSB-SC, SSB, And VSB. Modulators and Demodulators. Angle Modulation, Relation between FM and PM Wave. Generation of FM wave- Direct and Indirect Methods. Bandwidth of FM (NBFM, WBFM) **Pulse Analog Modulation:** Sampling-Natural and Flat top. reconstruction, TDM-Pulse Amplitude Modulation (TDM-PAM), Pulse Width Modulation (PWM), Pulse Position Modulation(PPM), Generation and Recovery. **Pulse Digital Modulation:** Pulse Code Modulation (PCM), Differential Pulse Code Modulation (DPCM), Delta Modulation (DM), ADPCM. **UNIT - III** **Digital Modulation and Transmission:** Advantages of digital communication. Modulation schemes: ASK, PSK, FSK. Spectral Analysis. Comparison. Digital Signaling Formats-Line coding. **Information and Coding Theory:** Entropy, Information, Channel Capacity. Source Coding Theorem:Shannon Fano Coding, Huffman Coding. **UNIT - IV** **Fiber Optical System:** Basic Optical Communication System. Optical fibers versus metallic cables, Light propagation through optical fibers. Acceptance angle and acceptance cone, Fiber configurations. Losses in optical fibers. Introduction to Lasers and light detectors. Applications: Military, Civil and Industrial applications. **UNIT - V** **Advanced Communication Systems**: Introduction to cellular radio telephones. Introduction to satellite Communication.		
54	**BTEE506E**	**Electromagnetic Field Theory** **UNIT 1**		**Subject Removed**

		Introduction: Vector Relation in rectangular, cylindrical and spherical coordinate system. Concept and physical interpretation of gradient, Divergence and curl. Green's and stock's theorems. **UNIT 2** **Electrostatics**: Electric field due to various charge configurations.The potential functions and displacement vector. Gauss's law.Poisson's and Laplace's equation and their solution. Uniqueness theorem. Continuity equation. Capacitance and electrostatics energy.Boundary conditions. **UNIT 3** **Magnetostatics**: Magnetic field intensity, flux density & magnetization, Faraday's law. Bio Savart's Law. Ampere's law.Magnetic scalar and vector potentials. Energy Stored in magnetic field. Boundary conditions. Analog between electric and magnetic field. **UNIT 4** **Time Varying Fields**: Displacement currents and equation of continuity, Maxwell's equations, Uniform plane wave in free space, dielectrics and conductors, skin effect sinusoidal time variations, reflection of Uniform Plane Wave (UPW), standing wave ratio. Potentials vector and power onsiderations. **UNIT 5** **Radiation, Emi And Emc**: Radiation: Retarded potentials and concept of radiation. Alternating current element and power radiated. Radiation resistance**:** Introduction to Electromagnetic Interference and Electromagnetic compatibility, EMI coupling modes, methods of eliminating interference; shielding, grounding, conducted EMI, EMI Testing: emission testing, susceptibility testing.		
55	**BTEE507**	**Industrial Electronics Lab** 1 Study the characteristics of SCR. • Observe the terminal configuration. • Measure the breakdown voltage. • Measure the latching & holding current.	**POWER ELECTRONICS LAB** 1 Study the comparison of following power electronics devices regarding ratings, performance characteristics and applications: Power Diode, Power Transistor, Thyristor, Diac, Triac, GTO, MOSFET, MCT and SIT.	**Syllabus change** **Title change** **Code change**

		• V-I characteristics. 2 Perform experiment on triggering circuits for SCR. R-triggering circuit R-C triggering circuit UJT triggering circuit. Study & obtain the waveforms of single phase half wave controlled converter. 3 Study & obtain the waveforms of single phase half controlled symmetrical and asymmetrical bridge converters. 4 Study & obtain the waveforms of single phase fully controlled bridge converter. 5 Study & obtain the waveforms for voltage- commutated- chopper. 6 Study & obtain the waveforms for current- commutated- chopper. 7 Perform experiment on single phase PWM inverter. 8 Perform experiment buck, boost & buck-boost regulator. 9 Perform experiment on Motor control - open loop & closed loop. 10 Study & obtain the characteristics of DIAC.	2 Determine V-I characteristics of SCR and measure forward breakdown voltage, latching and holding currents. 3 Find V-I characteristics of TRIAC and DIAC. 4 Find output characteristics of MOSFET and IGBT. 5 Find transfer characteristics of MOSFET and IGBT. 6 Find UJT static emitter characteristics and study the variation in peak point and valley point. 7 Study and test firing circuits for SCR-R, RC and UJT firing circuits. 8 Study and test 3-phase diode bridge rectifier with R and RL loads. Study the effect of filters. 9 Study and obtain waveforms of single-phase half wave controlled rectifier with and without filters. Study the variation of output voltage with respect to firing angle. 10 Study and obtain waveforms of single-phase half controlled bridge rectifier with R and RL loads. Study and show the effect of freewheeling diode. 11 Study and obtain waveforms of single-phase full controlled bridge converter with R and RL loads. Study and show rectification and inversion operations with and without freewheeling diode. 12 Control the speed of a dc motor using single-phase half controlled bridge rectifier and full controlled bridge rectifier. Plot armature voltage versus speed characteristics.	
56	**BTEE508**	**Microprocessor Lab** 1. Study the hardware, functions, memory structure and operation of 8085-Microprocessor kit. 2. Program to perform integer division: (1) 8-bit by 8-bit (2) 16 bit by 8 bit. 3. Program to add two 8–bit	**MICROPROCESSOR LAB** 1 Study the hardware, functions, memory structure and operation of 8085-Microprocessor kit. 2 Program to perform integer division: (1) 8-bit by 8-bit (2) 16-bit by 8-bit. 3 Transfer of a block of data in memory to another place in memory 4 Transfer of black to another location in reverse order.	**No Change**

		numbers 4. Program to Find 2's compliment of a number. 5. Transfer of a block of data in memory to another place in memory 6. Transfer of black to another location in reverse order. 7. Searching a number in an array. 8. Sorting of array in: (1) Ascending order (2) Descending order. 9. Finding party of a 32-bit number. 10. Program to multiply two 8–bit numbers 11. Program to generate and sum 15 Fibonacci numbers. 12. Reversing bits of an 8-bit number.	5 Searching a number in an array. 6 Sorting of array in: (1) Ascending order (2) Descending order. 7 Finding party of a 32-bit number. 8 Program to perform following conversion (1) BCD to ASCII (2) BCD to hexadecimal. 9 Program to multiply two 8–bit numbers 10 Program to generate and sum 15 Fibonacci numbers. 11 Program for rolling display of message "India", "HELLO". 12 To insert a number at correct place in a sorted array. 13 Reversing bits of an 8-bit number. 14 Fabrication of 8-bit LED interfaces for 8085 kit through 8155 and 8255. 15 Data transfer on output port 8155 & 8255 & implementation of disco light, running light, and sequential lights on the above mentioned hardware. 16 Parallel data transfer between two DYNA-85 kit using 8253 ports. 17 Generation of different waveform on 8253/8254 programmable timer.	
57	**BTEE509**	**MATLAB Programming Lab** 1. Introduction to Matlab 2 Basic operation in Matlab using Matrix and array input type 3. Find mesh current in given ckt using Mat lab	**SYSTEM PROGRAMMING LAB** Basics of MATLAB matrices and vectors, matrix and array operations, Saving and loading data, plotting simple graphs, scripts and functions, Script files, Function files, Global Variables, Loops, Branches, Control flow, Advanced data objects, Multi-dimensional matrices, Structures, Applications in linear algebra curve fitting and interpolation. Numerical integration, Ordinary differential equation. (All contents is to be covered with tutorial sheets) Simulink: Idea about simulink, problems based on simulink. (All contents is to be covered with tutorial sheets)Write a program to generate Machine Op- code table using two pass Assembler.	**New Course**

		 4. plotting simple graphs . 5. script and function files. 6. curve fitting and interpolation 7. Application of simulink in Matlab		
58	**BTEE510**	**Control System Lab** 1. Perform an experiment to find out the DC motor & generator constants . 2. Study of torque speed characteristics of DC motor. 3. Perform an experiment to find out the transfer function and inertia of DC motor.. 4. Perform and experiment to find out the value of RLC by using second order time response analysis. 5. Perform and experiment to find out the parameters of AC servomotor KM, KG and effective friction. 6. Perform and experiment to find out the inertia nad tansfer function of AC servomotor. 7. Perform and experiment on compensation design kit to design the lag network . 8. Study of stability analysis (nyquist criterial) of linear time invariant system.	**DBMS LAB** 1 Designing database and constraints using DDL statements. 2 Experiments for practicing SQL query execution on designed database. 3 Database connectivity using JDBC/ODBC. 4 Features of embedded SQL. 5 Designing front end in HLL and accessing data from backend database. 6 Designing simple projects using front end-back end programming 7 Project for generating Electricity Bills 8 Project for managing student's attendance/marks details.	**Code Change**
59	**BTEE511**	**Digital Signal Processing Modelling and simulation using MAT LAB** 1. Realising a given block diagram having multiplier, adder/ subtractor and system (Discrete/Continuous) with given Impulse response. Calculating output for given input. 2. To simulate the transmitter and receiver for BPSK 3. To design and simulate FIR digital filter (LP/HP).	**PROFESSIONAL ETHICS AND DISASTERS MANAGEMENT** 1 Objectives: to help the students • To appreciate the importance and values and ethics in implementing the technology and ensure sustainable development, happiness and prosperity. • To understand the co-existence with nature and to be aware of potential natural and manmade disasters.	**New Course**

		4. To design and simulate IIR digital filter (LP/HP). 5. To design and simulate DFT/FFT . **DSP Lab using TMS320C6XXX DSP Kits** **6.** To study the architecture of TMS320C6XXX DSP kits using Bloom with DSP. **7.** To generate wave form (SINE, COSINE, SQUARE & TRIANGULAR). **8.** Verification of Sampling Theorem. **9.** Verification of linear/circular convolution. **10.** To design FIR and FIR digital filter (LP/HP).	2 Human Values: Effect of Technological Growth and Sustainable Development. Profession and Human Values: Values crisis in contemporary society. Nature of values. Psychological Values, Societal Values and Aesthetic Values. Moral and Ethical values. 3 Professional Ethics: • Professional and Professionalism- Professional Accountability, Role of a professional, Ethic and image of profession. • Engineering Profession and Ethics- Technology and society, Ethical obligations of Engineering professionals, Roles of Engineers in industry, society, nation and the world. • Professional Responsibilities- Collegiality, Loyalty, Confidentially, Conflict of Interest, Whistle Blowing. 4 Disaster Management: Understanding Disasters and Hazards and related issues social and environmental. Risk and Vulnerability. Types of Disasters, their occurrence/ causes, impact and preventive measures: Natural Disasters- Hydro-meteorological Based Disasters like Flood, Flash Flood, Cloud Burst, Drought, Cyclone, Forest Fires; Geological Based Disasters like Earthquake, Tsunami, Landslides, Volcanic Eruptions. 5 Manmade Disasters: Chemical Industrial Hazards, Major Power Break Downs, Traffic Accidents, Fire Hazards, Nuclear Accidents. Disaster profile of Indian continent. Case studies. Disaster Management Cycle and its components. In order to fulfill objectives of course, (A) The institute shall be required to organize at least 3 expert lectures by eminent social workers/professional leaders. (B) Each student shall compulsorily be required to: I. Visit a social institution/NGO for at least 7 days during the semester and submit a Summary report. II. Perform a case study of a disaster that has	

			occurred in last decade and submit a Summary report.	
60	**BTEE 512**	**Training viva**	**Discipline & Extra Curricular Activity**	**New Course**
61	**BTEE601**	**Advanced Power System** **UNIT 1** Wave terminology, Development of wave quotations, Terminal problems, Lattice diagrams, Origin and Nature of power system transients and surges, Surge parameters of plants, Equivalent Circuit representations. Lumped and distributed circuit transients. **UNIT 2** Line energisation and de-energisation transients-Earth and earthwire effects. Current chopping in circuit breakers. Short line fault condition and its relation to circuit breaker duty. Trapped harge effects. Effect of source and source representation in short line fault studies. **UNIT 3** Control of transients, Lightening phenomenon, influence of tower footing resistance and earth resistance, Traveling waves in distributed parameters multiconductor lines, parameters as a function of frequency. **UNIT 4** Mechanism of Lightning Discharge Types of Lightning strokes, Harmful effects of lighting, protections against lightning, overhead Ground wires. **UNIT 5** Lightening Arresters, Types of lightening arresters, Surge Absorber simulation of surge diverters in trarient analysis. Fourier integral and z transform methods in power system trarient.	**Modern Control Theory** UNIT 1 Introduction: Concept of Linear vector space Linear Independence, Bases & Representation, domain and range. Concept of Linearity, relaxedness, time invariance, causality. State Space Approach of Control System Analysis:Modern Vs conventional control theory, concept of state, state variable state vector, state space, state space equations, Writing statespace equations of mechanical, Electrical systems, Analogous systems. UNIT 2 State Space Representation using physical and phase variables, comparison form of system representation. Block diagram representation of state model. Signal flow graph representation. State space representation using canonical variables. Diagonal matrix. Jordan canonical form, Derivation of transfer functions from state-model. UNIT 3 Solution of State Equations:Eigenvalues and Eigen vectors. Matrix.Exponential, State transition matrix, Properties of state transition matrix. Computation of State transition matrix concepts of controllability &observability, Pole placement by state feedback. UNIT 4 Digital Control Systems: Introduction, sampled data control systems, signal reconstruction, difference equations. The z-transform, Z-Transfer Function. Block diagram analysis of sampled data systems, z and s domain relationship. UNIT 5 Modeling of sample-hold circuit, steady state accuracy, stability in z-plane and Jury stability criterion, bilinear transformation Routh-Hurwitz criterion on s-planes,digital PID controllers, Introductionto adaptive control.	**Code change**

62	BTEE602	**Switchgear & protection** **UNIT 1** **Circuit Breakers** Circuit Breakers: Elementary principles of arc interruption, Recovery, Restriking Voltage and Recovery voltages.- Restriking Phenomenon, Average and Max. RRRV, Numerical Problems - Current Chopping and Resistance Switching - CB ratings and Specifications : Types and Numerical Problems. – Auto reclosures. Description and Operation of following types of circuit breakers: Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum and SF6 circuit breakers. **UNIT 2** **Electromagnetic and Static Relays** Principle of Operation and Construction of Attracted armature, Balanced Beam, induction Disc and Induction Cup relays. Relays Classification: Instantaneous, DMT and IDMT types. Application of relays: Over current/ Under voltage relays, Directionrelays, Differential Relays and Percentage Differential Relays.Universal torque equation, Distance relays: Impedance, Reactance and Mho and Off-Set Mho relays, Characteristics of Distance Relays and Comparison. Static Relays: Static Relays verses Electromagnetic Relays. **UNIT 3** **Generator and Transformer Protection** Protection of generators against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection. Numerical Problems on % Winding Unprotected. Protection of transformers: Percentage Differential Protection, Numerical Problem on Design of CT s Ratio, Buchholtz relay Protection. **UNIT 4** **Feeder and Bus-Bar Protection**	**High Voltage Engineering** UNIT 1 (i) Breakdown in Gases: Introduction to mechanism of breakdown in gases, Townsend's breakdown mechanism. Breakdown in electromagnetic gases, Application of gases in power system. (ii) Breakdown in Liquids: Introduction to mechanism of breakdown in liquids, suspended solid particle mechanism and cavity breakdown. Application of oil in power apparatus. (iii) Breakdown in solids: Introduction to mechanism of breakdown in solids, electromechanical breakdown, treeing & tracking breakdown and thermal breakdown UNIT 2 (i) High DC Voltage Generation: Generation of high dc voltage, basic voltage multiplier circuit. (ii) High AC Voltage Generation: Cascaded Transformers. (iii) Impulse Voltage generation: Impulse voltage, basic impulse circuit, Mark's multistage impulse generator. (iv) Measurement of High Voltage: Potential dividers - resistive, capacitive and mixed potential dividers. Sphere gap- Construction and operation. Klydonorgraph. UNIT 3 Nondestructive Insulation Tests: (i) Measurement of resistively, dielectric constant and loss factor. High Voltage Schering Bridge- measurement of capacitance and dielectric loss. (ii)Partial Discharges: Introduction to partial discharge, partial discharge equivalent circuit. Basic wide-band and narrow band PD detection circuits. UNIT 4 (i) Over voltages: Causes of over voltages, introduction to lightning phenomena, over voltages due to lighting. (ii) Travelling Waves: Travelling waves on transmission lines-open end line, short circuited line, line terminated through a resistance, line connected to a cable, reflection and refraction at a T-junction and line terminated through a capacitance. Attenuation of traveling waves. UNIT 5 (i) Over Voltage Protection: Basic construction protection angle and protective zone, ground rods, counterpoise, surge absorber, rod gap and arcing horn, lighting arresters - expulsion type, non -linear gap type and metal oxide gapless type. (ii) Insulation Coordination:Volt-time curves, basic impulse insulation levels,	**Code change**

		Protection of Lines: Over Current, Carrier Current and Three-zone distance relay protection using Impedance relays. Translay Relay. Protection of Bus bars – Differential protection. **UNIT 5** **Protection against over voltages** Generation of Over Voltages in Power Systems.-Protection against Lightning Over Voltages - Valve type and Zinc-Oxide Lighting Arresters - Insulation Coordination -BIL, Impulse Ratio, Standard Impulse Test Wave, Volt-Time Characteristics.	coordination of insulation levels	
63	**BTEE603**	**Economic operation of power system** **UNIT 1** **Economics of Power Generation:** Introduction, cost of electrical energy, expression for cost of electrical energy, depreciation, power plant cost analysis, economics in plant selection, selection of types of generation and types of equipments, factors effecting economic generations and distributions, generating cost, economics of different types of generating plants. **UNIT 2** **Economical Operations of thermal power plants:** Methods of loading turbo generators, input, output and heat rate characteristics, incremental cost, two generations units, large no of units, sequence of adding units, effects of transmission losses, economic scheduling considering transmission losses, coordination equations, penalty factors **UNIT 3** **Hydro Thermal coordination:** Advantages of combined operation, base load peak load operation requirement, combined working of run-off river and steam plant, reservoirs hydroplants and thermal plants (long term operational aspects), short term hydro thermal coordination, coordination equations, scheduling methods and applications.	**Switchgear & Protection** UNIT 1 Static Comparators:amplitude and phase comparators, phase comparators. Introduction to (a) amplitude type, phase splitting type and sampling type, product type and coincidence type. Static Over Current Relays:Introduction to instantaneous, definite time, inverse time and directional overcurrent relays. UNIT 2 Static Differential Relays: Brief description of static differential relay schemes- single phase and three phase schemes. Introduction to static differential protection of generator and transformer. Static Distance Relays:Introduction to static impedance, reactance and mho relays. UNIT 3 Carrier Current Protection: Basic apparatus and scheme of power line carrier system. Principle of operation of directional comparison and phase comparison carrier Distance Protection:Effect of power swings on the performance of distance protection. Out of step tripping and blocking relays, mho relay with blinders. Introduction to quadrilateral and elliptical relays. UNIT 4 Circuit Breakers-I:Electric arc and its characteristics, arc interruption-high resistance interruption and current zero interruption. Arc interruption theories– recovery rate theory and energy balance theory.	**Syllabus Change** **Code Change**

		UNIT 4 **Parallel Operations of Generators:** Conditions, synchronizing current and power, two alternators in parallel (effect of change in excitation, load sharing, sharing of load currents), Infinite bus bars, active and reactive power control, synchronizing power, torque, operating limits of alternators, operating characteristics of cylindrical alternator rotor. **UNIT 5** **Economics for Electrical Engineers:** Concepts of physical and financial efficiencies of electrical goods and services, supply and demand, break even and minimum cost analysis, linear and nonlinear break even, min cist analysis	Restriking voltage and recovery voltage, develop expressions for restriking voltage and RRRV. Resistance switching, current chopping and interruption of capacitive current. Oil circuit breakers-bulk oil and minimum oil circuit breakers. Air circuit breakers. Miniature Circuit breaker (MCB). UNIT 5 Digital Protection:Introduction to digital protection. Brief description of block diagram of digital relay. Introduction to digital overcurrent, transformer differential and transmission line distance protection.	
64	**BTEE604**	**Signals & Systems** **UNIT 1** **CLASSIFICATION OF SIGNALS AND SYSTEMS**: Basic concepts & definitions, continuous & discrete time signals, systems & their classification, LT1 systems, convolution, system modeling using Differential & Difference Equations. **UNIT 2** **ANALYSIS OF C.T. SINGALS**: Fourier series analysis, Spectrum of C.T. signals, Fourier Transform and Laplace Transform in Signal Analysis. **UNIT 3** **ANALYSIS OF D.T. SIGNALS:** Discrete time Fourier series, Spectrum of D.T. signals, Discrete Time Fourier Transform (DTFT), Discrete Fourier Transform (DFT), Properties of Z-transform in signal analysis. **UNIT 4** **Z-TRANSFORM & LAPLACE TRANSFORM:** Introduction. The region of convergence for the Z-transform. The Inverse Z-transform. Two dimensional Z-transform. Properties of Z transform. Laplace transform, Properties of Laplace Transform,	**Advanced Power Electronics** UNIT 1 AC Voltage Controllers: Principle of On-Off Control, Principle of Phase control, SinglePhase Bi-directional Controllers with Resistive Loads, Single Phase Controllers with Inductive Loads, Three Phase full wave AC controllers, AC Voltage Controller with PWM Control. UNIT 2 Cyclo-converters: Basic principle of operation, single phase to single three-phase to three-phase and three-phase to single phase cyclo-converters. Output equation, Control circuit. UNIT 3 Inverters:Principle of Operation, Single-phase bridge inverters. Three phase bridge Inverters: 180 and 120 degree of conduction. VSI and CSI. Voltage control of Single Phase and Three Phase Inverters, Harmonic analysis,harmonic reduction techniques,Pulse width modulation techniques. UNIT 4 Resonant Pulse Inverter:Series resonant inverter with unidirectional switches, parallel resonant inverter, class E resonant inverter, L-type and M-type ZCS resonant converter, ZVS resonant converter. UNIT 5 Power Supplies: Switched Mode DC Power Supplies, fly-back converter, forward converter, half and full bridge converter, resonant DC power supplies, bi-directional power supplies. Resonant AC power supplies,	**New Course**

		Application of Laplace transform to system analysis. **UNIT 5** **SAMPLING:** Mathematical theory of sampling. Sampling theorem. Ideal & Real sampling. Interpolation technique for the reconstruction of a signal from its samples. Aliasing. Sampling in freq. domain. Sampling of discrete time signals.	bidirectional AC power supplies. Multistage conversions, Control Circuits: Voltage Mode Control, Current Mode Control	
65	**BTEE605**	**Modern Control Theory** **UNIT 1** **Introduction:** Concept of Linear vector space Linear Independence, Bases & Representation domain and range. Concept of Linearity, relaxedness, time invariance, causality. **UNIT 2** **State Space Approach of Control System Analysis:** Modern Vs conventional control theory,concept of state, state variable state vector, state space, state space equations, Writing statespace equations of mechanical, Electrical systems, Analogous systems. **UNIT 3** State Space Representation using physical and phase variables, comparison form of system epresentation. Block diagram representation of state model. Signal flow graph representation.State space representation using canonical variables. Diagonal matrix. Jordan canonical form ,Derivation of transfer function from state-model. **UNIT 4** **Solution of State Equations:** Diagonalization, Eigenvalues and eigen vectors. Matrix exponential, State transition matrix, Properties of state transition matrix. Computation of Statetransition matrix concepts of controllability & observability. Pole placement by statefeedback, Ackerman's formula **UNIT 5** **Digital Control Systems:** Introduction, sampled data	**Smart Grid Technology** UNIT 1 Introduction to Smart Grid: Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities, challenges and benefits Difference between conventional & Smart Grid, Concept of Resilient &Self-Healing Grid, Present development & International policies in Smart Grid, Diverse perspectives from experts and global Smart Grid initiatives. UNIT 2 Smart Grid Technologies: Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation ,Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and Control, Distribution Systems: DMS, Volt/Var control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plug in Hybrid Electric Vehicles (PHEV). UNIT 3 Smart Meters and Advanced Metering Infrastructure: Introduction to Smart Meters, Advanced Metering infrastructure (AMI) drivers and benefits,AMIprotocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement, Unit (PMU), Intelligent Electronic Devices (IED) & their application for monitoring & protection. UNIT 4 Power Quality Management in Smart Grid: Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected RenewableEnergy Sources, Power Quality Conditioners for Smart Grid, Web based Power Qualitymonitoring, Power Quality Audit. UNIT 5 High Performance Computing for Smart	**New Course**

		control systems, signal reconstruction,difference equations. The z-transform, Z-Transfer Function. Block diagram analysis ofsampled data systems, z and s domain relationship, digital PID controller	Grid Applications: Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN), Broadbandover Power line (BPL), IP based Protocols, Basics of Web Service and CLOUD Computing tomake Smart Grids smarter, Cyber Security for Smart Grid	
66	**BTEE606A**	**Power Quality** **UNIT 1** Introduction: Power Quality (PQ), PQ problems , Sags, Swells, Transients, Harmonics, Interruptions, Flicker,Voltage fluctuations, Notch. PQ Issues, Assessing PQ: Remedies Customer side of meter, Utility side of themeter. Power quality monitoring – Monitoring considerations, Historical Perspective of PQ Measuring Instruments, PQ measurement equipment, Assessment of PQ measurement data, Application of intelligent systems, PQ monitoring standards. **UNIT 2** Voltage Sag Analysis: Voltage sag characteristics - Methodology for computation of voltage sag magnitude and occurrence Accuracy of sag analysis Duration & frequency of sags Faults behind transformers Effect of pre-fault voltage Simple examples Voltage dip problems, fast assessment methods for voltage sags in distribution systems. **UNIT 3** PQ Consideration in Industrial Power Systems: Adjustable speed drive (ASD) systems and applications Sources of power system harmonics Mitigation of harmonics Characterization of voltage sags experienced by three-phase ASD systems Types of sags and phase angle jumps Effects of momentary voltage dips on the operation of induction and synchronous motors. **UNIT 4** Harmonics: Harmonic distortion, Voltage versus current distortion, Harmonics versus Transients, Harmonic Indices, Harmonic sources from commercial loads	Advanced Microprocessors UNIT 1 8086 Microprocessor: Hardware specifications, architecture, address spaces, clock generator, bus controller and arbiter, Minimum and maximum mode, System Bus Timing. UNIT 2 Software & Instruction Set: Assembly language programming: addressing mode and instructions of 8086, linking and execution of programs, MACRO programming, assembler directives and operators. UNIT 3 I/O Interfaces: Programmable peripheral interfacing (8255, 8155), Programmable Timer interfacing (8253, 8254), Programmable interrupt controller (8259), Serial CommunicationInterfaces. UNIT 4 Data & Memory Interfacing: A/D, D/A converter interfacing, Memory interfacing and Decoding, DMA controller. UNIT 5 Multiprocessor Configurations: 8086 based Multiprocessor systems. 8087 Numeric data processor. Introduction to 8-bit and 16-bit microcontrollers.	**Code Change**

		UNIT 5 Harmonic sources from industrial loads, Locating Harmonic sources, System response characteristics, Effects of Harmonic distortion, Inter harmonics, Devices for controlling harmonic distortion.		
67	**BTEE606B**	**Power System Reliability** **UNIT 1** Load Forecasting:Introduction, Factors affecting Load Forecasting, Load Research, Load Growth Characteristics, Classification of Load and Its Characteristics, Load Forecasting Methods - (i) Extrapolation (ii) Co-Relation Techniques, Energy Forecasting, Peak Load Forecasting, Reactive Load Forecasting, Non-Weather sensitive load Forecasting, Weather sensitive load Forecasting, Annual Forecasting, Monthly Forecasting, Total Forecasting. **UNIT 2** System Planning : Introduction, Objectives & Factors affecting to System Planning , Short Term Planning, Medium Term Planning, Long Term Planning, Reactive Power Planning. **UNIT 3** Reliability : Reliability, Failure, Concepts of Probability, Evaluation Techniques (i) Markov Process (ii) Recursive Technique, Stochastic Predic tion of Frequency and Duration of Long & Short Interruption, Adequacy of Reliability,Reliability Cost. **UNIT 4** Generation Planning and Reliability: Objectives & Factors affecting Generation Planning, Generation Sources, Integrated Resource Planning, Generation System Model, Loss of Load (Calculation and Approaches), Outage Rate, Capacity Expansion, Scheduled Outage, Loss of Energy, Evaluation Methods. Interconnected System, Factors Affecting Interconnection under Emergency Assistance.	**Power System Instrumentation** UNIT 1 Theory of Errors: Accuracy and precision, systematic and random errors, limits of error, probable error and standard deviation. Gaussian error curves, combination of errors. UNIT 2 Transducers: Construction & Operating Characteristics of active and digital transducers, Measurement of temperature, pressure, displacement, acceleration, noise level. Instrumentation for strain, displacement, velocity, acceleration, force, torque and temperature. UNIT 3 Signal Conditioning: Instrumentation amplifiers, isolation amplifiers, analog multipliers, analog dividers, function generators, timers, sample and optical and magnetic isolators. Frequency to voltage converters, temperature to current converters. Shielding and grounding. UNIT 4 Power System Instrumentation-I:Measurement of voltage, current, phase angle, frequency, active power and reactive power in power plants. Energy meters and multipart tariff meters. Basic idea of LT & HT panel's. UNIT 5 Power System Instrumentation-II:Capacitive voltage transformers and their transient behavior, Current Transformers for measurement and protection,composite errors and transient response.	**New Course**

		UNIT 5 Transmission Planning and Reliability: Introduction, Objectives of Transmission Planning, Network Reconfiguration, System and Load Point Indices, Data required for Composite System Reliability. Parallel & Meshed Networks - Introduction, Basic Evaluation Techniques, Bus Bar Failure, Scheduled Maintenance, Temporary and Transient Failure, Weather Effects, Breaker Failure		
68	**BTEE606C**	**Power system coordination and control** **UNIT 1** INTRODUCTION System load variation: System load characteristics, load curves daily, weekly and annual, load duration curve, load factor, diversity factor. Reserve requirements: Installed reserves, spinning reserves, cold reserves, hot reserves. Overview of system operation: Load forecasting, techniques of forecasting, basics of power system operation and control. **UNIT 2** REAL POWER FREQUENCY CONTROL Fundamentals of speed governing mechanism and modeling Speed load characteristics Load sharing between two synchronous machines in parallel concept of control area, LFC control of a single area system: Static and dynamic analysis of uncontrolled and controlled cases, Economic Dispatch Control. Multi area systems: Two area system modeling; static analysis, uncontrolled case; tie line with frequency bias control of two area system derivation, state variable model. **UNIT 3** HYDROTHERMAL SCHEDULING PROBLEM Hydrothermal scheduling problem: short term and long term mathematical model, algorithm. Dynamic programming solution methodology for hydrothermal scheduling with pumped hydro plant: Optimization with pumped	**Digital Communication and Information Theory** UNIT 1 PCM & Delta Modulation Systems: PCM and delta modulation, quantization noise in PCM and delta modulation. Signal-to-noise ratio in PCM and delta modulation, T1 Carrier System, Comparison of PCM and DM. Adaptive delta Modulation. Bit, word and frame synchronization, Matched filter detection. UNIT 2 Digital Modulation Techniques: Various techniques of phase shift, amplitude shift and frequency shift keying. Minimum shift keying. Modulation & Demodulation. UNIT 3 Error Probability in Digital Modulation: Calculation of error probabilities for PSK, ASK, FSK & MSK techniques. UNIT 4 Information Theory:Amount of Information, Average Information, Entropy, Information rate, Increase in Average information per bit by coding, Shannon's Theorem and Shannon's bound Capacity of a Gaussian Channel, BW-S/N trade off, Orthogonal signal transmission. UNIT 5 Coding: Coding of Information, Hamming code, Single Parity-Bit Code, Linear Block code, cyclic code &convolution code.	**New Course**

		hydro plant Scheduling of systems with pumped hydro plant during off peak seasons: algorithm. Selection of initial feasible trajectory for pumped hydro plant Pumped hydro plant as spinning reserve unit gene ration of outage induced constraint Pumped hydro plant as Load management plant. **UNIT 4** UNIT COMMITMENT AND ECONOMIC DISPATCH Statement of Unit Commitment (UC) problem; constraints in UC: spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints; UC solution methods: Priority list methods, forward dynamic programming approach, numerical problems .Incremental cost curve, coordination equations without loss and with loss,solution by direct method and λ iteration method. Base point and participation factors. Economic dispatch controller added to LFC control. **UNIT 5** COMPUTER CONTROL OF POWER SYSTEMS Energy control centre: Functions Monitoring, data acquisition and control. System hardware configuration SCADA and EMS functions: Network topology determination, state estimation, security analysis and control. Various operating states: Normal, alert, emergency, in extremis and restorativeState transition diagram showing various state transitions and control strategies		
69	**BTEE606D**	**Advanced Microprocessors** **UNIT 1** **8086 Microprocessor:** Hardware specifications, architecture, address spaces, clock generator, bus controller and arbiter, Minimum and maximum mode, System Bus Timing. **UNIT 2** **Software & Instruction Set:** Assembly language		**Code change**

		programming: addressing mode and instructions of 8086, linking and execution of programs, MACRO programming, assembler directives and operators. **UNIT 3** **I/O Interfaces:** Programmable peripheral interfacing **(**8255, 8155), Programmable Timer interfacing (8253,8254), Programmable interrupt controller (8259) Serial Communication interfaces. **UNIT 4** **Data & Memory Interfacing:** A/D, D/A converter interfacing, Memory interfacing and Decoding, DMA controller. **UNIT 5** **Multiprocessor Configurations:** 8086 based Multiprocessor systems. 8087 Numeric data processor.		
70	**BTEE607**	**Power System Lab** 1. To study the operation of electro-mechanical type on inverse time over current relay by using VPL 102A. 2. To study the operation of electro-mechanical type under voltage relay by using VPST-103B. 3. To study the performance of directional over current relay using VPL-82. 4. To study the phase to earth fault relay by balance condition using VPL-04A. 5. To study the operational of micro-controller based biased single phase differential protection on transformer secondary relay using VPL-83. 6. To study the characteristics of normal fuse, HRC fuse and MCB, using fuse, HRC fuse and MCB characteristics trainer VPL-03. 7. To analyses the directional over current relay by DMT & IDMT method using VPL-81. 8. To study the gas actuated buchholz relay.	**Control System Lab** 1 Introduction to MATLAB Computing Control Software. 2 Defining Systems in TF, ZPK form. 3 (a) Plot step response of a given TF and system in state-space. Take different values of damping ratio and w_n natural undamped frequency. (b) Plot ramp response. 4 For a given 2nd order system plot step response and obtain time response specification. 5 To design 1st order R-C circuits and observe its response with the following inputs and trace the curve. (a) Step (b) Ramp (c) Impulse 6 To design 2nd order electrical netw following cases. (a) Under damped system (b) Over damped System.	**Syllabus Change** **Code change**

			(c) Critically damped system. 7 To Study the frequency response of following compensating Networks, plot the graph and final out corner frequencies. (a) Log Network (b) Lead Network (c) Log-lead Network. 8 To draw characteristics of ac servomotor 9 To perform experiment on Potentiomete 10 Check for the stability of a given closed 11 Plot bode plot for a 2nd order system and	
71	**BTEE608**	**Advanced Power Electronics Lab** 1 .Study and test AC voltage regulators using triac, antiparallel thyristors and triac&diac. 2 .Study and test single phase PWM inverter. 3 .Study and test buck, boost and buck-boost regulators. 4. Study and test MOSFET chopper. 5 .Study and test Zero voltage switching. 6 .Study and test SCR DC circuit breaker. 7 .Control speed of a dc motor using a chopper and plot armature voltage versus speed characteristic. 8 .Control speed of a single-phase induction motor using single phase AC voltage regulator. 9 .(i) Study single-phase dual converter. (ii) Study speed control of dc motor using single-phase dual converter. 10 .Study one, two and four quadrant choppers (DC-DC converters). 11 .Study speed control of dc motor using one, two and four quadrant choppers. 12 .Study single-phase cycloconverter.	**Power System Lab** 1 Study the burden effect on the performance of CT and measure ratio error. 2 Find out the sequence components of currents in three 1-Phase transformers and 3-Phase transformer and compare their results. 3 (i) Study over current relay. (ii) Draw the current-time characteristic of an over current relay for TMS=1 & 0.5 and PSM=1.25 & 1.0. 4 (i) Study percentage bias differential relay. (ii) Plot the characteristics of a percentage bias differential relay for 20%, 30% and 40% biasing. 5 Study gas actuated Buchholz relay. 6 Study under frequency relay and check it's setting experimentally. 7 Design a HV transmission line. 8 Study a typical grid substation. 9 Study earthing of power station, substation and building	**Code change**
72	**BTEE609**	**Power System Design Lab** 1. Generating station design: Design considerations and basic schemes of hydro, thermal, nuclear and gas power plants. Electrical equipment for power stations. 2. Auxiliary power supply scheme for thermal power plant. 3. Distribution system Design: Design of	**Advanced Power Electronics Lab** 1 Study and test AC voltage regulators using triac, antiparallel thyristors and triac&diac. 2 Study and test single phase PWM inverter. 3 Study and test buck, boost and	**Code Change**

		feeders & distributors. Calculation of voltage drops in distributors. Calculation of conductor size using Kelvin's law. 4. Methods of short term, medium term and long term load forecasting. 5. Sending end and receiving end power circle diagrams. 6. Instrument Transformers: Design considerations of CTs & PTs for measurement and protection. 7. Substations: Types of substations, various bus–bar arrangements**.** Electrical equipment for substations.	buck- boost regulators. 4 Study and test MOSFET chopper. 5 Study and test Zero voltage switching. 6 Study and test SCR DC circuit breaker. 7 Control speed of a dc motor using a chopper and plot armature voltage versus speed characteristic. 8 Control speed of a single-phase induction motor using single phase AC voltage regulator. 9 (i) Study single-phase dual converter. (ii) Study speed control of dc motor using single-phase dual converter. 10 Study one, two and four quadrant choppers (DC-DC converters). 11 Study speed control of dc motor using one, two and four quadrant choppers. 12 Study single-phase cycloconverter.	
73	**BTEE610**	**Signal and Systems Lab** 1. Introduction to MATLAB and its basic commands. 2. Plot unit step, unit impulse, unit ramp, exponential, parabolic functions and sinusoidal signals 3. Plot the linear convolution of two sequences. 4. Plot the correlation of two sequences. 5. Plot the magnitude and phase spectra of a signal using Fourier transforms. 6. Plot the magnitude and phase spectrum of signal using Fourier series. 7. Find out the Z transform of a signal and check the stability using pole zero location. 8. Plot the spectra of ideally sampled signal w.r.t. sampling of Discrete time signals. 9. Verification of few properties of Fourier transform. 10. Evaluate the DTFS coefficients of a signal and plot them.	**Smart Grid Lab** 1. Study different components of smart grid 2. To visit thermal/nuclear power plant 3. To design and simulate hybrid wind-solar power generation system using simulating software 4. Study Different terminology used in power quality assessment 5. Study and measure certain parameters of power quality in laboratory with and without power quality improvement devices.	**New Course**
74	**BTEE611**	**Industrial tour/ In house workshop**	**Entrepreneurship Development** 1 Definition of entrepreneur, qualities of a successful entrepreneur, Charms of being an entrepreneur, achievement- motivation, leadership and entrepreneurial competencies. 2 Decision-making, procedures and formaliti	**New Course**

			3 Identification and selection of business opportunities and market su Implementation and customer satisfaction. 4 Business crises, problem-solving attitude, communication skill. Government 5 Knowledge based enterprises, Scope of entrepreneur in present con entrepreneurship. 6 Marketing & Sales Promotion, Techno-Economic Feasibility Assessment by Preparation of Preliminary & Detailed project report.	
75	**BTEE612**	Minior Project - I	Discipline & Extra Curricular Activity	**New Course**
76	**BTEE701**	Training & Seminar	Power System Planning UNIT 1 Introduction of power planning, National and Regional Planning,structure of P.S., planning tools Electricity Regulation, Electrical Forecasting, forecasting techniques modeling. UNIT 2 Generation planning, Integrated powergeneration cogeneration/captive Power pooling and power trading. Transmission and distribution planning. Power system Economics. Power sector finance, financial planning, participation Rural Electrification investment, concept of Rational tariffs. UNIT 3 Power supply Reliability, Reliability planning. System operation management, load prediction, reactive power balance Online power flow studies, state estimation, computerized management, system simulator. UNIT 4 Computer aided planning, wheeling. Environmental effects, the greenhouse effect Technological impacts. Insulation coordination. Reactive compensation. UNIT 5 Optimal power system expansion planning: Formulation optimization problem incorporating the capital, Operating and maintenance cost of candidate plants of different types (Thermal, Hydro, Nuclear, Non-conventional etc.) and	**New Course**

			minimum assured reliability constraint – optimization techniques for solution by programming.	
77	**BTEE702**		**Power System Analysis** UNIT 1 Percent and per unit quantities. Single line diagram for a balanced 3-phase system Admittance Model: Branch and node admittances Equivalent admittance network and calculation of Y bus. Modification of an existing Y bus. UNIT 2 Impendence Model: Bus admittance and impedance matrices. Thevenin's theorem and Z bus. Direct determination of Z bus. Modification of an existing bus. Symmetrical fault Analysis: Transient on a Transmission line, short circuit of a synchronous machine on no load, short circuit of a loaded synchronous machine. Equivalent circuits of synchronous machine under sub transient, transient and steady state conditions. Selection of circuit breakers, Algorithm for short circuit studies. Analysis of three-phase faults. UNIT 3 SymmetricalComponents:Fortescue theorem, symmetrical component transformation. Phase shift in star-delta transformers. Sequence Impedances of transmission lines, Synchronous Machine and Transformers, zero sequence network of transformers and transmission lines. Construction of sequence networks of power system. Fault Analysis: Analysis of single line to ground faults using symmetrical components, connection of sequence networks under the fault condition. UNIT 4 Unsymmetrical Fault Analysis: (i) Analysis of line-to-line and double line to ground faults using symmetrical components, connection of sequence under fault conditions. Analysis of unsymmetrical shunt faults using bus impedance matrix method. UNIT 5 Load Flow Analysis:Load flow problem,development of load flow equations,bus classification Gauss Seidel, Newton Raphosn, decoupled and fast decoupled methods for load flow	**Syllabus Change Code change**

			analysis. Comparison of load flow methods.	
78	**BTEE703**		**Artificial Intelligence Techniques** UNIT 1 Artificial Intelligence: Introduction to AI and knowledge based Expert systems, Introduction, Importance and Definition of AI, ES, ES building tools and shells. UNIT 2 Knowledge Representation: Concept of knowledge, Representation of knowledge using logics rules, frames. Procedural versus. Declarative knowledge, forward versus backward chaining Control Strategies: Concept of heuristic search, search techniques depth first search, Breath first search, Generate & test hill climbing, best first search. UNIT 3 Artificial Neural Network: Biological Neurons and synapses, characteristics Artificial Neural Networks, types of activation functions. Perceptions: Perception representation, limitations of perceptrons. Single layer and multiplayer perceptrons. Perceptron learning algorithms. UNIT 4 Basic Concepts in Learning ANN: Supervised learning, Back propagation algorithm, unsupervised learning, Kohonen's top field network & Algorithm. UNIT 5 Fuzzy Logic: Fuzzy logic concepts, Fuzzy relation and membership functions, Defuzzification, Fuzzy controllers, Genetic Algorithm: concepts, coding, reproduction, crossover, mutation, scaling and fitness.	**Syllabus Change** **Title change** **Code change**
79	**BTEE704**		**Non Conventional Energy Sources** UNIT 1 Introduction: World energy situation, conventional and non-conventional energy sources, Indian energy scene. Tidal Energy: Introduction to tidal power. Components of tidal power plants, double basin arrangement. Power generation. Advantages and limitations of tidal power generation. Prospects of tidal energy in India. UNIT 2 Solar Energy: Solar radiation, solar radiation geometry, solar radiation on tilted surface. Solar energy collector. Flat- plate collector, concentrating collector - parabolidal and heliostat.	**Code Change**

			Solar pond. Basic solar power plant. Solar cell, solar cell array, basic photo-voltaic power generating system. UNIT 3 Wind Energy: Basic principle of wind energy conversion, efficiency of conversion, site selection. Electric power generation-basic components, horizontal axis and vertical axis wind turbines, towers, generators, control and monitoring components. Basic electric generation schemes- constant speed constant frequency, variable speed constant frequency and variable speed variable frequency schemes. Applications of wind energy. Geothermal Energy: Geothermal fields, estimates of geothermal power. Basic geothermal steam power plant, binary fluid geothermal power plant and geothermal preheat hybrid power plant. Advantages and disadvantages of geothermal energy. Applications of geothermal energy. Geothermal energy in India. UNIT 4 Nuclear Fusion Energy: Introduction, nuclear fission and nuclear fusion. Requirements for nuclear fusion. Plasma confinement – magnetic confinement and inertial confinement. Basic Tokamak reactor, laser fusion reactor. Advantages of nuclear fusion. Fusion hybridand cold fusion. UNIT 5 Biomass Energy: Introduction, biomass categories, bio-fuels. Introduction to biomass conversion technologies. Biogas generation, basic biogas plants-fixed dome type, floating gasholder type, Deen Bandhu biogas plant, Pragati design biogas plant. Utilization of bio gas. Energy plantation. Pyrolysis scheme. Alternative liquid fuels –ethanol and methanol. Ethanol production.	
80	**BTEE705**		**Power System Engineering** UNIT 1 Economic Operation of Power Systems: Introduction, system constraints, optimal operation of power systems. Input output, heat rate and incremental rate curves of thermal generating units. Economic distribution of load between generating units within a plant. Economic distribution of load between power stations, transmission loss equation. Introduction to unit commitment and dynamic programming. UNIT 2	**Code Change**

			Power System Stability-I: Power angle equations and power angle curves under steady state and transient conditions. Rotor dynamics and swing equation (solution of swing equation not included). Synchronizing power coefficient. Introduction to steady state and dynamic stabilities, steady state stability limit. UNIT 3 Power System Stability-II: Introduction to transient stability. Equal area criterion and its application to transient stability studies under basic disturbances. Critical clearing angle and critical clearing time. Factors affecting stability and methods to improve stability. UNIT 4 Excitation Systems: Introduction of excitation systems of synchronous machines, types of excitation systems, Elements of various excitation systems and their control (functional block diagrams and their brief description)-DC excitation systems, AC excitation systems, brushless excitation system. Interconnected Power Systems: powers systems. Reserve capacity of power stations, spinning and maintenance resaves. Advantages and problems of interconnected power systems. Power systems inter connection in India. UNIT 5 Tap Changing transformer, phase angle control and phase shifting transformer. Series compensation of transmission lines, location and protection of series capacitors, advantages and problems Introduction to power system security. Introduction to voltage stability.	
81	**BTEE706A**		**Electromagnetic Field Theory** UNIT 1 Introduction: Vector Relation in rectangular, cylindrical, spherical and general curvilinear coordinate system. Concept and physical interpretation of gradient, Divergence and curl, Green's Stoke's and Helmholz theorems UNIT 2 Electrostatics: Electric field vectors-electric field intensity, flux density & polarization. Electric field due to various charge configurations. The potential functions and displacement vector. Gauss's law, Poisson's and Laplace's	**Code Change**

			equation and their solution. Uniqueness theorem. Continuity equation. Capacitance and electrostatics energy. Field determination by method of images. Boundary conditions. Field mappings and concept of field cells. UNIT 3 Magnetostatics: Magnetic field vector: Magnetic field intensity, flux density & magnetization, Bio-Savart's law, Ampere's law, Magnetic scalar and vector potential, self & mutual inductance. Energy stored in magnetic field, Boundary conditions, Analogy between electric and magnetic field, Field mapping and concept of field cells. UNIT 4 Time Varying Fields: Faraday's law, Displacement currents and equation of continuity. Maxwell's equations, Uniform plane wave in free space, dielectrics and conductors, skin effect sinusoidal time variations, reflections, refraction & polarization of UPW, standing wave ratio. Pointing vector and power considerations. UNIT 5 Transmission Lines: The high-frequency circuit. LCR ladder model. The transmission Lin equation. Solution for loss-less lines. Wave velocity and wave impedance. Reflection and Transmission coefficients at junctions. VSWR.	
82	**BTEE706B**		**Computer Aided Design of Electrical** UNIT 1 Basic Principles of Electrical Machine Design: Specifications, Factors affecting the design, Limitations, main dimension, loadings, output equation, factor affecting the size and rating, Electrical Engineering Materials: conducting, magnetic and insulating materials. Magnetic Circuit Calculation: Ohm's law for magnetic circuit, mmf required for air gap and iron parts, tapered teeth, real and apparent flux density, magnetizing current. UNIT 2 Heating and Cooling of Electrical Machines: heat dissipation and heat flow equations, Newton's law of cooling, equations for temperature rise, Rating of Machines: Continuous, short and intermittent ratings, mean	**New Course**

			temperature rise, hydrogen cooling of turbo alternators, quantity of cooling medium. UNIT 3 ComputerAidedDesignofTransformers: Powerand Distribution Transformers, core and yoke cross sections, square and stepped core, output equations, main dimensions, types & design of windings, optimization concepts. UNIT 4 Computer Aided Design of Synchronous Machines: Turbo and Hydro alternators, choice of specific magnetic & electric loading, short circuit ratio and its effects air gap length, output equation, main dimensions, flow charts for design of synchronous machine, design of stator core & winding. UNIT 5 Computer Aided Design of Induction Machines: Output equation, main dimensions, design criteria, flow charts for design of induction motor, air gap length, design of stator core and winding, rotor design.	
83	**BTEE706C**		**Economic Operation of Power Systems** UNIT 1 Economics of Power Generation: Introduction, cost of electrical energy, expression for cost of electrical energy, depreciation, power plant cost analysis, economics in plant selection, selection of types of generation and types of equipments, factors effecting economic generations and distributions, generating cost, economics of different types of generating plants UNIT 2 Economical Operations of Thermal Power Plants: Methods of loading turbo generators, input, output and heat rate characteristics, incremental cost, two generations units, large no of units, sequence of adding units, effects of transmission losses, economic scheduling considering transmission losses, coordination equations, penalty factors UNIT 3 Hydro Thermal coordination: Advantages of combined operation, base load peak load operation requirement, combined working of run-off river and steam plant	**Code Change**

			Reservoirs hydroplants and thermal plants (long term operational aspects), short term hydro thermal coordination, coordination equations, scheduling methods and applications. UNIT 4 Parallel Operations of Generators: Conditions, synchronizingcurrent and power, two alternators in parallel (effect of change in excitation, load sharing, sharing of load currents), Infinite bus bars, active and reactive power control, synchronizing power, torque, operating limits of alternators, operating characteristics of cylindrical alternator rotor. UNIT 5 Economics for Electrical Engineers: Concepts of physical and financial efficiencies of electrical goods and services, supply and demand, break even and minimum cost analysis, linear and nonlinear break even, min cist analysis	
84	**BTEE707**		**Power System Planning Lab** Status of National and Regional Planning, for power system 2. Write components of Structure of power system 3. Explain in detail various planning tools. 4. Write short note on Electricity Regulation 5. Modeling of Electrical Forecasting techniques 6. Transmission and distribution planning 7. concept of Rational tariffs 8. Rural Electrification	**New Course**
85	**BTEE708**		**Power System Modelling & Simulation lab** 1. Simulate Swing Equation in Simulink (MATLAB) 2. Modeling of Synchronous Machine. 3.Modeling of Induction Machine. 4.Simulate simple circuits using Circuit Maker. 5.(a) Modeling of Synchronous Machine with PSS (b) Simulation of Synchronous Machine	**New Course**

			with FACTS device. 6.(a) Modeling of Synchronous Machine with FACTS device (b) Simulation of Synchronous Machine with FACTS devices. 7.FACTS Controller designs with FACT devices for SMIB system.	
86	**BTEE709**		**Industrial Economics & Management** 1 Money Banking and Trade: Functions of money, supply & demand for money, money price level & inflation, black money, meaning, magnitude & consequences. Functions of Commercial banks, banking system in India, shortcomings and improvements. Function of RBI, monetary policy-making, objectives and features. Sources of public revenue, principles of taxation, direct and indirect taxes, Theory of international trade, balance of trade and payment, Foreign exchange control, devaluation New economic policy: Liberalization, extending privatization, globalization. 2 Management Principles: Management functions, responsibilities of management to society, development of management thought. Nature of planning, decision making, management by objectives, Line and staff authority relationships, decentralization and delegation of authority, span of management. 3 Production Management: Production planning and control, inventory control, quality control and Total quality management. ISO standards Related to quality/Environment/safety etc. Tools of Project Management: CPM, PERT, project information systems. Marketing functions, management of sales and advertising marketing research. 4 Human Resource Management: Function, application of industrial	**New Course**

			psychology for selection, training and recruitment. Communication process, media channels and barriers to effective communication, theories of motivation, leadership. 5 Finance and Account Management: Engineering Economics: Investment decision, present worth, annual worth and rate of return methods. Payback time. Need for good cost accounting system, cost control techniques of financial control, financial statements, financial ratios, breakeven analysis, budgeting and budgetary control.	
87	**BTEE710**		**Practical Training & Industrial Visit**	**Title Change Code Change**
88	**BTEE711**		**Project-I**	**Title Change Code Change**
89	**BTEE712**		**Discipline & Extra Curricular Activity**	**New Course**
90	**BTEE801**	**Power System Analysis** **UNIT 1** **Power System Network Matrices-1** Graph Theory: Definitions, Bus Incidence Matrix, Y_{bus} formation by Direct and Singular Transformation Methods, Numerical Problems. Formation of Z_{Bus}: Partial network, Algorithm for the Modification of Z_{Bus} Matrix for addition element for the following cases: Addition of element from a new bus to reference, Addition of element from a new bus to an old bus, Addition of element between an old bus to reference and Addition of element between two old busses (Derivations and Numerical Problems).- Modification of Z_{Bus} for the changes in network (Problems) **UNIT 2** **Power flow Studies-1** Necessity of Power Flow Studies – Data for Power Flow Studies – Derivation of Static load flow equations – Load flow solutions using Gauss Seidel Method: Acceleration Factor, Load flow solution with	**EHV AC/DC Transmission** **UNIT 1** EHV AC Transmission: Need of EHV transmission lines, power handling capacity and surge impedance loading. Problems of EHV transmission, Bundled Conductors: geometric mean radius of bundle, properties of bundle conductors. Electrostatic fields of EHV lines and their effects, corona effects: Corona loss, audio and radio noise. UNIT 2 Load Frequency Control: Introduction to control of active and reactive power flow, turbine speed governing system. Speed governing characteristic of generating unit and load sharing between parallel operating generators Method of Load Frequency Control: Flat frequency, flat tie line and tie line load bias control. Automatic generation control (description of block diagram only). UNIT 3 Voltage Control: No load receiving end voltage and reactive generation. Methods of voltage control. Synchronous phase modifier Shunt capacitors and reactors, saturable reactors, Thyristorised static VAR	**Code Change**

		and without P-V buses, Algorithm and Flowchart. Numerical Load flow Solution for Simple Power Systems (Max. 3-Buses): Determination of Bus Voltages, Injected Active and Reactive Powers (Sample One Iteration only) and finding Line Flows/Losses for the given Bus Voltages.Newton Raphson Method in Rectangular and Polar Co-Ordinates Form: Load Flow Solution with or without PV Busses- Derivation of Jacobian Elements, Algorithm and Flowchart. Decoupled and Fast Decoupled Methods.- Comparison of Different Methods – DC load Flow UNIT 3 Short Circuit Analysis Per-Unit System of Representation. Per-Unit equivalent reactance network of a three phase Power System, Numerical Problems. Symmetrical fault Analysis: Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors, Numerical Problems Symmetrical Component Theory: Symmetrical Component Transformation, Positive, Negative and Zero sequence components: Voltages, Currents and Impedances. Sequence Networks: Positive, Negative and Zero sequence Networks, Numerical Problems. Unsymmetrical Fault Analysis: LG, LL, LLG faults with and without fault impedance, Numerical Problems. UNIT 4 Power System Steady State Stability Analysis Elementary concepts of Steady State, Dynamic and Transient Stabilities. Description of: Steady State Stability Power Limit, Transfer Reactance, Synchronizing Power Coefficient, Power Angle Curve and Determination of Steady State Stability and Methods to improve steady state stability. UNIT 5 Power System Transient State Stability	compensators- TCR, FC-TCR and TSC-TCR. UNIT 4 FACTS: Introduction to FACTS controllers, types of FACTS controllers, Brief description of STATCOM, Thyristor controlled series capacitors and unified power flow controller. UNIT 5 HVDC Transmission: Types of D.C. links, advantages and disadvantages of HVDC transmission. Basic scheme and equipment of converter station. Ground return. Basic principles of DC link control and basic converter control characteristics. Application of HVDC transmission.	

		Analysis Derivation of Swing Equation. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Critical Clearing Angle Calculation.- Solution of Swing Equation: Point-by-Point Method. Methods to improve Stability - Application of Auto Reclosing and Fast Operating Circuit Breakers		
91	**BTEE802**	**Power System Engineering** **UNIT 1** Different form energy sources: Fossils fuels, Nuclear energy and Hydro power,**-Renewable Energy Sources:** Introduction to Solar energy, geo-thermal energy, tidal energy, wind energy, bio-gas energy and M.H.D. Power generation. **Thermal Power Plant:** Location and Site selection, general layout and working of plant, boilers, economizers, super heaters, draft equipments, fuel and ash handling plants**.** **UNIT 2** **Gas Turbine Power Plant:** Lay out, Working and components of gas turbine power plant, combined gas and steam turbine plant. **Hydro Electric Plant:** Location and site selection, general layout and operation of plant, Types of Hydro Turbines and their characteristics – Impulse and reaction type (Pelton Wheel, Francis and Kaplan turbines,), speed governing system. **Diesel Power Plant:** Layout and components of plant auxiliary equipments. **UNIT 3** **Nuclear Power Plant:** Location and site selection, general layout and operation of plant, brief description of reactors, moderators and reflectors. **UNIT 4** **Economic Operation Of Power System:** Performance curves, Economic generation scheduling neglecting losses and generator limits, Economic generation scheduling Economic Dispatch including transmission losses – approximate penalty factor, iterative technique for solution of	**Electric Drives and Their Control** UNIT 1 Dynamics of Electric Drives: Fundamental torque equations, speed-torque conventions and multi-quadrant operation, Nature and classification of load torques, steady state stability, load equalization, close loop configurations of drives. UNIT 2 DC Drives: Speed torque curves, torque and power limitation in armature voltage and field control, Starting, Braking: Regenerative Braking, dynamic braking and plugging. Speed Control-Controlled Rectifier fed DC drives, Chopper Controlled DC drives. UNIT 3 Induction Motor Drives-I: Starting, Braking-Regenerative braking, plugging and dynamic braking. Speed Control: Stator voltage control, variable frequency control from voltage source, Voltage Source Inverter (VSI) Control. UNIT 4 Induction Motor Drives-II: Variable frequency control from current source, Current Source Inverter (CSI) Control, Cycloconverter Control, Static rotor resistance control, Slip Power Recovery-Stator Scherbius drive, Static Kramer drive. UNIT 5 Synchronous Motor Drive: Control of Synchronous Motor-Separately Controlled and VSI fed Self-Controlled Synchronous Motor Drives. Dynamic and Regenerative Braking of Synchronous Motor with VSI. Control of Synchronous Motor Using Current Source Inverter (CSI).	**Code Change**

		economic dispatch with losses; Derivation of transmission loss formula. **UNIT 5** **Substation Layout:** Types of substations, typical layout and constructional details of pole mounted, Indoor, Outdoor sub-stations, hybrid gas insulated sub stations, bus bar arrangements, application of substation equipment like transformer , circuit breaker, isolator, metering equipments and protecting equipment , substation grounding.		
92	**BTEE803**	**Electrical Machine Design** **UNIT 1** **MAGNETIC CIRCUITS AND COOLING OF ELECTICAL MACHINES** Concept of magnetic circuit – MMF calculation for various types of electrical machines – Real and apparent flux density of rotating machines – Leakage reactance calculation for transformers, Induction and synchronous machine – Thermal ratings Continuous, Short time and Intermittent – Direct and Indirect cooling methods – Cooling of turbo alternators **UNIT 2** **D.C. MACHINES** Constructional details – Winding design – Output equation – Main dimensions – Choice of specific loadings – Choice of number of poles – Armature design – Design of field poles and field coil – Design of commutator and brushes – Losses and efficiency calculations **UNIT 3** **TRANSFORMERS** Constructional details of core and shell type transformers – Amorphous Cores – Output rating of single phase and three phase transformers – Optimum design of transformers – Design of core, Yoke and windings for core and shell type transformers – Equivalent circuit parameter from design data – Losses and efficiency calculations – Design of tank and cooling tubes	**Protection of Power System** UNIT 1 Causes and consequences of dangerous currents: Faults, overloads and switching over currents. Introduction to protection, trip circuit of a circuit breaker. Functional characteristics of a relay, zone of protection, primary and backup protection. CTs &PTs: Current transformer construction, measurement and protective CTs. Type of potential transformers. Steady state ratio and phase angle errors in CTs and PTs. Transient errors in CT and CVT (Capacitive Voltage Transformer). UNIT 2 Overcurrent Protection: HRC fuse and thermal relay. Overcurrent relays – instantaneous, definite time, inverse time and inverse definite minimum time overcurrent relays, time and current gradings. Induction disc type relay. Directional overcurrent relay, 300, 600 and 900 connections. Earth fault relay. Brief description of overcurrent protective schemes for a feeder, parallel feeders and ring mains. UNIT 3 Generator Protection: Stator protection– differential and percentage differential protection, protection against stator inter-turn faults, stator overheating protection. Rotor protection-protection against excitation and prime mover failure, field earth fault and unbalanced stator currents (negative sequence current protection). UNIT 4 Transformer Protection: Percentage differential protection, magnetizing inrush current, percentage differential relay with	**New Course**

		UNIT 4 **THREE PHASE INDUCTION MOTORS** Constructional details of squirrel cage and slip ring motors – Output equation – Main dimensions – Choice of specific loadings – Design of stator – Design of squirrel cage and slip ring rotor – Equivalent circuit parameters from design data – Losses and efficiency calculations **UNIT 5** **SYNCHRONOUS MACHINES** Constructional details of cylindrical pole and salient pole alternators – Winding design – Output equation – Choice of specific loadings – Main dimensions – Short circuit ratio – Design of stator and rotor of cylindrical pole and salient pole machines – Design of fieldcoil – Performance calculation from design data – Introduction to computer aided design	harmonic restraint. Buchholz relay. Differential protection of generator transfer unit. Busbar Protection: Differential protection of busbars. Highimpedance relay scheme, frame leakage protection UNIT 5 Transmission Line Protection: Introduction to distance protection. Construction, operating principle and characteristics of an electromagnetic impedance relay. Effect of arc resistance.Induction cup type reactance and mho relays. Comparison between impedance, reactance and mho relays. Three stepped distance protection of transmission line. Induction Motor Protection: Introduction to various faults and abnormal operating conditions, unbalance supply voltage and single phasing. Introduction to protection of induction motors- HRC fuse and overcurrent, percentage differential, earth fault and negative sequence voltage relays	
93	**BTEE804**	**Electric Drives & Their Control** **UNIT 1** **INTRODUCTION** Basic Elements – Types of Electric Drives – factors influencing the choice of electrical drives – heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and Load variation factors. **UNIT 2** **DRIVE MOTOR CHARACTERISTICS** Mechanical characteristics – Speed-Torque characteristics of various types of load and drive motors – Braking of Electrical motors – DC motors: Shunt, series and compound - single phase and three phase induction motors. **UNIT 3** **STARTING METHODS** Types of D.C Motors starters – Typical control circuits for shunt and series motors – Three phase squirrel cage and slip ring induction motors.	BTEE804A **Utilization of Electrical Power** UNIT 1 Electric Heating: Different methods of electric heating. Principle of high frequency induction and dielectric heating. Construction, operation, performance and applications of arc furnace and induction furnace Electric Welding: Welding process, welding transformer, Classification of Electric Welding: arc welding, resistance welding, welding of various metals. UNIT 2 Illuminations: Definitions, laws of illuminations, polar curves, luminous efficiency, photometer, incandescent lamps, filament materials, Halogen lamp, electric discharge lamps, sodium vapour lamp, mercury vapour lamp and fluorescent lamp. Light Calculations: commercial, industrial, street and flood lighting. UNIT 3 Electrolytic Process: Principles and applications of electrolysis, electro-deposition, Manufactures of chemicals, anodizing, electro-polishing , electro-cleaning, electroextraction, electro-refining, electro-	**Code Change**

		UNIT 4 **CONVENTIONAL AND SOLID STATE SPEED CONTROL OF D.C. DRIVES** Speed control of DC series and shunt motors – Armature and field control, Ward-Leonard control system - Using controlled rectifiers and DC choppers – applications. **UNIT 5** **CONVENTIONAL AND SOLID STATE SPEED CONTROL OF A.C. DRIVES** Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip power recovery scheme – Using inverters and AC voltage regulators – applications.	stripping (parting) power supplies for electrolytic process. UNIT 4 Electric Traction & Means of Supplying Power: Systems of Electric Traction: DC & AC Systems, Power Supply for Electric Traction System: Comparison and application of different systems. Sub-station equipment and layout, conductor rail & pantograph. UNIT 5 Traction Methods: Types of services, speed time and speed distance curves, estimation of powerand energy requirements, Mechanics of train movement. Co-efficient of adhesion, Adhesive weight, effective weight. Traction Motor Controls: DC and AC traction motors, Series parallel starting. Methods of electric braking of traction motors.	
			BTEE804B: FACTS DEVICES & THEIR APPLICATIONS **Unit 1** Problems of AC transmission systems, power flow inparallel paths and meshed system, factors limiting loading capability, Stability consideration. Power flow control of an ac transmission line. Basic types of facts controllers. Advantages of FACTS technology. **Unit 2** Voltage-Sourced Converters: Basic concept of voltage-sourced converters, single and three phase bridge converters. Introduction to power factor control. Transformer connections for 12-pulse, 24 pulse and 48 pulse operations. Static Shunt Compensators: Mid-point and end point voltage regulation of transmission line, and stability improvement. Basic operating principle of Static Synchronous Compensators (STATCOM). Comparison between STATCOM and SVC. **Unit 3**	

			Static Series Compensators: Concept of series capacitive compensation, voltage and transient stabilities, power oscillation and sub synchronous oscillation damping. Introduction to thyristors witched series capacitor (TSSC), thyristor controlled series capacitor (TCSC), and static synchronous series compensator, - operation, characteristics and applications. **Unit 4** Static Voltage and Phase Angle Regulators: Voltage and phase angle regulation. Power flow control and improvement of stability by phase angle regulator. Introduction to thyristor controlled voltage and phase angle regulators (TCVR and TCPAR) (ii) Introduction to thyristor controlled braking resistor and thyristor controlled voltage limiter. **Unit 5** UPFC: Unified Power Flow Controller (UPFC), basic operating principles, conventional transmission control capabilities. Comparison of UPFC to series compensators and phase angle regulator. Applications of UPFC. IPFC: Interline Power Flow Controller (IPFC), basic operating principles and Characteristics. Applications of IPFC.	
			BTEE804C: POWER SYSTEM TRANSIENTS Unit 1 Wave terminology, Development of wave quotations, Terminal problems, Lattice diagrams, Origin and Nature of power system transients and surges, Surge parameters of plants, Equivalent Circuit representations. Lumped and distributed circuit transients. Unit 2 Line energisation and de-energisation transients-Earth and earthwire effects. Current chopping in circuit breakers. Short line fault condition and its relation to circuit breaker duty. Trapped charge effects. Effect of source and source representation in short line fault studies. Unit 3 Control of transients, Lightening	

			phenomenon, influence of tower footing resistance and earth resistance, Traveling waves in distributed parameters multiconductor lines, parameters as a function of frequency. Unit 4 Mechanism of Lightning Discharge Types of Lightning strokes, Harmful effects of lighting, protections against lightning, overhead Ground wires. Unit 5 Lightening Arresters, Types of lightening arresters, Surge Absorber simulation of surge diverters in transient analysis. Fourier integral and z transform methods in power system transient.	
94	**BTEE805A**	**EHV AC/DC Transmission** **UNIT 1** 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, Overlapping. **UNIT 2** FACTS devices, basic types of controller, series controller, static synchronous series compensator(SSSC), thyristor-controlled series capacitor(TCSC), thyristor controlled seriesreactor(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 3** 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 &	**BTEE805: COMPUTER BASED POWER SYSTEM LAB** 1. Fault analysis (for 3 to 6 bus) and verify the results using MATLAB or any available software for the cases: (i) LG Fault (ii) LLG Fault (iii) LL Fault and (iv) 3-Phase Fault 2. Load flow analysis for a given system (for 3 to 6 bus) using (i) Gauss Seidal (ii) Newton Raphson (iii) Fast Decoupled Method and verify results using MATLAB or any available software 3. Study of voltage security analysis 4. Study of overload security analysis and obtain results for the given problem using MATLAB or any software. 5. Study of economic load dispatch problem with different methods. 6. Study of transient stability analysis using MATLAB/ETAP Software.	**New Course**

		protection harmonics misoperation, Commutation failure, Multi terminal D.C. lines. **UNIT 4** Control of EHV d.c. system desired features of control, control characteristics, Constant current control, Constant extinction angle control. Ignition Angle control. Parallel operation of HVAC & DC system. Problems & advantages. **UNIT 5** 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 **BTEE805B Intelligent and smart instrumentation** **UNIT-I** **Recent Trends in Sensor Technologies:** Introduction**;** Film sensors (Thick film sensors, Thin film sensors)**;** Semiconductor IC technology – standard methods; Microelectro-mechanical systems (Micro-machining, some application examples)**;** Nano-sensors**.** Bulk Micromachining. Micromachining Surface Micromachining. Other Micromachining Techniques. (LIGA Process) Micromilling. Micromachined Materials, Digital transducers. **UNIT-II** **Sensors:-** Primary sensors**;** Excitation**;** Amplification; Filters**;** Converters; Compensation (Nonlinearty**:** look up table method**,** polygon interpolation, polynomial interpolation**,** cubic spline interpolation, Approximation & regression; Noise & interference**;** Response time**;** Drift; Cross-sensitivity)**;** Information Coding/ Processing**;** Data Communication**;** Standards for smart sensor interface. **UNIT-III** **VI and Data Acquisition:**		

		Introduction to virtual Instrumentation, VI programming using LabVIEW, Signal Conditioning, DAQ Hardware Configuration, DAQ Hardware, DAQ Software Architecture, DAQ Assistant, Channel and Task configuration, Selecting and Configuring a DAQ device, Serial interfacing - RS 232C, RS 422, RS 423, RS 485. **UNIT IV** **Instrumentation Systems:-** Types of Instrumentation systems, Intelligent Instrumentation, Component of Intelligent Instrumentation System, **UNIT V** Concept of real time system and its industrial application, realization of real time system using microcontroller and typical applications. **BTEE805CPLC and SCADA Systems** **UNIT-I** **Programmable Logic Controller (PLC) Basics**: Introduction, Parts of PLC, Principles of operation, PLC size and applications, PLC Advantages and Disadvantages, PLC Manufacturers, PLC hardware components, I/O section, Analog I/O modules, Digital I/O modules, CPU-Processor memory module, Programming devices, Devices which can be connected to I/O modules, Relay, Contactor, SPST, Push Buttons, NO/NC Concept **UNIT-II** **Programming of Programmable Logic Controller**: General PLC Programming Procedures, Contacts and Coils, Program SCAN, Programming Languages, Ladder Programming, Relay Instructions, Instruction Addressing, Concept of Latching, Branch Instructions, Contact and Coil I/O Programming Examples, Relation of		

		Digital Gate Logic to Contact/Coil Logic. **UNIT-III** **Programmable Logic controller Functions:** Timer Instructions: ON DELAY Timer and OFF DELAY timer, Counter Instructions: UP/DOWN Counters, Timer and Counter Applications, Program Control Instructions: Master Control Reset, Jump and Subroutine, **UNIT-IV** Math Instructions- ADD, SUB. Data Handling: Data Move, Data Compare, Data Selection, Electro-pneumatic Sequential Circuits and Applications. **UNIT-V** **SCADA:** Definition of SCADA, Applicable Processes, Elements of SCADA System, A Limited Two-Way System. Real Time Systems: Communication Access and Master-Slave determining scan interval. Introduction to Remote Control, Communications-A/D Conversion, Long Distance Communication, Communication System components in brief- Protocol, Modems, Synchronous/Asynchronous telephone cable/radio, Half Duplex, Full Duplex System, Brief introduction to RTU and MTU, Applications-Automatic Control, Advisory Applications. **BTEE805D Power line Carrier Communication** **UNIT- I** **Channel Characterization:** Introduction, channel modelling fundamentals, model for outdoor channel, models for indoor channels, noise and disturbances measuring techniques, PLC channel emulation tools. Coupling: Introduction, filtering basics, transformer and capacitor coupler design, impedance adaptation concepts.		

		UNIT- II **Digital Transmission Techniques:** Introduction, Architecture of PLC system, Narrowband and broadband PLC systems, Modulation and coding for narrow band and broad band PLC systems, Error Handling. **UNIT- III** **PLC Networks :** Introduction, Organisation and structure of PLC networks, Media Access Control layer, Multiple Access Schemes, Protocols for PLC, **UNIT-IV** Traffic control, Supporting Energy Management Systems, Quality of service(QOS), International standards on PLC networking Technology . **UNIT-V** **Systems and Implementations:** PLC smart grid systems, PLC broadband Access systems, Multimedia PLC systems, DC-PLC systems, PLC in emerging countries		
95	**BTEE806A**	**BTEE806A** **Power Distribution System** **UNIT 1** **Heating and welding:** Advanced and method of electric heating, resistance ovens, Induction heating, dielectric heating, the arc furnace, heating of building, electric welding, resistance and arc welding, control devices and welding equipment. 10 HOURS **UNIT 2** **Electrolytic process:** Fundamental principles extraction refining of metals electroplating. Factors affering electrode position process 06 Hours **UNIT 3** **Illumination:** Laws of illumination, distribution and control of light lighting	**BTEE806** **Electrical Drives and Control Lab** 1. Study and test the firing circuit of three phase half controlled bridge converter. 2. Study and obtain waveforms of 3 phase half controlled bridge converter with R and RL loads. 3. Study and test the firing circuit of 3-phase full controlled bridge converter. 4. Study and obtain waveforms of 3-phase full controlled bridge converter with R and RL loads. 5. Study and test 3-phase AC voltage regulator. 6. Control speed of dc motor using 3-phase half controlled bridge converter. Plot armature voltage versus speed characteristic.	**Code Change**

		calculation, factory lighting, flood lighting, street lighting, different types of lamps, incandescent, fluorescent, vapour and CFL and their working, Glare and its remedy **UNIT 4** **Electrictraction:** System of traction, speed time curve, tractive effort, co-efficient of adhesions selection of traction motors, method of control, energy saving by series parallel control, AC traction equipment. AC series motor, characteristics, regenerative braking, linear induction motor and their use. AC traction, disel electric equipmepment, train lighting system. **UNIT 5** **Power Factor consideration:** Cause & disadvantages of LPF, methods of improvements, economic aspect Electrical Tariffs: Types of domestic & non-domestic prevailing tariff structures.	7. Control speed of dc motor using 3-phase full controlled bridge converter. Plot armature voltage versus speed characteristic. 8. Control speed of a 3-phase induction motor in variable stator voltage mode using 3-phase AC voltage regulator. 9. Control speed of a 3-phase BLDC motor. 10. Control speed of a 3-phase PMSM motor using frequency and voltage control 11. Control speed of universal motor using AC voltage regulator. 12. Study 3-phase dual converter. 13. Study speed control of dc motor using 3-phase dual converter. 14. Study three-phase cycloconverter and speed control of synchronous motor using cycloconverter. 15. Control of 3-Phase Induction Motor in variable frequency V/f constant mode using 3-phase inverter	
96	**BTEE806B**	**Artificial Intelligence** **UNIT 1** Introduction and Intelligent systems, What Is AI, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, Applications of A.I. Intelligent Agents Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents, How the components of agent programs work.		**Code Change**

		UNIT 2 Solving Problems by Searching, Study and analysis of various searching algorithms. Implementation of Depth-first search Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform-cost search, Depth-first search, Depth-limited search, Iterative deepening depth-first search, Bi-directional search Informed (Heuristic) Search Strategies: Greedy best-first search A* search: Minimizing the total estimated solution cost, Conditions for optimality: Admissibility and consistency, Optimality of A*, Memory-bounded heuristic search, Heuristic Functions, Generating admissible heuristics from sub problems: Pattern databases, Learning heuristics from experience Beyond Classical Search Local Search Algorithms and Optimization Problems: Hill-climbing search Simulated annealing, Local beam search, Genetic algorithms, Local Search in Continuous Spaces, Searching with Non-deterministic Actions: AND-OR search trees, Searching with Partial Observations **UNIT 3** Adversarial Search and Constraint Satisfaction Problems, Study of mini-max algorithm Adversarial Search: Games, Optimal Decisions in Games, The mini-max algorithm, Optimal decisions in multiplayer games, Alpha-Beta Pruning, Move ordering , Imperfect Real-Time Decisions, Evaluation functions, Cutting off search, Forward pruning, Search versus lookup, Stochastic Games, Evaluation functions for games of chance, Partially Observable Games Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Variations on the CSP formalism, Constraint Propagation: Inference in CSPs, Backtracking Search for CSPs, Local Search for CSPs, Alpha-beta pruning and CSP, Implementation aspects of mini-max algorithm and CSP.		

		UNIT 4 Logical agents and Classical Planning, Study and comparison of knowledge representation structures. Implementation aspects of Backtracking algorithm and forward and backward chaining Logical Agents: Knowledge representation structures: Frames, semantic net, Scripts, Logic: Prepositional Logic, Prepositional Theorem Proving, Inference and proofs, Proof by resolution, Conjunctive normal form, Horn clauses and definite clauses, Forward and backward chaining, A complete backtracking algorithm, Syntax and Semantics of First-Order Logic, Symbols and interpretations, Knowledge Engineering in First-Order Logic, Unification, Resolution, Introduction to logic programming (PROLOG) Classical Planning: Definition of Classical Planning, The complexity of classical planning, Algorithms for Planning as State-Space Search, Forward (progression) state- space search, Backward (regression) relevant-states search, Heuristics for planning, Planning Graphs, Other Classical Planning Approaches, Hierarchical Planning **UNIT 5** Quantifying Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Bayes' Rule and Its Use, Representing Knowledge in an Uncertain Domain, Other Approaches to Uncertain Reasoning, Rule-based methods for uncertain reasoning, representing vagueness: Fuzzy sets and fuzzy logic, Study of fuzzy logic and Decision trees, Implementation aspects of Decision trees Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, The decision tree representation, Expressiveness of decision trees, Inducing decision trees from examples		
97	**BTEE8**			**Subject**

	06C	**Power Plant Instrumentation** **UNIT 1** Power plant: Unit, overview, Types of boiler, Exhaust Gas Boilers and Incinerators, turbine generators, condensers, material handling systems. Comparison of thermal power plant, hydroelectric power plant, Nuclear power plant, solar power plant, Wind power plant. **UNIT 2** Boiler Instrumentation: Control and optimization, Combustion control, air to fuel ratio control, 3-element drum level control, steam temperature and pressure control, oxygen/CO2 in flue gases, furnace draft, boiler interlocks, sequence event recorder, supervisor control, data acquisition controls, burner management systems and controllers. Start-up and shut-down procedures, Boiler safety standard, Boiler inspection procedures. Boiler load calculation, boiler efficiency calculation. **UNIT 3** Turbine instrumentation and control, start-up and shut-down, thermal stress control, condition monitoring &power distribution instrumentation. Synchronous, Induction generators. **UNIT 4** Hydroelectric power generation, regulation & monitoring of voltage & frequency of output power. Pollution & effluent monitoring & control. Energy Management, electrical sub-station controls **UNIT 5** Power Generation using non-conventional energy sources viz. Wind Power, solar Power, Tidal Power, Plant safety & redundancies. Nuclear Power Generation & control Station. Diesel Generator Controls.		**Removed**
98	**BTEE806D**	**Power Distribution System** **UNIT 1** Introduction to sub-transmission and distribution system;		**Title Change Code Change**

		classification of loads – residential, commercial, agricultural, industrial and their characteristics; distribution system planning – short-term, mid-term, long-term, load modeling and characteristics; definition of demand factor, utilization factor, load factor, plant factor, diversity factor, loss factor; computer applications to distribution system automation; tariff. **UNIT 2** Distribution feeders, transformers and sub-stations; primary feeders – voltage level, radial and loop types, uniformly distributed and non-uniformly distributed load; design considerations for secondary system voltage level, location of substation, rating, service area with primary feeders, optimal location; existing system improvement. **UNIT 3** System analysis – voltage drop and power loss calculation; methods of solution for radial networks, three-phase balanced primary lines, non-three-phase primary lines; loss reduction, voltage regulation, voltage control and improvement, issues in quality of service – voltage sag, swell and flicker; application of capacitors to distribution system – effect of series and shunt capacitors, power factor correction, economic justification for capacitor with cost-benefit analysis aiming at most economic power factor, optimum location of capacitor. **UNIT 4** Distribution sub-station bus schemes, description and comparison of switching schemes; types of common faults and procedure for system fault calculation; protection – objectives, over current protection devices – fuses, **UNIT 5** Automatic circuit re-closer, automatic line sectionalizing, coordination of protective devices fuse to fuse, fuse to circuit		

		breaker, re-closer to circuit breaker		
99	**BTEE807**	**Electric Machine Design Lab** To design the following parts of the electrical machines by using C++/MATLAB or any other related software. 1. Design of Armature 2. Design of Commutator 3. Design of Armature winding 4. Design of Magnetic Core of Transformer 5. Design of rotor bars and slots of squirrel cage induction motor 6. Design of rotor core of slip ring induction motor 7. Design of salient pole rotor of synchronous machine 8. Design of stator core and winding for synchronous machine 9. Design of rotor for turbo alternators 10. Design of damper winding	**High Voltage Engineering Lab** 1. Study filtration and Treatment of transformer oil. 2. Determine dielectric strength of transformer oil. 3. Determine capacitance and dielectric loss of an insulating material using Schering bridge. 4. Study solid dielectrics used in power apparatus. 5. Study applications of insulating materials. 6. Study direct testing and indirect testing of circuit breakers. 7. Study high voltage testing of electrical equipment: line insulator, cable, bushing, power capacitor, and power transformer. Design an EHV transmission line.	**New Course**
100	**BTEE808**	**Electric Drives & Control Lab** 1. Study and test the firing circuit of three phase half controlled bridge converter. 2. Study and obtain waveforms of 3 phase half controlled bridge converter with R and RL loads. 3. Study and test the firing circuit of 3-phase full controlled bridge converter. 4. Study and obtain waveforms of 3-phase full controlled bridge converter with R and RL loads. 5. Study and test 3-phase AC voltage regulator. 6. Control speed of dc motor using 3-phase half controlled bridge converter. Plot armature voltage versus speed characteristic. 7. Control speed of dc motor using 3-phase full controlled bridge converter. Plot armature voltage versus speed characteristic. 8. Control speed of a 3-phase induction motor in variable stator voltage mode using 3-phase AC voltage regulator. 9. Control speed of universal motor using AC voltage regulator. 10. Study 3-phase dual converter. 11. Study speed control of dc motor using 3-phase dual converter.	**Project-II**	**Title Change** **Code Change**

101	**BTEE809**	**MAT Lab for Electrical Engineers** 1. Fault analysis (for 3 to 6 bus) and verify the results using MATLAB or any available software for the cases: (i) LG Fault (ii) LLG Fault (iii) LL Fault and (iv) 3-Phase Fault 2. Load flow analysis for a given system (for 3 to 6 bus) using (i) Gauss Seidal (ii) Newton Raphson (iii) Fast Decoupled Method and verify results using MATLAB or any available software 3. Study of voltage security analysis 4. Study of overload security analysis and obtain results for the given problem using MATLAB or any software. 5. Study of economic load dispatch problem with different methods. 6. Study of transient stability analysis using MATLAB	**Seminar**	**Code change**
102	**BTEE810**	**Seminar**	**Discipline & Extra Curricular Activities**	**New Course**