Semester III **B.Tech in Electrical Engineering**

MAT 105 : ADVANCE ENGINEERING MATHEMATICS

3L+1T+0P+ 3.5C **MM 100**

MODULE 1: LAPLACE TRANSFORM - Laplace transform with its simple properties, applications to the solution of ordinary and partial differential equations having constant co-efficient with special reference to the wave and diffusion equations.

MODULE 2: FOURIER SERIES & Z TRANSFORM – Expansion of simple functions in Fourier series. Half range series, Change of intervals, Harmonic analysis. Z -TRANSFORM - Introduction, Properties, Inverse Z Transform.

MODULE 3: 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.

MODULE 4: COMPLEX VARIABLES-I - Analytic functions, Cauchy-Riemann equations, Elementary transformations, Line integral in complex domain, Cauchy's theorem. Cauchy's integral formula.

MODULE 5: COMPLEX VARIABLES-II -Taylor's series Laurent's series poles, Residues, Evaluation of simple definite real integrals using the theorem of residues. Simple contour integration.

Text/Reference Books:

1. Engineering Mathematics, T Veerarajan, TMH
2. Mathematical Techniques, Jordan, Oxford
3. Advance Engineering Mathematics, Potter, Oxford
4. Advanced Engineering Mathematics, Irvin Kreyszig, Wiley
5. Mathematical Methods, Dutta, D., New Age
6. Text BOOK Of Engineering Mathematics, Dutta, New Age

Semester III **B.Tech in Electrical Engineering**

BEC 301 : ELECTRONICS DEVICES AND CIRCUITS

3L+0T+0P+3C **MM 100**

MODULE1: 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.

MODULE 2: JUNCTION DIODES - Formation of homogenous and hetro-juntion 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 multipliers, Breakdown diodes, Schottky diodes, and Zener diode as voltage regulator, Construction, Characteristics and operating principle of UJT.

MODULE 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.

MODULE 4: JFET & MOSFET - Construction and operation, 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 FET as active load.

MODULE 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, Darlington Emitter pair.

Text/Reference Books:

1."Integrated Electronics Analog and Digital Circuits & Systems" Millman J. &Halkias C.C., McGraw Hill.
2."Electronic Devices and Integrated Circuits" B. P. Singh and Rekha Singh, , Pearson Education
3."Application of Analog Integrated Circuits" Soclof, SPrentice Hall of India.
4. Electronics Devices & Circuit Theory" Boylestad&Nashelskey, Prentice Hall of India.
5. "Electronics Principles" Albert Malvino, Mc Graw Hill Education.

Semester III **B.Tech in Electrical Engineering**

BEC 303 : DIGITAL ELECTRONICS

3L+0T+0P+3C **MM 100**

MODULE 1: NUMBER SYSTEMS AND CODES: Introduction to number systems, weighted and non-weighted codes, 1's complement, 2's complement, complement arithmetic
Introduction to Boolean Algebra: Postulates and theorems of Boolean algebra, Boolean functions, canonical and standard form, simplification of Boolean function using Boolean laws and theorems

MODULE 2: LOGIC GATES: Diode and transistor as a switch, basic logic gates, derived logic gates, block diagrams and truth tables, logic diagrams from Boolean expression and vice versa, converting logic diagram to universal logic, positive logic, negative logic and mixed logic

MODULE 3: SIMPLIFICATION OF BOOLEAN FUNCTIONS: K-map representation, incompletely specified functions, simplification realization with gates, Quine-McCluskey method
Combinational Logic: Analysis and design of combinational circuits, half adder and full adder, half subtractor and full subtractor, binary serial and parallel adder, BCD adder, binary multipliers, magnitude comparator, decoders, encoders, multiplexers, de-multiplexers

MODULE 4: SEQUENTIAL CIRCUITS: Latches, flip-flops, triggering of the flip-flops, master-slave flip-flop, excitation tables, conversion of the flip-flops, analysis and design of clocked sequential circuits, shift registers, counters

MODULE 5: LOGIC FAMILIES: Logic gate characteristics (propagation delay, speed, noise margin, fan-in, fan-out, power dissipation), standard logic families (RTL, DCTL, DTL, TTL, ECL, MOS), tri-state devices
Programmable Logic: Introduction to programmable logic array (PLA) & programmable array logic (PAL

Text/Reference Books:

1. Digital Design, Moris Mano, Pearson Education
2. Digital Fundamental, Floyd and Jain, Pearson Education
3. Digital System: Principles and Applications, Tocci, Pearson Education
4. Digital Electronics, B. P. Singh, Dhanpat Rai & Sons
5. Modern Digital Electronics, R. P. Jain, Tata McGraw-Hill

Semester III **B.Tech in Electrical Engineering**

BEE 301 : CIRCUIT ANALYSIS

3L+0T+0P+3C **MM 100**

MODULE 1:INTRODUCTION: Introduction to circuit elements and their characteristics. Current and voltage reference. KVL and KCL, Node Analysis Mesh analysis. Response of single element, double element and triple element circuits. Resonance, selectivity & Q-factor in ac ci rcuits.

MODULE 2: NETWORK THEOREMS: Thevenis's, Norton's, Superposition, Reciprocity, Compensation, Millman's, Tellegen's, Maximum power transfer and Miller`s theorems in DC & AC Circuits.

MODULE 3: 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.

MODULE 4: NON-SINUSOIDAL WAVES: Complex Periodic Waves and Their Analysis By Fourier Series. Different Kinds of Symmetry, Determination of Co-Efficients. 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.

MODULE 5: 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. B.Tech Electrical Engineering Syllabus Page 3

Text/Reference Books:

1. Network Analysis, Van Valkenburg, PHI
2. Engineeirng Circuit Analysis, Hayt & Kemmerly, 6/e (TMH)
3. Electric Circuits (SIE), J. Edminster& M. Nahvi, 5/e, SOL
4. Circuits & Networks, Nagsarkar & Sukhija, Oxford
5. Electric Circuit Theory & Technology, John Bird, ELSEVIER
6. Network & Systems, D Roy Chodhary, New Age
7. Network Analysis and Synthesis, Ghosh & Chakrabarti, (TMH)
8. Circuit Theory, A. Chakarvorty , Dhanpat Rai & Co. (Pvt.) Ltd.

Semester III **B.Tech in Electrical Engineering**

BCS 302 : OBJECT ORINTED PROGRAMMING WITH C++

3L+1T+0P+ 3.5C **MM 100**

MODULE 1: DIFFERENT PARADIGMS FOR PROBLEM SOLVING: need for OOP, differences between OOP and Procedure oriented programming, Abstraction, Overview of OOP principles, Encapsulation, Inheritance and Polymorphism.

MODULE 2: **C++ BASICS**: Structure of a C++ program, Data types, Declaration of variables, Expressions, Operators, Operator Precedence, Evaluation of expressions, Type conversions, Pointers, Arrays, Pointers and Arrays, Strings, Structures, References. Flow control statement- if, switch, while, for, do, break, continue, goto statements. Functions-Scope of variables, Parameter passing, Default arguments, inline functions, Recursive functions, Pointers to functions.

MODULE 3: DYNAMIC MEMORY: allocation and de-allocation operators-new and delete, Preprocessor directives. C++ Classes And Data Abstraction: Class definition, Class structure, Class objects, Class scope, this pointer, Friends to a class, Static class members, Constant member functions, Constructors and Destructors, Dynamic creation and destruction of objects, Data abstraction, ADT and information hiding.

MODULE 4: **POLYMORPHISM** - Function overloading, Operator overloading, Generic programming necessity of templates, Function templates and class templates.Inheritance: Defining a class hierarchy, Different forms of inheritance, Defining the Base and Derived classes, Access to the base class members, Base and Derived class construction, Destructors, Virtual base class.

MODULE 5: **VIRTUAL FUNCTIONS AND POLYMORPHISM** - Static and Dynamic bindings, Base and Derived class virtual functions, Dynamic binding through virtual functions, Virtual function call mechanism, Pure virtual functions, Abstract classes, Implications of polymorphic use of classes, Virtual destructors.

Text/Reference Books:

1. Problem solving with C++, The OOP, 4th Edition, Walter Savitch, Pearson Education.
2. C++, The Complete Reference, 4th Edition, Herbert Schildt, TMH.
3. C++ Primer, 3rd Edition, S.B.Lippman and J.Lajoie, Pearson Education.
4. The C++ Programming Language, 3rd Edition, B.Stroutstrup, Pearson Education.
5. Object Oriented Programming in C++, 3rd Edition, R.Lafore, Galigotia Publications pvt

Semester III **B.Tech in Electrical Engineering**

BEE 302 : ELECTRICAL MACHINES-I

3L+0T+0P+3C **MM 100**

MODULE 1: ELECTROMECHANICAL ENERGY CONVERSION - Basic principles of electromechanical energy conversion. Basic aspects and physical phenomena involved in energy conversion. Energy balance equation.

MODULE 2: DC GENERATORS - Construction, Types of DC generators, emf equation, lap & wave windings, equalizing connections, armature reaction, commutation, methods of improving commutations, demagnetizing and cross magnetizing mmf, interpoles, characteristics, parallel operation. Rosenberg generator.

MODULE 3: **DC MOTORS -** Principle, back emf, types, production of torque, armature reaction & interpoles, characteristics of shunt, series & compound motor, DC motor starting. Speed Control of DC Motor: Armature voltage and field current control methods, Ward Leonard method. Braking, losses and efficiency, direct & indirect test, Swinburne's test, Hopkinsion test, field & retardation test, single-phase series motor.

MODULE 4: **TRANSFORMERS -** Construction, types, emf equation. No load and load conditions. Equivalent circuits, Vector diagrams, OC and SC tests, Sumpner's back-to-back test, efficiency. Voltage regulation, effect of frequency, parallel operation, autotransformers, switching currents in transformers, separation of losses.

MODULE 5: POLYPHASE TRANSFORMERS - Single unit or bank of single-phase units, polyphase connections, Open delta and V connections, Phase conversion: 3 to 6 phase and 3 to 2 phase conversions, tertiary winding.

Text/Reference Books:

1. Electric Machinery, A.E. Fitggerald, C.Kingsley Jr and Umans, 6th Edition McGraw Hill,
2. Electric Machines, Kothari & Nagrath 3/e,TMH
3. The Performance and Design of AC machines, M.G. Say, Pit man & Sons.
4. Electric Machinery, Guru, 3E, Oxford
5. Electrical Machinery, P. S. Bimbhra, Khanna Pub.
6. Electric Machinery Fundamentals, Stephen J Chapman, McGraw-Hill
7. Electrical Machines, Husain Ashfaq , Dhanpat Rai & Sons

Semester III **B.Tech in Electrical Engineering**

BEC 306 : ELECTRONICS DEVICES & CIRCUITS LAB

0L+0T+2P+ 1C **MM 100**

1. Study the following devices: (a) Analog & digital multimeters (b) Function/ Signal generators (c) Regulated d. 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.

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 D.C. voltage output & ripple factor.

Semester III **B.Tech in Electrical Engineering**

BEC 307 : DIGITAL ELECTRONICS LAB

0L+0T+ 2P +1C **MM 100**

1. To study and perform the following experiments.
   a) Operation of digital multiplexer and de-multiplexer.
   b) Binary to decimal encoder.
   c) Characteristics of CMOS integrated circuits.
2. To study and perform experiment- Compound logic functions and various combinational circuits based on AND/NAND and OR/NOR Logic blocks.
3. To study and perform experiment -Digital to analog and analog to digital converters.
4. To study and perform experiment- Various types of counters and shift registers.
5. To study and perform experiment - Interfacing of CMOS to TTL and TTL to CMOS ICs.
6. To study and perform experiment- BCD to binary conversion on digital IC trainer.
7. To study and perform experiment with -
   (a) Astable (b) Monostable (c) Bistable Multivibrators and the frequency variation with different parameters, observe voltage waveforms at different points of transistor.
8. To study and perform experiment -Voltage comparator circuit using IC-710.
9. To study and perform experiment- Schmitt transistor binary circuit.
10. Design 2 bit binary up/down binary counter on bread board.

Semester III **B.Tech in Electrical Engineering**

BCS 305 OBJECT ORIENTED PROGRAMMING WITH C++ LAB

0L+0T+2P +1C **MM 100**

1. Create a user defined function (any) and use it inside the program.
2. Implement "call by value" & "call by reference " function call techniques by using any user defined functions.
3. Implement the working of classes and objects by using any real world object.
4. Create a Stack object model in C++ & also make use of default and parameterized constructor to make the class more flexible in use.
5. Make all the member functions, including constructors, non-inline in the above class.
6. Create any user defined class using the concept of static data and member functions.
7. Create a Class or program implementing the concept of passing and returning object to/from member functions.
8. WAP to implement polymorphism through function overloading (Area of different shapes).
9. Create a user defined type Complex and do all the Complex number arithmetic. And also make use of operator overloading.
10. Implement single level inheritance by using Student and Marks class.
11. Implement multilevel inheritance by using the Stack class.
12. Demonstrate the calling mechanism of constructors and destructors in Multilevel Inheritance.
13. Create generic Stack model for storing different types of data.
14. Create a user defined type Matrix and perform all matrix operations. Also make use of operator overloading.
15. Implement the concept of abstract classes and virtual functions by using Shape, Rectangle and Triangle class.

Semester III **B.Tech in Electrical Engineering**

BEE 303 ELECTRICAL MACHINES LAB-I

0L+0T+2P +1C **MM 100**

1. To separate hysteresis and eddy current losses of a single phase transformer at rated voltage, frequency by conducting no load tests at different frequencies keeping V/f constant.
2. To operate two single phase transformers of different KVA ratings in parallel and plot the variation of currents shared by each transformer versus load current.
3. To conduct Sumpners test on two identical single phase transformers and determine their efficiency at various loads.
4. To perform direct load test on a D.C. shunt motor and plot variation of (a) Input current (b) Speed(c) Torque (d) Efficiency versus output power.
5. To obtain magnetization characteristics of a D.C. machine. Estimate field circuit resistance of a D.C. shunt generator at rated speed. Measure field winding and armature winding resistance. Plot the external characteristics of D.C. shunt generator.
6. To make Scott connection of two single phase transformer and to verify the current. Relation by drawing phasor diagrams for (a) Balanced and (b) Unbalanced resistive loads.
7. To conduct open circuit and short circuit test on a three phase three winding transformer and determine the equivalent circuit parameters
8. To conduct direct load test on a D.C. compound generator with
   a. Shunt field alone
   b. Cumulative and differential compounding for short and long shunt connections.
9. To study the performance of 3-phase transformer for its various connections, i.e. star/star star/delta delta/star and delta/delta and find the magnitude of 3^{rd} harmonic current.

Semester III **B.Tech in Electrical Engineering**

ENG 115 SOFT SKILL & PROFESSIONAL APTITUDE

0L+0T+2P +1C **MM 100**

MODULE: 1- INTERPERSONAL RELATIONSHIP MANAGEMENT- Importance & Benefits of IPR, Developing Interpersonal Abilities, Team Building- Definition and Types, Team work skills, Qualities of a Team Player, Leadership- Understanding the qualities of a Good Leader, 4 Factors of Leadership, Bring out the Leader in You

MODULE: 2- RESUME WRITING- Concepts of Resume, Curriculum Vitae and Bio-data, Resume – Information and Details, Sample Resume and Template, Cover Letter- Cover letter Writing, Sample Cover letter and Template

MODULE: 3 -PERSONAL GROOMING AND INTERVIEW ETIQUETTE- Basic Personal Hygiene, Professional Attire – Men& Women, Interview Etiquette Guide, Telephonic Interview- Importance and Preparation, Advantages and Disadvantages, Things to Remember, Video Interview- Preparation and Practice, Guide to a Successful Video Interview, Importance and Types of Personal Interviews, FAQs with Answers

MODULE: 4 - GROUP DISCUSSION- Group Discussion Guide, Topics for Group Discussion, Mock GD

MODULE: 5 –EXTEMPORE- Guide to Successful Extempore, Extempore Topics, Practice Session

Text/Reference Books:

1. Business communication Design, Angell, Pamela, Mcgraw-Hill, New York.
2. Grammar Finder, Eastwood, John, Oxford university press.
3. Effective technical communication, Mitra, K. Barun, Oxford university press.
4. Communicate to conquer: A handbook of group discussion and interviews, PHI learning, New Delhi.

Semester III **B.Tech in Electrical Engineering**

MGT 201 : ORIENTATION PROGRAM IN ENTREPRENEURSHIP

0L+0T+2P +1C **MM 100**

OBJECTIVE: The goal of this programme is to inspire students and help them imbibe an entrepreneurial mindset. Student will learn what entrepreneurship is and how it has impacted the world and their country. They will introduce to the key traits and the DNA of an entrepreneur. This certificate program focuses on a specific Entrepreneurial knowledge or skill requirement such as creative thinking, communication, risk taking and resilience.

Module 1:
Entrepreneurship; Concept, functions, Need, Characteristics and competency. How has entrepreneurship change the world? Process of Entrepreneurship development , Idea Generation exercises.

Module 2:
Entrepreneurial DNA, Traits Gaps and Gap Analysis. Relevance of Entrepreneurship in Socio-Economic development. Barriers to Entrepreneurship. Case studies.

Module 3:
Entrepreneurial Pursuits and Human Activities; nature, purpose and pattern of Human activities: Economic and non-economic, need for innovation. Creativity. Case studies

Module 4:
Entrepreneurial Values, Attitudes and Motivation-Meaning and concept. Developing entrepreneurial Motivation -concept and process of achievement motivation. Leadership, Communication and influencing ability. Success stories.

Module 5:
Enterprise and Environment: Environmental function, Critical factors for launching of a new enterprise, Understanding a market, Competitive analysis of the market.

Suggested Readings:

Online course through massive open online classes (MOOC), classroom learning through an experienced facilitator/faculty on campus (games, video, and practical experience

1. Vasanta Desai: Dynamics of entrepreneurial development and management;
2. Vasanta Desai: Entrepreneurial development;
3. Peter F. Drucker: Innovation and development;
4. M.V. Deshpande: Entrepreneurship of small scale industries;
5. Balakrishnan, G. Financing of small scale industries.

Semester IV **B.Tech in Electrical Engineering**

BEE 401 : CIRCUIT ANALYSIS & SYNTHESIS

3L+1T+0P +3.5C **MM 100**

MODULE 1: GRAPH THEORY - Graph of a Network, definitions, tree, co tree , link, basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix Duality, Loop and Node methods of analysis.

MODULE 2: NETWORK FUNCTIONS: The concept of complex frequency, series and parallel combinations. terminals and terminal pairs, driving point impedance transfer functions, poles and zeros. Restrictions on pole and zero location in s-plane. Time domain behaviour from pole and zero plot. Procedure for finding network functions for general two terminal pair networks

MODULE 3: 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 RL and R-C networks in Foster and Cauer forms.

MODULE 4: 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.

MODULE 5: 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.

Text/Reference Books:

1. An Introduction to Modern Network Synthesis, M. E. Van Valkenburg, Wiley Eastern
2. Circuits & Networks, Nagsarkar & Sukhija, Oxford
3. Network & Systems, Choudhary D.Roy, Wiley Eastern Ltd.
4. Network Analysis and Synthesis, Ghosh & Chakrabarti, TMH
5. Network Theory: Analysis and Synthesis, Samarajit Ghosh, Prentice Hall of India, 2008
6. Circuit Theory, A.Chakrabarti, Dhanpat Rai & Co.

Semester IV **B.Tech in Electrical Engineering**

BEE 402 : ELECTRICAL AND ELECTRONICS MEASUREMENT AND INSTRUMENTATION

3L+0T+0P +3C **MM 100**

Module 1: INTRODUCTION - Functional elements of an instrument – Static and dynamic characteristics, Accuracy & precision, Repeatability, Limits of errors, Systematic & random errors Modeling of errors, Probable error & standard deviation, Gaussian error analysis, Combination of errors – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration.

Module 2: ELECTRICAL AND ELECTRONIC INSTRUMENTS - Principle and types of analog and digital voltmeters, ammeters, multimeters – Single and three phase wattmeters and energy meters – Magnetic Measurement - Ballistic Galvanometer, **f**lux meter, determination of hysteresis loop, measurement of iron losses. Instrument transformers – Instruments for measurement of frequency and phase.

Module 3: MEASUREMENT OF PARAMETERS - D.C & A.C potentiometers, Electronic Voltmeter, Electronic Multimeters, Digital Voltmeter, Vector Impedance meter, RF Power & Voltage Measurements. Different methods of measuring low, medium and high resistances**,** measurement of inductance, frequency & capacitance with the help of AC Bridges, Q Meter.

Module 4: DISPLAY DEVICES AND SIGNAL GENERATION - CRT display, digital CRO, LED, LCD & dot matrix display. Sine wave generators, Frequency synthesized signal generators, Sweep frequency generators. Signal Analysis – Measurement Technique, Wave Analyzers, and Frequency - selective wave analyzer, heterodyne wave analyzer, Harmonic distortion analyzer, and Spectrum analyzer.

Module 5: TRANSDUCERS - Construction, Working Principles, Application of following Transducers RTD, Thermocouples, Thermistors, LVDT, RVDT, Strain Gauges, Bourdon Tubes, Bellows, Seismic Accelerometers, Tacho generators, Load Cell, Piezoelectric Transducers, Ultrasonic Flow Meters.

Text/Reference Books:

1. Electrical Measurement & Measuring Instrument, E.W. Golding & F.C. Widdis A.H. Wheeler& Co. India.
2. Electrical & Electronic Measurement & Instrument, A.K. Sawhney, Dhanpat Rai & Sons
3. Electrical Measurement, Forest K. Harries, Willey Eastern Pvt. Ltd. India .
4. Basic Electrical Measurement, M.B. Stout, Prentice hall of India.
5. Electronic Instrument & Measurement Technique, W.D.Cooper Prentice Hall International.
6. Electrical Measurement &Measuring Instrument, Rajendra Prashad, Khanna Publisher.
7. Electrical Measurements and Measuring Instruments, J.B. Gupta, S.K. Kataria & Sons.

Semester IV **B.Tech in Electrical Engineering**

BEC 402 : MICROPROCESSOR AND INTERFACING

3L+0T+ 0P +3C **MM 100**

MODULE1: INTRODUCTION TO MICROPROCESSOR - Overview of microprocessor structure and its operation, Microprocessor evaluation and its types, Address bus , Data bus, Control bus, Demultiplexing and buffering of system bus, peripheral devices and memory organization.

MODULE 2: 8085 MICROPROCESSOR - 8085 MPU, Pins and Signals, Microprocessor Architecture, internal data operations and Registers, Memory mapped I/O and Peripheral mapped I/O, 8085 Microprocessor Programming model, Interrupts of 8085, Addressing modes of 8085.

MODULE 3: ASSEMBLY LANGUAGE PROGRAMMING USING 8085 - Instruction set, Classification of instructions, Programming technique, Assembly language programs involving logical, Branch & Call instructions, sorting, evaluation of arithmetic expressions, string manipulation, Machine cycle, T-state, Timing Diagram.

MODULE 4: MICROPROCESSOR SYSTEM PERIPHERAL AND INTERFACE - Introduction to interfacing, 8155, 8255, 8253, 8257, 8259, 8279, DMA Controller, A/D Conversion, Memory and Keyboard interface.

MODULE 5: MICROPROCESSOR 8086 - Pins and Signals, Internal architecture , 8086 system configuration and timing, minimum and maximum mode, memory segmentation, Addressing modes of 8086, Instructions set of 8086, Interrupts of 8086.

Text/Reference Books:

1. Microprocessor Architecture, Programming and application with the 8085 by Ramesh Gaonkar, Wiley.
2. Introduction to Microprocessor, B. Ram. Wiley.
3. Microprocessor Interfacing, programming and hardware, D. V. Hall, TMH.
4. Fundamental of Microprocessor, Uday kumar, Pearson.
5. Microprocessor 8085 and its Interfacing, Sunil kumar, PHI

Semester IV **B.Tech in Electrical Engineering**

MGT 101 : SOCIOLOGY AND ELEMENTS OF ECONOMICS

3L+0T+0P+3C **MM 100**

MODULE 1: Introduction to sociological concepts-structure, system, organization, social institutions, Culture social stratification (caste, class, gender, power). State & civil society. Social change in contemporary India: Modernization and globalization, Secularism and communalism, Nature of development.

MODULE 2: Socialization: Meaning, Types, Agents & Process. Social Group: Concepts, Characteristics and Types. Ecology and Environment.

MODULE 3: Basic Principles and Methodology of Economics. Demand/Supply-elasticity-. Theory of the Firm and Market Structure. Basic Macroeconomic Concepts (including GDP/GNP/NI/Disposable Income)

MODULE 4: Public Sector Economics – Welfare, Externalities, Demand & Supply of Labor.
Monetary and Fiscal Policy Tools & their impact on the economy – Inflation and Phillips Curve

MODULE 5: Liberalization, Privatization & Globalization (LPG): Concept, Reasons for implementation of LPG and Pros & Cons of Liberalization, Privatization & Globalization (LPG) , Indian economy Brief overview of post independence period – plans

Text book/ Reference books

1 Indian Economy, Dutt Gaurav & Mahajan Ashwani, S Chand
2 Sociology and element of Economics for engineers, B Shalini, K Aman, T Deepika, Neelkant
3 Sociology, Giddens, A, Polity, 6th edn.
4 Sociology, Haralambos M, RM Heald, M Holborn, Collins
5 State, Society and Tribes Person, Xaxa, V,

Semester IV **B.Tech in Electrical Engineering**

BEE 403 : GENRATION OF ELECTRICAL POWER

3L+0T+0P+ 3C **MM 100**

MODULE-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.

MODULE- 2: (i) Hydro Power Plants: Classification of hydroelectric plants. Basic schemes of hydroelectric and pumped storage plants. **(ii) 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.

MODULE- 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 capacitors and synchronous condensers.

MODULE- 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.

MODULE- 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 generating units, types of reserve and size of plant. Selection and location of power plants.

Text/Reference Books:

1. Power System Analysis, Grainger John, J. and Stevenson, Jr. W.D., McGraw Hill, 1994.
2. Fundamentals of Energy Production, Harder Edwin, I., John Wiley and Sons, 1982.
3. Elements of Electric Power Station Design, Deshpande. M.V., A.H., Wheeler and Co.
4. Power Distribution Engineering, Burke James, J. Marcel Dekker.

Semester IV **B.Tech in Electrical Engineering**

BEE 404 : ELECTRICAL MACHINES- II

3L+1T+0P+ 3.5C **MM 100**

MODULE 1: BASIC CONCEPTS OF ELECTRICAL MACHINES - Winding factors, generated e. m. f., m. m. f. of distributed a.c. winding, rotating magnetic field.

MODULE 2: INDUCTION MACHINES (a) Constructional features, production of torque, phasor diagram, equivalent circuit, performance analysis, torque-slip characteristics. (b) Testing- Running light and blocked rotor test, load test. (c) Effect of rotor resistance, deep bar and double cage induction motor. (d) Generator Operation (e) Starting- Starting methods of squirrel cage and wound rotor induction motor. (f) Speed Control- Various methods of speed control of squirrel cage and wound rotor induction motor. (g) Effects of space harmonics.

MODULE 3: SINGLE PHASE INDUCTION MOTORS - Constructional features, double revolving field theory, equivalent circuit, determination of parameters. Split phase starting methods & applications.

MODULE 4: SYNCHRONOUS MACHINES (a) Constructional features. (b) Cylindrical rotor machine-Synchronous Generator- Generated e.m.f., circuit model and phasor diagram, armature reaction, synchronous impedance, voltage regulation and different methods for its estimation.

MODULE 5: SYNCHRONOUS MOTOR - Operating principle, circuit model, phasor diagram, effect of load.III) Operating characteristics of synchronous machines, V-curves, starting methods of synchronous motors. (c) Salient pole Machine- Two reaction theory, analysis of phasor diagram, power angle characteristics, determination of x dand xq. (d) Parallel operation of Alternators-Synchronization and load division.

Text/Reference Books:

1. Electric Machinery, A.E. Fitggerald, C.Kingsley Jr and Umans, 6th Edition McGraw Hill.
2. Electric Machines, Kothari & Nagrath:, 3/e,TMH
3. The Performance and Design of AC machines, M.G. Say, Pit man & Sons.
4. Electric Machinery, Guru, 3E, Oxford
5. Electrical Machinery, P.S. Bimbhra, Khanna Pub.
6. Electric Machinery Fundamentals, Stephen J Chapman, McGraw-Hill
7. Electrical Machines, Husain Ashfaq , Dhanpat Rai & Sons
8. Electric Machine and Tranformers, Irving L.Kosow, Prentice Hall of India.

Semester IV **B.Tech in Electrical Engineering**

BEE 405 CIRCUIT ANALYSIS & SYNTHESIS LAB

0L+0T+2P+1C **MM 100**

Performing Following Experiment on PSpice/MATLAB

LIST OF EXPERIMENTS:

1. Verification of principle of superposition theorem with dc and ac sources.
2. Verification of principle of Thevenin, theorem.
3. Verification of principle of Maximum power transfer theorems
4. Determination of transient response of current in RL & RC circuits with step voltage input.
5. Determination of transient response of current in RLC circuit with step voltage input for under damped, critically damped and over damped cases.
6. Determination of frequency response of current in RLC circuit with sinusoidal ac input.
7. Derive relation for ABCD parameter By using PSpice/LTSpice for given circuit
8. Derive relation for Y and Z parameter by using PSpice/LTSpice for given circuit
9. Determination of image impedance and characteristic impedance of T and Π networks, using O.C. and S.C. tests
10. Verification of parameter properties in inter-connected two port networks: series, parallel and cascade also study loading effect in cascade

Semester IV **B.Tech in Electrical Engineering**

BEE 406 : ELECTRICAL AND ELECTRONICS MEASUREMENT AND INSTRUMENTATION LAB

0L+0T+2P + 1C **MM 100**

1. Calibration of ac voltmeter and ac ammeter;
2. Measurement of phase difference and frequency of a sinusoidal ac voltage using C.R.O.;
3. Measurement of Earth resistance using fall of potential method and low resistance by Kelvin‟s double bridge
4. Measurement of voltage, current and resistance using dc potentiometer;
5. Measure unknown inductance capacitance resistance using Anderson Bridge
6. Measure unknown inductance capacitance resistance using Maxwell Bridge
7. Measurement of capacitance by De Sauty bridge and Schering bridge;
8. Measurement of temperature by RTD, thermocouple and thermistor;
9. Measurement of displacement using LVDT, strain gauge based displacement transducer and strain gauge based load cell;
10. Measurement of flow rate by anemometer;

Semester IV **B.Tech in Electrical Engineering**

BEC 407 : MICROPROCESOR & INTERFACING LAB

0L+0T+2P+1C **MM 100**

1. Study the hardware, functions, memory structure and operation of 8085 microprocessor kit.
2. Program to perform integer division: (i) 8-bit by 8-bit (ii) 16-bit by 8-bit.
3. Transfer of a block of data in memory to another place in memory in the direct and reverse order.
4. Searching a number in an array and finding its parity.
5. Sorting of array in: (i) Ascending (ii) Descending order
6. Programme to perform following conversion: (i) BCD to ASCII (ii) BCD to Hexadecimal
7. Programme to multiply two 8-bit numbers.
8. Programme to generate and sum 15 fibanocci numbers.
9. Programme for rolling display of message "INDIAN".
10. To insert a number at correct place in a sorted array.
11. Serial and Parallel data transfer on output port 8155 & 8255 & designing of disco light, running light, and sequential lights on off by above hardware.
12. Generation of different waveform on 8253/ 8254 programmable timer.

Semester IV **B.Tech in Electrical Engineering**

BEE 407 : ELECTRICAL MACHINES LAB- II

0L+0T+2P+1C **MM 100**

1. To conduct running light test on a three phase squirrel cage induction motor and measure & plot input current, power, power factor at different values of applied voltage. Compute shunt parameters of the equivalent circuit at rated voltage conditions. (a) To conduct blocked rotor test on above motor at rated current conditions, measure stator winding resistance and compute series parameters of the equivalent circuit. (b)Draw complete equivalent circuit of the motor and compute the performance at rated voltage and at a slip of 5 %.
2. To conduct direct load test on a three phase squirrel cage induction motor and measure & plot input current, torque, power factor, speed efficiency against output power.
3. To separate hysteresis and eddy current losses of a single phase transformer at rated voltage and frequency by conducting no load tests at different frequencies keeping V/f constant.
4. To run a slip ring induction motor with variable rotor resistance and plot. (i) Speed versus external resistance. (ii) Braking time versus external resistance.
5. To determine the resistance of cage I/M by performing variable frequency test.
6. To conduct running light and blocked rotor test on a 3-phase slip ring I/M and to measure stator resistance .to draw the circle diagram and determine there from its performance characteristics.
7. To start run and reverse a single phase capacitor start induction motor. Perform running light test and blocked rotor test to determine the equivalent circuit of the same.
8. To synchronize an alternator across the infinite bus (RSEB) & summarize the effects of variation of excitation on load sharing.
9. To plot the V-curve for a synchronous motor for different values of loads
10. To run a three phase scarge motor plots the variation of (a) Injected voltage versus brush separation. (b) No load speed versus brush separation. (c) No load speed versus injected voltage.
11. To run the induction motor as a SEIG (separately excited induction generator) and plot the variation of terminal voltage with speed, frequency with speed at different excitation capacitance.

Semester IV **B.Tech in Electrical Engineering**

MGT 110 : GENERAL APTITUDE

0L-0T-2P+1C **MM 100**

MODULE-1 Number System:-Number Series, HCF and LCM of Numbers, Fractions and Decimals, Square Root and Cube Roots, Indices and Surds, Simplification and Approximation,

MODULE-2 Problems on Ages and Numbers Percentage, Profit, Loss and Discount, Average, Ratio and Proportion, Time, Work and Wages, Pipes and Cisterns, Simple Interest, Compound Interest,

MODULE-3 Growth and Depreciation, Time and Distance, Trains, Boats and Streams, Races, Clocks, Calendar

MODULE-4 Area of Plane Figures, Volume and Surface Area of Solid Figures Elementary Algebra, Linear Equations, Quadratic Equations and In-equation, Progression,

MODULE-5 Permutation and Combination, Probability, Geometry, Trigonometry, **D**ata Interpretation, Data Sufficiency

Text/Reference Books:

1. R. S. Agarwal- Aptitude Mathematics
2. Mathuria- Quicker Mathematics

Semester IV **B.Tech in Electrical Engineering**

MGT 202 : BASIC PROGRAM IN ENTREPRENEURSHIP

0L-0T-2P+1C **MM 100**

Objective: The goal of this Program is to provide a space and platform for discovery, both self – discovery and opportunity discovery. Students will discover their strengths in terms of an entrepreneurial founding team and learn basics such as opportunity discovery, prototyping, business plans, challenges etc.

Module 1: Identification and classification of ideas. Entrepreneurial opportunities, environment scanning, Market assessment.

Module 2: Clarifying the Value Proposition, Product and Service; Market segmentation, Product Life cycle; BCG Matrix.

Module 3: Environmental Scanning and SWOT analysis; Components of an ideal business plan – market plan, financial plan, operational plan, and HR plan.

Module 4: Concept to Creation, Teething Problems of startup, Organizing and Marketing a Startup Selling on the web, launching e-commerce , Starting and growing an Enterprise, Growth Path

Module 5: Students have to prepare a detailed business plan selecting a product(s), Presentation of such business plans and submission after necessary corrections suggested by subject faculty

References:

Online Courses through MOOC, Classroom learning through an experienced Facilitator/Faculty on campus (Games, Exercises, Videos, and Practical Experiences)

1. Tendon ,C: Environment and Entrepreneur; Cliugh Publications, Allahabad.
2. Siner A David: Entrepreneural Megabuks; John Wiley and Sons, New York.
3. Srivastava S. B: A Practical Guide to Industrial Entrepreneurs; Sultan Chand and Sons, New Delhi.
4. Prasanna Chandra: Protect Preparation, Appraisal, Implementation; Tata McGraw Hill. New Delhi.
5. Paudey I.M: Venture Capital - The Indian Experience; Prentice Hall of India. New Delhi
6. Holt: Entrepreneurship-New Venture Creation; Prentice Hall of India. New Delhi

Semester V **B.Tech in Electrical Engineering**

BCS 401 : DATA BASE MANAGEMENT SYSTEMS

3L+0T+0P+ 3C **MM 100**

MODULE 1: INTRODUCTION - Database Systems versus File Systems, View of Data, Data Models, database languages, Database Users and Administrators. Transaction Management, Decision Support Systems, Components of a Database management System. Distributed Processing and Client- Server Architecture. Entity-Relationship Model – Basic Concepts, Constraints, Keys, Design Issues, E-R Diagrams.

MODULE 2: RELATIONAL MODEL - Structures of relational databases, Integrity Constraints, Logical database Design, Tables, Views, Data Dictionary. Relational Algebra, Relational Calculus. SQL – Basic Structures, Query Handling, Embedded SQL, Open Database Connectivity (ODBC), Java Database Connectivity (JDBC), Triggers, Security and Authorization. Query By Example (QBE), User Interfaces and Tools, Forms and Graphical User Interfaces. Report Generators. Overview of Relational Query Optimization.

MODULE 3: RELATIONAL DATABASE DESIGN - Functional Dependencies, Multi-valued Dependencies, Normal Forms, Decomposition into Normalized Relations, Physical Database Design – File Structures. Object-Relational Databases – Nested Relations, Complex Data types, Object-Relational Features in SQL:1999.

MODULE 4: INTERNET DATABASES - World Wide Web, Client Side Scripting and Applets, Web Servers and Sessions, Services, Server Side Scripting. XML – Structure of XML Data, XML Document Schema, XQuery, Storage of XML Data, XML Applications.

MODULE 5: ADVANCED TOPICS - Fundamental Concepts of Transaction Management, XConcurrency Control, Recovery Systems, Data Analysis and OLAP. Introduction to Data Mining, Data Farming, Data Warehousing, Spatial and Geographic Databases, Temporal databases a,d Multimedia Databases.

Text / Reference Books:

1. Date C J, " An Introduction to Database Systems", Addision Wesley
2. Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill
3. Elmasri, Navathe, "Fudamentals of Database Systems", Addision Wesley
4. O'Neil, Databases, Elsevier Pub.
5. Leon & Leon,"Database Management Systems", Vikas Publishing House

Semester V **B.Tech in Electrical Engineering**

BEE 501 : POWER ELECTRONICS

3L+1T+0P+ 3.5C **M.M.100**

MODULE 1: POWER SEMICONDUCTORS: - Construction and characteristics, specification and ratings, of SCR, TRIAC, MOSFET, IGBT and Power Transistor. Triggering Method of SCR, Protection of SCR- Protection against over voltage, over current, dv/dt, di/dt, Gate protection. Methods of turn on of SCR : R, RC, UJT relaxation oscillator, Drive snubber circuits for MOSFET and Turn-on and turn-off characteristics and switching losses.

MODULE 2: - PHASE-CONTROLLED CONVERTERS - 2-pulse, 3-pulse and 6-pulse converters with R, RL and RLE load, Effect of freewheeling diode, Effect of source inductance, Distortion and displacement factor, Ripple factor.

MODULE 3: - DC TO DC CONVERTERS - Step-down and step-up choppers – Type A, B, C, D, and E Chopper, Time ratio control and current limit control, Switching mode regulators: Buck, boost, buck-boost and buck converter. Voltage commutated chopper and current commutated chopper.

MODULE 4: - INVERTERS - Single phase and three phase (both 120 and 180 degree mode) inverters – PWM techniques: Sinusoidal PWM, modified sinusoidal PWM and multiple PWM – Voltage and harmonic control - Series resonant inverter - Current source inverters.

MODULE 5: - AC TO AC CONVERTERS - Single – phase AC voltage controllers, Integral cycle control, single Phase step up and step down cycloconverters (continuous and discontinuous mode), Three phase cycloconvertor- three phase to single phase convertor, three phase to three phase convertor, output voltage equations.

Text/Reference Books:

1. Power Electronics: Circuits, Devices and Applications, Muhammad H. Rashid, Pearson Education, Third edition, 2004 / PHI.
2. Power Electronics: Converters, Applications and Design, Ned Mohan, John Wiley and sons, third edition, 2003.
3. Power Electronics, Cyril.W.Lander, McGraw Hill International, Third edition, 1993.
4. Modern Power Electronics and AC Drives, Bimal K. Bose, ' Pearson Education, 2003.
5. Introduction to Power Electronics, Mr. Jaganathan, ' Prentice Hall of India, 2004.
6. Power Electronics M D Singh and K B Khanchandani, TMH, 2008.
7. Elements of Power Electronics, Krein P. T, Oxford.
8. Power Electronics, P C Sen, Tata McGraw-Hill, India.
9. Power Electronics, C W Lander, McGraw Hill
10. Power Electronics and Motor Control, W Shepherd, Cambridge Uni. Press.

Semester V **B.Tech in Electrical Engineering**

BEE 502 : CONTROL SYSTEM ENGINEERING

3L+0T+0P+ 3C **M.M.100**

MODULE 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.

MODULE 2: 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.

MODULE 3: 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.

MODULE 4: STABILITY OF THE SYSTEM: Absolute stability and relative stability, Routh's stability criterion, root locus method of analysis, polar plots, Nyquist stability criterion. M and N Loci, Nichols chart.

MOUDLE 5: ELEMENTARY IDEAS OF COMPENSATION, NETWORKS: Lag, lead and log lead networks, brief idea of proportional, derivative and integral controllers.

Text/Reference Books:

1. Modern Control Engineering, K. Ogata, '4th edition, Pearson Education, New Delhi, 2003 / PHI.
2. Control Systems Engineering, I.J. Nagrath& M. Gopal New Age International Publishers, 2003.
3. Automatic Control Systems, B.C. Kuo, Prentice Hall of India Ltd., New Delhi, 1995.
4. Control Systems, Principles & Design, M. Gopal, Tata McGraw Hill, NewDelhi, 2002.
5. Control Engineering Theory and Practice, M.N. Bandyopadhyay, Prentice Hallof India, 2003

Semester V **B.Tech in Electrical Engineering**

BEE 503 : TRANSMISSION & DISTRIBUTION OF ELECTRICAL POWER

3L+1T+0P+ 3.5C **M.M.100**

MODULE 1: **(I) 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.

MODULE 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.

MODULE 3: PARAMETERS OF TRANSMISSION LINES - Resistance inductance and capacitance of overhead lines, 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**.**

MODULE 4: TRANSMISSION LINE PERFORMANCE - Generalized ABCD line constants, equivalent circuit and performance of long transmission line. Ferranti effect. Interference with communication circuits. Power flow through a transmission line, **Corona:** Electric stress between parallel conductors. Disruptive critical voltage and visual critical voltage, Factors affecting corona. Corona power loss. Effects of corona.

MODULE 5: (i) INSULATORS - Pin, shackle, suspension, post and strain insulators. Voltage distribution across an insulator string, grading and methods of improving string efficiency**. (ii) 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.

Text/Reference Books:

1. A S Pabla: Electric Power Distribution. (TMH)
2. B R Gupta: Power System Analysis & Design, S. CHAND PUBLISHERS
3. Soni, Gupta and Bhatnagar: A Course in Electrical Power, Dhanpat Rai
4. C.L. Wadhwa: Electrical Power Systems, New Age
5. Nagrath Kothari: Modern Power System Analysis. (TMH)
6. J. J. Grainger& W. D. Stevenson: Power System Analysis (TMH).
7. Kamaraju: Electrical Power Distribution Systems (TMH)

Semester V **B.Tech in Electrical Engineering**

BEE 504 : SMART GRID TECHNOLOGY

3L+0T+0P+ 3C **M.M.100**

MODULE 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

MODULE 2: SMART GRID TECHNOLOGIES: Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation Transmission systems: Ems. 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).

MODULE 3: SMART METERING INFRASTRUCTURE: Introduction to Smart Meters, Advanced Metering infrastructure (AMI) drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement, Unit (PMU), Intelligent Electronic Devices (IED) & their application for monitoring & protection.

MODULE 4: POWER QUALITY MANAGEMENT IN SMART GRID: Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.

MODULE 5: HIGH PERFORMANCE COMPUTING FOR SMART 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

Text/Reference Books:

1. Ali K., M.N. Marwali, Min Dai, "Integration of Green and Renewable Energy in Electric Power Systems", Wiley.
2. Clark W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press.
3. JanakaEkanayake, N. Jenkins, K. Liyanage, J. Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", Wiley.
4. Jean Claude Sabonnadiere, NouredineHadjsaid, "Smart Grids", Wiley Blackwell.
5. Tony Flick and Justin Morehouse, "Securing the Smart Grid", Elsevier Inc.

Semester V **B.Tech in Electrical Engineering**

BEE 505 : SMART GRID LAB

0L+0T+2P+ 1C **M.M.100**

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.

Semester V **B.Tech in Electrical Engineering**

BEE 506 : POWER ELECTRONICS LAB

0L+0T+2P+ 1C **M.M.100**

1. Study of characteristics of the SCR (a) observe the terminal configuration (b) measure the breakdown voltage (3) measure the latching and holding current (d) plot V-I characteristics
2. Study the performance of single-phase half-wave and full-wave controlled rectifiers.
3. Study different firing circuits of SCR.
4. Study and perform Buck, Boost, and Buck boost regulator
5. Study protection circuits of SCR: (i) dv/dt (ii) di/dt (iii) Over voltage (iv) Over current
6. Study and obtain the characteristics of a DIAC and TRIAC.
7. Study firing circuit of SCR using ramp-comparator scheme.
8. Study firing circuit of SCR using cosine-wave scheme.
9. Study and obtain waveform for voltage and current commutated chopper
10. Study and perform experiments on single phase PWM Invertor.

Semester V **B.Tech in Electrical Engineering**

BCS 404 : DATA BASE MANAGEMENT SYSTEMS LAB

0L+0T+2P+ 1C **M.M.100**

Student can use My Sql (preferred open source DBMS) or any other Commercial DBMS tool (MS-Access / ORACLE) at backend and C++ (preferred) VB/JAVA at front end.

1. (a) Write a C++ program to store students records (roll no, name, father name) of a class using file handling.(Using C++ and File handling).
   (b) Re-write program 1, using any DBMS and any compatible language.(C++/MySQL) (VB and MS-Access)

2. Database creation/ deletion, table creation/ deletion.
   (a) Write a program to take a string as input from user. Create a database of same name. Now ask user to input two more string, create two tables of these names in above database.
   (b) Write a program, which ask user to enter database name and table name to delete. If database exist and table exist then delete that table.

3. Write a program, which ask user to enter a valid SQL query and display the result of that query.

4. Write a program in C++ to parse the user entered query and check the validity of query.
   Only SELECT query with WHERE clause

5 - 6. Create a database db1, having two tables t1 (id, name, age) and t2 (id, subject, marks).
   (a) Write a query to display name and age of given id (id should be asked as input).
   (b) Write a query to display average age of all students.
   (c) Write a query to display mark-sheet of any student (whose id is given as input).
   (d) Display list of all students sorted by the total marks in all subjects.

7 - 8. Design a Loan Approval and Repayment System to handle Customer's Application for Loan and handle loan repayments by depositing installments and reducing balances.

9 -10. Design a Video Library Management System for managing issue and return of Video tapes/CD and manage customer's queries.

Semester V **B.Tech in Electrical Engineering**

BEE 507 : CONTROL SYSTEMS LAB

0L-0T-2P+1C **M.M.100**

1. Study of Step Response and Feed Back Properties for Ist order system.
2. Study of Step Response and Feed Back Properties for 2nd order system.
3. To study and analysis field control of DC motor using MATLAB
4. To study and analysis field control of DC motor using MATLAB
5. To obtain the Frequency Response Characteristics and Design of Compensator for a given system.
6. To obtain the transfer Function and Control Characteristics of AC Servo Motor.
7. To obtain the Operational Characteristics for the Control Application of the following devices.
   (i) Stepper Motor (ii) Temperature Detectors
8. Simulation of control systems using MATLAB.
9. To obtain the Position Control performance of DC Servo Motor.
10. Comparisons of different Control Action (P/I/D/Relay) on Industrial Process (Pneumatic/ Simulated System).

Semester V **B.Tech in Electrical Engineering**

MGT 203 : FOUNDATION PROGRAM IN ENTREPRENEURSHIP

0L-0T-2P+1C **M.M.100**

Objective: This program will acquire the students with the skills required to take an idea to market.

Module I: Customer Development and Experience, understanding consumer behavior and needs , designing the product/service according to the market needs , how to create an experience and not just a service.

Module II: Project Formulation – Steps involved in setting up a Business, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal.

Module III: Small, Medium And Large Industrial Sectors, Industrial Potential, Demand And Resource Based Industries, Service Sector, corporate entrepreneurship, entrepreneurship and technocrat entrepreneurship.

Module IV: Sources of finance for enterprises, angel investors and venture capitalists, banks and government institutions, policies for start-ups.

Module V.: Stakeholders Validation – test angel investor interest in the solution, pitching to others (investors, partners, potential key hires) , obtaining seed funding and making the first key hires , validate interest for partners , channels.

References: Online courses through MOOC.

1. Tendon ,C: Environment and Entrepreneur; Cliugh Publications, Allahabad.
2. Siner A David: Entrepreneural Megabuks; John Wiley and Sons, New York.
3. Srivastava S. B: A Practical Guide to Industrial Entrepreneurs; Sultan Chand and Sons, New Delhi.
4. Prasanna Chandra: Protect Preparation, Appraisal, Implementation; Tata McGraw Hill. New Delhi.
5. Paudey I.M: Venture Capital - The Indian Experience; Prentice Hall of India. New Delhi
6. Holt: Entrepreneurship-New Venture Creation; Prentice Hall of India. New Delhi
7. World Bank Development report 2015-16.
8. World Bank "doing Business" 2014, 2015, 2016.
9. Govt. of India "Economic survey 2015-16", Oxford University Press
10. UNDP-Human Development Report 2015-16.

Program Elective Course-I

Semester V **B.Tech in Electrical Engineering**

BEC 502 : MICROCONTROLLER & EMBEDDED SYSTEM

3L-0T-0P+3C **M.M.100**

MODULE 1: INTRODUCTION TO VARIOUS MICROCONTROLLER - Overview of Embedded System: Definition, Design Challenges and Characteristics, Difference between microprocessor, microcontroller, introduction of various microcontrollers, 8051 By Intel, PIC by Microchip, AVR by ATMEL, ARM by ARM, MSP430 by Texas, Use and application of 8051 .

MODULE 2: 8051 MICRO CONTROLLER - 8051 Microcontroller: Architecture, Addressing modes, I/O Port Programming, Single bit, Instructions and Programming

MODULE 3: 8051 PROGRAMMING - Interrupt Programming, Timers Programming, serial port Programming and interrupt programming in Assembly and C .

MODULE 4: ARM PROCESSORS - ARM Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector table, Core Extensions, Instruction Set, Introduction to Thumb Instruction Set (Writing Programs not included in the theory Course)

MODULE 5: APPLICATIONS OF EMBEDDED SYSTEMS - Concepts of system-on-chip, How modern-day system-on-chip (SoC) microcontrollers can Implement a whole signal chain. Applications of Embedded systems: Energy meters, Smoke detectors, Data acquisition system, wired sensor network, and wireless sensor networks with Chipcon RF interface.

Text/Reference Books:

1. Andrew N. Sloss et.al. ARM System Developers Guide, ELSEVIER
2. Muhammad Ali Mazidi et.al., The 8051 Microcontroller & Embedded Systems, Pearson
3. Embedded System Design, A Unified Hardware/Software Introduction, Frank
4. Vahid / Tony Givargis, 2006 reprint, John Wiley Student Edition.
5. Muhammad Ali Mazidi et.al., The PIC Microcontroller, Pearson

Program Elective Course-I

Semester V **B.Tech in Electrical Engineering**

BEE 508 : ADVANCE DISTRIBUTION SYSTEM

3L-0T-0P+3C **M.M.100**

MODULE 1: (i) DISTRIBUTION SYSTEMS - Distribution of power, future distribution systems, power loads.
(ii)Load Forecasting: Introduction, load survey, load forecasting-regression analysis, correlation theory, analysis of time series, load growth factors, sources of error.

MODULE 2: OPERATION - Operation criterion and standards: Voltage control – voltage regulation, kVA – km conductor loading, correction of system voltage. Harmonics – introduction, effects of harmonics on networks, limits of harmonics, filters. Load variations- causes of voltage fluctuations, measures to reduce flickering. Ferro-resonance. System losses- Introduction, losses in components, measurement of losses, reduction of losses. Energy management.

MODULE 3: DISTRIBUTION POWER CAPACITORS - Reactive power flow, monitoring and compensation in distribution system, maintaining system voltage. Series and shunt capacitors, comparison. Shunt capacitors in distribution system - LT and HT shunt capacitors, capacitor rating for power factor improvement, constructional features. System harmonics.

MODULE 4: GROUNDING - Grounding system, earth and safety, earth electrode- earth resistance calculation, effect of rod size and soil resistivity, earth conductor sizes. Introduction to earth electrode design. Brief description of system earthing – system neutral earthing, earthing of substations, lines and consumer premises. Earth fault protection of feeders.

MODULE 5: DISTRIBUTION AUTOMATION - Introduction to distribution automation. Concept of communicationpower line carrier, radio communication, fibre optics, satellite communication and sensors. Introduction to supervisory control and data acquisition (SCADA). Brief descriptor of an automation system.

Text/Reference Books:

1. A S Pabla: Electric Power Distribution. (TMH)
2. B R Gupta: Power System Analysis & Design, S. CHAND PUBLISHERS
3. Nagrath Kothari: Modern Power System Analysis. (TMH)
4. J. J. Grainger& W. D. Stevenson: Power System Analysis (TMH).
5. Kamaraju: Electrical Power Distribution Systems (TMH)

Program Elective Course-I

Semester V **B.Tech in Electrical Engineering**

BEC 603 : DIGITAL SIGNAL PROCESSING

3L-0T-0P+3C **M.M.100**

MODULE 1: REALIZATION OF DIGITAL SYSTEMS - Introduction, direct form realization of IIR systems, cascade realization of an IIR systems, parallel form realization of an IIR systems, Ladder structures: continued fraction expansion of H(z), example of continued fraction, realization of a ladder structure, example of a ladder realization.

MODULE 2: DESIGN OF INFINITE IMPULSE RESPONSE DIGITAL FILTERS - Introduction to Filters, Impulse Invariant Transformation, Bi-Linear Transformation, All- Pole Analog Filters: Butterworth and Chebyshev Design of Digital Butterworth and Chebyshev Filters.

MODULE 3: FINITE IMPULSE RESPONSE FILTER DESIGN - Windowing and the Rectangular Window, Other Commonly Used Windows, Examples of Filter Designs Using Windows ,The Kaiser Window.

MODULE 4: DISCRETE FOURIER TRANSFORMS - Definitions, Properties of the DFT, Circular Convolution, Linear Convolution.

MODULE 5: FAST FOURIER TRANSFORM ALGORITHMS - Introduction, Decimation –In Time(DIT) Algorithm, Computational Efficiency, Decimation in Frequency(DIF) Algorithm Application of DSP to Speech and Radar signal processing.

Text/Reference Books:

1. Digital Signal Processing, Sanjit K Mitra, TMH
2. Digital Signal Processing, S.Salivahanan A Vallavaraj, C.Gnanapriya, TMH
3. Digital Signal Processing: Principals, Algorithms And Applications, John G.Proakis, Dimitris G Manolakis, PHI
4. Digital Signal Processing, A.V. Oppenheim And R.W. Schaffer, PHI
5. Digital Signal Processing, Thomas J. Cavicchi, John Wiley & Sons
6. Digital Signal Processing, Emmanuel Ifeachor, Barry Jervis, Pearson
7. Digital Signal Processing, Chi-Tsong Chen, Oxford
8. Digital Signal Processing, Engelberg, Shlomo, Springer

Semester VI **B.Tech in Electrical Engineering**

BEE 601 : POWER SYSTEM ANALYSIS

3L-1T-0P+3.5C **M.M.100**

MODULE 1: REPRESENTATION OF POWER SYSTEM COMPONENTS - Synchronous machines, Transformers, Transmission lines, one line diagram, Impedance and reactance diagram, per unit System sequence impedances and sequence networks. Percent and per unit quantities. Single line diagram for a balanced 3-phase system.
Impendence model: Formation of Zbus using singular transformation, direct determination method of Zbus. Modification of an existing bus impedance matrix.

MODULE 4: LOAD FLOW - Introduction, bus classifications, **Admittance Model**: Branch and node admittances, Equivalent admittance network and calculation of Ybus. Modification of an existing Y bus. Development of load flow equations, load flow solution using Gauss Siedel and Newton Raphson method, approximation to N-R method, line flow equations and fast decoupled method

MODULE 2: SYMMETRICAL FAULT ANALYSIS - Transient in R-L series circuit, calculation of 3-phase short circuit current and reactance of synchronous machine, internal voltage of loaded machines under transient conditions, Computer method for short circuit calculations.

MODULE 3: UNSYMMETRICAL FAULTS - Symmetrical components- Symmetrical Components of unbalanced phasors, power in terms of symmetrical components, Analysis of single line to ground fault, line-to-line fault and Double Line to ground fault on an unloaded generators and power system network with and without fault impedance.

MODULE 5: POWER SYSTEM STABILITY - Stability and Stability limit, Steady state stability study, derivation of Swing equation, transient stability studies by equal area criterion and step-by- step method. Factors affecting steady state and transient stability and methods of improvement, Power Control- Concept of Load frequency control, Concept of voltage and reactive power control

Text/Reference Books:

1. W.D. Stevenson, Jr. "Elements of Power System Analysis", McGraw Hill.
2. C.L. Wadhwa, "Electrical Power System", New Age International.
3. Chakraborthy, Soni,Gupta & Bhatnagar, "Power System Engineering", Dhanpat Rai & Co.
4. T.K Nagsarkar & M.S. Sukhija, "Power System Analysis" Oxford University Press,2007.
5. L. P. Singh; "Advanced Power System Analysis & Dynamics", New Age International
6. Hadi Sadat; "Power System Analysis", Tata McGraw Hill.
7. P.S.R. Murthy " Power System Analysis" B.S. Publications,2007

Semester VI **B.Tech in Electrical Engineering**

BEE 602 : ADVANCE CONTROL THEORY

3L-0T-0P+3C **M.M.100**

MODULE 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 state space equations of mechanical, Electrical systems, Analogous systems.

MODULE 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.

MODULE 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.

MODULE 4: DIGITAL CONTROL SYSTEMS: Introduction, Modelling of sample-hold circuit, sampled data control systems. Z-transform. Block diagram analysis of sampled data systems, z and s domain relationship.

MODULE 5: STABILITY OF NON LINEAR SYSTEM- Steady state accuracy, stability in z-plane and Jury stability criterion, bilinear transformation Routh-Hurwitz criterion on s-planes, digital PID controllers, Introduction to adaptive control.

Text/Reference Books:

1. M.Gopal, "Digital Control and State variable Methods", Tata Mc Graw Hill
2. Ajit K.Madal, "Introduction to Control Engineering: Modeling, Analysis and Design" New Age International.
3. D.Landau, "Adaptive Control", Marcel Dekker Inc.
4. S.Rajasekaran & G.A.Vjayalakshmi Pai, "Neural Networks,Fuzzy Logic and Genetic Alogorithms: Synthesis and Applications" Prentice Hall of India.
5. Donald E. Kiv, "Optimal Control Theory: An Introduction" Prentice Hall
6. B.C. Kuo, "Digital Control Systems" Sounders College Publishing
7. C.H.Houpis and G.B.Lamont, "Digital Control Systems: Theory, Hardware, Software", Mc Graw Hill

Semester VI **B.Tech in Electrical Engineering**

BEE 603 : ADVANCE POWER ELECTRONICS

3L-1T-0P+3.5C **M.M.100**

MODULE 1: AC VOLTAGE CONTROLLERS: Principle of On-Off Control, Principle of Phase control, Single Phase Bi-directional Controllers with Resistive Loads, Single Phase Controllers with Inductive Loads, Three Phase full wave AC controllers, AC Voltage Controller with PWM Control.

MODULE 2: 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.

MODULE 3: CONVERTERS: Cuk and SEPIC converters – operations in CCM and DCM, non-idealities. Isolated DC-DC Convertrs: Flyback, Forward and Push-pull topologies.

MODULE 4: DC POWER SUPPLIES: Switched Mode DC Power Supplies, flyback converter, forward converter, half and full bridge converter, resonant DC power supplies, bi- directional power supplies.

MODULE 5: AC POWER SUPPLIES: Switched mode power supplies, Resonant AC power supplies, bi- directional AC power supplies. Multistage conversions, Control Circuits: Voltage Mode Control, Current Mode Control

Text/Reference Books:

1. M.H. Rashid,"Power Electronics: Circuits, Devices & Applications", Prentice Hall of India Ltd. 3rd Edition,2004.
2. Bose -Power Electronics & Motor Drives ELSEVIER
3. V.R. Moorthy, "Power Electronics: Devices, Circuits and Industrial Applications" Oxford Press, 2007.
4. V Subrahmanyam: Power Electronics, New Age Inc. Publishers, New Delhi.
5. Chakrabarti & Rai, "Fundamentals of Power Electronics & Drives"Dhanpat Rai & Sons.
6. Ned Mohan, T.M.Undeland and W.P.Robbins, "Power Electronics: Converters, Applications and Design", Wiley India Ltd, 2008.

Semester VI **B.Tech in Electrical Engineering**

BEE 604 : ELECTRIC DRIVE & THEIR CONTROL

3L-0T-0P+3C **M.M.100**

MODULE 1: INTRODUCTION - Classifications of Electric Drives, components of electric drives, advantages of electric drives, Review of characteristics and speed control of D.C. and A.C. motors.

Dynamics of Electric Drives:- Fundamental torque equation, speed-torque conventions and multiquadrant operation, equivalent values of drive parameters, components of load torques, nature and classification of load torques, calculation of time and energy-loss in transient operations, criteria for steady state stability, load equalization.

MODULE 2: RATING AND HEATING OF MOTORS - Thermal model of motor for heating and cooling, classes of motor duty, determination of motor rating, frequency of operation of motors subjected to intermittent loads.

Rectifier Control of D.C. Drives- Controlled rectifier circuits, 1-phase fully controlled rectifier-fed separately excited d.c. motor, 1-phase half-controlled rectifier-fed separately excited d.c. motor, 3-phase fully controlled rectifier-fed separately excited d.c. motor, multi quadrant operation of fully-controlled rectifier-fed d.c. motor.

MODULE 3: CHOPPER CONTROL OF D.C. DRIVES - Principle of operation and control techniques, motoring operation of separately excited and series excited motors, multi quadrant control of chopper-fed motors.

MODULE 4: INDUCTION MOTOR (IM) DRIVES - 3-phase a.c. voltage controller-fed IM drive, voltage source inverter (VSI) and current source inverter (CSI) variable frequency drives, comparison of VSI and CSI drives, cyclo-converter-fed IM drive, static rotor resistance control of 3-phase slipring IM.

MODULE 5: SYNCHRONOUS MOTOR DRIVES - VSI drive, CSI drive, CSI drive with load commutation, cyclo-converter drive,

Braking methods- Various methods of braking d.c. and a.c. motors, regenerative braking of d.c. motors during chopper control, static scherbius drive, commutatorless Kramer drive. Introduction to Microprocessor Control of Electric Drives.

Text/Reference Books:

1. G.K. Dubey, "Fundamentals of Electrical Drives" Narosa Publishing House, 1995.
2. K Pillai, "A First course on Electrical Drives" Wiley Eastern Ltd.
3. Subrahmanyam, "Electric Drives: Concepts and Applications", Tata Mc Graw Hill Publishing Co. Ltd., 1994.
4. K Dubey, "Power Semiconductor Controlled Drives, "Prentice Hall, Englewood cliffs, New Jersey, 1989.
5. L- Sharkawi & A Mohamad " Fundamental of Electric Drive", Vikas Publishing House

Semester VI **B.Tech in Electrical Engineering**

BEE 605 : UTILIZATION OF ELECTRICAL ENERGY & ELECTRIC TRACTION

3L-0T-0P+3C **M.M.100**

MODULE 1: ILLUMINATION - Nature of light, important definitions, laws of illumination, principle of production of light- discharge through gases under pressure – incandescence/sources of light-filament lamp, halogen lamp-discharge lamp-sodium discharge lamp, high pressure mercury discharge lamp, dual lamps, fluorescent lamps, lamp efficiency, requirements of good lighting, illumination level, absence of contrasts, shadows, glare, colour rendering-lamp fittings. Lighting schemes, design of indoor & outdoor lighting system-street lighting, flood lighting, photometers.

MODULE 2: ELECTRIC HEATING - Advantages of electric heating, classification of heating methods, detailed study of resistance heating, arc heating, electron bombardment heating, induction heating & dielectric heating and their control.

MODULE 3: ELECTROLYTIC PROCESSES - Fundamentals of electro deposition-laws of electrolysis applications of electrolysis, electro deposition, manufacture of chemicals, anodizing, electro- polishing, electro-cleaning, electro-parting, electrometallurgy, electric supply.

MODULE 4: TRAIN MECHANICS - Types of services, characteristics of each type of service, speed time curve, simplified speed time curve, average speed, schedule speed, factors affecting schedule speed, tractive effort for propelling a train, power of the traction motor, specific energy output, specific energy consumption, factors affecting specific energy consumption, mechanics of train movement, coefficient of adhesion, factors affecting slip.

MODULE 5: ELECTRIC TRACTION - D.C. & A.C. traction motors, their characteristics Traction Motor Control: Starting and speed control of D.C. series motors, shunt transition, bridge transition, drum controller employing shunt transition, energy saving with series parallel starting, metadyne control, multiple unit control, braking of traction motors. Current Collection Systems- Conductor rail equipment, current collection gear for OHE: Cable collector, pole collector, bow collector, pantograph collector.

Text/Reference Books:

1. E. Openshan Taylor, "Utilization of Electric Energy", Orient Longmans.
2. P.V. Gupta et. al, "A Course in Electrical Power", Dhanpat Rai & Sons Delhi
3. H. Partap, "Art & Science of Utilization of Electrical Energy".
4. N.V. Suryanarayana, "Utilization of Electric Power".
5. BR Sharma, "Utilization of Electrical. Energy".

Semester VI **B.Tech in Electrical Engineering**

BEE 606 : POWER SYSTEM ANALYSIS LAB

0L-0T-2P+1C **M.M.100**

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. Study of the over current relay and draw the time current characteristic of an over current relay for TMS=1 & 0.5 and PSM=1.25 & 1.0.
4. Study percentage bias differential relay and plot the characteristics of a percentage bias differential relay for 20%, 30% and 40% biasing.
5. To determine location of fault in a cable using cable fault locator
6. To study Ferranti effect and voltage distribution in H.V. long transmission line using transmission line model.
7. To obtain steady state, transient and sub-transient short circuit currents in an alternator
8. To obtain formation of Y-bus and Z bus
9. Perform load flow analysis using Gauss-Siedel method.
10. To perform symmetrical and unsymmetrical fault analysis in a power system

Semester VI **B.Tech in Electrical Engineering**

BEE 607 : ADVANCE POWER ELECTRONICS LAB

0L-0T-2P+1C **M.M.100**

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 SCR DC circuit breaker.
6. Control speed of a dc motor using a chopper and plot armature voltage versus speed characteristic.
7. (i) Study single-phase dual converter. (ii) Study speed control of dc motor using single-phase
8. Study one, two and four quadrant choppers (DC-DC converters).
9. Study speed control of dc motor using one, two and four quadrant choppers.
10. Study single-phase cycloconverter.

Semester VI **B.Tech in Electrical Engineering**

BEE 608 : ELECTRIC DRIVE & THEIT CONTROL LAB

0L-0T-2P+1C **M.M.100**

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

Semester VI **B.Tech in Electrical Engineering**

BEE 609 : ADVANCE SIMULATION LABORATRY

0L-0T-2P+1C **M.M.100**

List of Experiments based on MATLAB Simulation /Modeling

1. Introduction of advance tool of MATLAB
2. Determination of voltage and power at the sending end of medium transmission line using Simulation.
3. To find out economic load dispatch in power system using MATLAB
4. Computation of transmission line parameter using MATLAB
5. Formation of Y-Bus for the transmission line using MATLAB
6. Transient and small signal stability analysis using MATLAB
7. To design the single phase AC voltage regulator using MATLAB /SIMULINK
8. To design the single phase half controlled and full controlled bridge converter using R and RL load and draw the output waveform across the load and devices using MATLAB / SIMULINK
9. To design the three phase half controlled and fully controlled bridge converter using R and RL load and draw the output waveform across the load and devices using MATLAB / SIMULINK

Semester VI **B.Tech in Electrical Engineering**

BEE 610 : CAMPUS RECRUITMENT TRAINING –I (TECHNICAL)

0L-0T-2P+1C **M.M.100**

As a part of the curriculum, the Campus Recruitment Training (Technical) forms an important component of education for B Tech student. It is an attempt to bridge the gap between conventional study and competitive exam study or campus placement. The Program, which would be a help in government jobs as well as top private companies. In the process, it provides training for the students to improve their technical skill as per requirement. This program benefits the student to understand what he/she has studied in the class room and what is being practiced in competitive exam for government and private jobs.

In this program technical preparation according to competitive exam will be done in the field of Electrical Engineering. Major technical subjects **Electrical Machines:** DC machines, Induction Machines, Synchronous machines, Transformers, **Circuit Theory:** Network Theorem, Graph Theory, AC Network, Transient Analysis, Two port network, **Electrical Measurement:** measurement of resistance, Inductance and Capacitance, Potentiometer, DC and AC bridges, Moving coil, Moving Iron, Dynamometer, Induction type meter, measurement of Power, Energy and Frequency, Transducers are covered in stage first. The program mainly focuses on multiple choice question which help students for their preparation.

Semester VI **B.Tech in Electrical Engineering**

MGT 204 : INTERMEDIATE PROGRAM IN ENTREPRENEURSHIP

0L-0T-2P+1C **M.M.100**

Objective: This program will teach the students about market size , costs , channels and customer acquisition , business model and plan finalization , efficiency and growth processes.

Module I: Identify the vertical for operating your business opportunity , understanding your customers and accurately assessing market opportunity , Minimum Viable Product and The Lean Method.

Module II: Developing and validating a business model for your venture – Value Proposition , Customer Segments , Channels and Partners , Revenue Model and Streams , Key Resources , Activities and Costs , Customer Relationships and Customer Development Processes.

Module III: Translate your business model into a business plan , Visioning for your venture , Taking your product/service to the market , Delivering an Investor pitch to a panel of investors.

Module IV: Identify possible sources of funding for your venture , Marketing your business – Get to Market Plan , effective ways of marketing for start ups – digital and viral marketing , hire and manage a team , Managing start up finance.

Module V : Legal and regulatory aspects for starting up your venture , Enhancing the growth process and creating scalability , thorough understanding of market size , costs , margins , delivery channels , customer acquisition costs , Key areas of BM Canvas , 1-2 year roadmap and trajectory.

References:

Online courses through MOOC.

1. Tendon ,C: Environment and Entrepreneur; Cliugh Publications, Allahabad.
2. Siner A David: Entrepreneural Megabuks; John Wiley and Sons, New York.
3. Srivastava S. B: A Practical Guide to Industrial Entrepreneurs; Sultan Chand and Sons, New Delhi.
4. Prasanna Chandra: Protect Preparation, Appraisal, Implementation; Tata McGraw Hill. New Delhi.
5. Paudey I.M: Venture Capital - The Indian Experience; Prentice Hall of India. New Delhi
6. Holt: Entrepreneurship-New Venture Creation; Prentice Hall of India. New Delhi
7. World Bank Development report 2015-16.
8. World Bank "doing Business" 2014, 2015, 2016.
9. Govt. of India "Economic survey 2015-16", Oxford University Press
10. UNDP-Human Development Report 2015-16.

Program Elective Course-II

Semester VI **B.Tech in Electrical Engineering**

BEC 504 : ADVANCED MICROPROCESSORS

3L-0T-0P+3C **M.M.100**

MODULE 1: 80186, 80286, 80386 AND 80486 MICROPROCESSORS Architecture of 80186/ 80286/80386/80486, Enhancements of 80186, Real & Virtual Addressing Modes, Cache Memory, Special Registers, Memory Management, Memory Paging Mechanism, Exception Handling, Comparison of Microprocessors (8086 – 80186 –80286 – 80386 – 80486)

MODULE 2: PENTIUM MICROPROCESSORS: Pentium Microprocessor Architecture, Special Pentium Registers, Pentium Memory Management, New Pentium Instructions, Pentium Pro Microprocessor, Microprocessor Architecture of Pentium II Microprocessor Architecture of Pentium III, Microprocessor Architecture of Pentium IV, Comparison of Pentium Processors.

MODULE 3: RISC PROCESSORS I: PowerPC620 – Instruction fetching – Branch Prediction – Fetching – Speculation, Instruction dispatching –dispatch stalls – Instruction Execution – Issue stalls- Execution Parallelism – Instruction completion – Basicsof P6 micro architecture – Pipelining – our- of-order core pipeline – Memory subsystem.

MODULE 4: RISC PROCESSORS II(SUPERSCALAR PROCESSORS): Intel i960 – Intel IA32- MIPS R8000 – MIPS R10000 – Motorola 88110 – Ultra SPARC processor- SPARC version 8 – SPARC version 9.

MODULE5:PC HARDWARE OVERVIEW : Functional Units & Interconnection, New Generation Mother Boards 286 to Pentium 4, Bus Interface- ISA- EISA- VESA- PCI- PCIX. Peripheral Interfaces & Controllers, Memory and I/O Port Addresses.

Text/Reference Books:

1. B.B.Brey The Intel Microprocessor 8086/8088 /80186/80188, 80286, 80386, 80486
2. PENTIUM, PENTIUM Pro, PII, PIII & IV Archietecture, Programming & Interfacing, Pearson Ed ucation ,2004.
3. John Paul Shen, Mikko H.Lipasti, “Modern Processor Design”, Tata Mcgraw Hill, 2006.
4. Douglas V.Hall, “Microprocessors and Interfacing”, Tata McGraw Hill, II Edition2006

Program Elective Course-II

Semester VI **B.Tech in Electrical Engineering**

BEE 611 : POWER SYSTEM INSTRUMENTATION

3L-0T-0P+3C **M.M.100**

MODULE 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.

MODULE 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.

MODULE 3: SIGNAL CONDITIONING - Instrumentation amplifiers, isolation amplifiers, analog multipliers, analog dividers, function generators, timers, sample and hold, optical and magnetic isolators, frequency to voltage converters, temperature to current converters. Shielding and grounding.

MODULE 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.

MODULE 5: POWER SYSTEM INSTRUMENTATION-II - Capacitive voltage transformers and their transient behavior, Current Transformers for measurement and protection, composite errors and transient response.

Text/Reference Books:

1. R H Cerni and L E Foster: Instrumentation for Engineering Measurements, John Wiley and Sons,
2. Curtis and D Hohnson: Process Control Instrumentation Technology, John Wiley and sons.
3. R Morrison: Instrumentation Fundamentals and Applications, John Wiley and Sons
4. A.K.Sawhney, "Advanced Measurements & Instrumentation", Dhanpat Rai & Sons
5. E.O. Decblin, "Measurement System – Application & design", Mc Graw Hill.
6. W.D. Cooper and A.P. Beltried, "Electronics Instrumentation and Measurement Techniques" Prentice Hall International
7. A.S. Moris / Principles of Measurement & Instrumentation / Prentice Hall, 1993.

Program Elective Course-II

Semester VI **B.Tech in Electrical Engineering**

BEC 608 : INFORMATION THEORY AND CODDING

3L-0T-0P+3C **M.M.100**

MODULE 1: ELEMENTS OF INFORMATION THEORY - Measure of information, average information, entropy, and information rate. Communication channel, discrete and continuous channel

MODULE 2: Shannon-Hartley theorem and its implications. Channel capacity, Gaussian channel and bandwidth-S/N tradeoff.

MODULE 3: INTRODUCTION OF CODING - types of efforts, types of codes, error control coding, methods of controlling errors

MODULE 4: LINEAR BLOCK AND BINARY CYCLIC CODES - matrix decryption of linear block codes, error detection and error correction capabilities of linear block codes. Hamming codes, structure of cyclic codes, encoding using an (n-k) bit shift register syndrome calculation, its error detection & correction, special classes of cyclic codes BCH.

MODULE 5: BURST AND CONVOLUTION CODES - burst and random error correcting codes, encoders for convolution codes. Decoders for convolution codes

Text/Reference Books:

1. Coding and Information Theory (Graduate Texts in Mathematics) by Steven Roman
2. Information and Coding Theory (Springer Undergraduate Mathematics Series) by Gareth A. Jones and J. Mary Jones
3. Information Theory and Network Coding (Information Technology: Transmission, Processing and Storage) by Raymond W. Yeung
4. Fundamentals of Information Theory and Coding Design (Discrete Mathematics and Its Applications) by Roberto Togneri and Christopher J.S deSilva
5. Anoop Singh Poonia, "Information Theory of Coding", Dhanpat Rai Publishing Company.

Semester VII **B.Tech in Electrical Engineering**

MGT 103 : PROJECT FORMULATION & APPRAISAL TECHNIQUES

3L+0T+0P+ 3C **M.M.100**

Module 1 Introduction – project attributes; project life cycle; role of managers; Management – scheduling; Gantt charts; CPM; PERT; crashing; Generation of project ideas – resource allocation; environment analysis – PEST analysis, porter's model; analysis of strategic capabilities – value chain, BCG matrix, flexibility

Module 2 Appraisal methods in project scanning and selection – market appraisal; technical appraisal; environmental appraisal; evaluating intangibles, social appraisal – SCBA, UNIDO, LM, CSR.

Module 3 Total quality management: Introduction - Need for quality - Evolution of quality - Definition of quality -Basic concepts of TQM - Definition of TQM – TQM Framework -Contributions of Deming, TQM principles , The seven traditional tools of quality – New management tools – Six-sigma.

Module 4 **Financial Appraisal:** Time value of money; cost of capital – equity, debt, preference; weighted average cost; marginal and average cost; Capital budgeting – investment appraisal techniques; NPY; IRR; Payback period; replacement decisions; selection of exact discount factor – problems, inflation, taxation;

Module 5: **Risk Analysis** models – single probability analysis; sensitivity analysis; break even analysis; certainty equivalent; uncertainty analysis, simulation; decision tree model; risk and utility.

Recommended Books

1. Khatua Sitangshu. *Project Management and Appraisal*, Oxford University Press
2. Pandey, I.M. *Financial Management*. Vikas Publishing House
3. Prasanna, Chandra. *Financial Management*. Tata McGraw-Hill
4. Maheshwari, S .N. & Maheshwari, S. K. *Advanced Management Accounting Vol.1 & Vol.2*. Vikas Publishing House
5. Paresh Shah. *Management Accounting*. Oxford University Press

Semester VII **B.Tech in Electrical Engineering**

BEE 701 : HIGH VOLTAGE ENGINEERING

3L+0T+0P+ 3C **M.M.100**

MODULE 1: CONDUCTION & BREAKDOWN IN GASES, LIQUID & SOLID DIELECTRICS – Gases Ionization process, Townsend's current growth equation. Ist & 2nd ionization coefficients. Townsend criterion for breakdown. Streamer theory of breakdown. Panchen's law of gases. Gases used in practice.

MODULE 2: LIQUID DIELECTRICS – Conduction & break down in pure & commercial liquids, suspended particle theory, stressed oil volume theory, liquid dielectrics used in practice; Solid Dielectrics-Intrinsic, electromechanical & thermal breakdown, composite dielectric, solid dielectric susedin practice; Applications of Insulating Materials: Application of insulating materials in power transformers, rotating machines, circuit breakers, cables & power capacitors.

MODULE 3: GENERATION OF HIGH VOLTAGES & CURRENTS – Generation of high D.C., A.C., impulse voltage & impulse currents. Tripping & control of impulse generators; Measurement of High Voltages & Currents: Measurement of high D.C., A.C. (Power frequency & high frequency) voltages, various types of potential dividers, generating voltmeter, peak reading A.C. voltmeter, Digital peak voltmeter, electrostatic voltmeter. Sphere gap method, factors influencing the spark voltage of sphere gaps.

MODULE 4: HIGH VOLTAGE TESTING OF ELECTRICAL APPARATUS -Testing of insulators, bushings, circuit breakers power capacitors & power transformers. Overvoltage Phenomenon & Insulation Co-ordination: Theory of physics of lightning flashes & strokes. Insulation co-ordination, volt-time and circuit time characteristics. Boys camera, standard voltage & current shapes produced in Lab., Horn gap, single diverters, ground wires, surge absorbers.

MODULE 5: NONDESTRUCTIVE INSULATION TESTS: Measurement of resistively, dielectric constant and loss factor. High Voltage Schering Bridge- measurement of capacitance and dielectric loss. Partial Discharges: Introduction to partial discharge, partial discharge equivalent circuit.

Text/Reference Books:

1. M.S.NaiduandV.Kamaraju,"HighVoltageEngineering,TataMc-GrawHill.
2. E.KuffelandW.S.Zacngal,HighVoltageEngineering",PergamonPress.
3. M.P.Chaurasia,"HighVoltageEngineering",KhannaPublishers
4. R.S.Jha,"HighVoltageEngineering",DhanpatRai&sons
5. C.L.Wadhwa,"HighVoltageEngineering",WileyEasternLtd.
6. M.Khalifa,"HighVoltageEngineeringTheoryandPractice,"MarcelDekker.

Semester VII **B.Tech in Electrical Engineering**

BEE 702 : SWITCHGEAR AND RELAYING

3L+0T+0P+ 3C **M.M.100**

MODULE 1: SWITCHGEAR - Introduction, functions of a circuit breaker, contacts separation and arc phenomenon, theory of arc formation and its extinction, recovery voltage, restriking voltage, interruption of capacitive and inductive currents, resistance switching, double frequency transients, circuit breaker ratings, clearing time, reclosing time, classification of circuit breakers, oil, air-blast, vacuum and SF6 circuit breakers.

MODULE 2: PROTECTION AGAINST LIGHTNING –Lightning mechanism and its characteristics, over- voltages due to lightning, protection of lines and sub-stations against lightning using shield wires, tower footing resistance, counter poises, ground wires, rod gaps, lightning arrestors, their construction, working and ratings, surge absorbers and surge diverters.

MODULE 3: INSULATION CO-ORDINATION –Impulse volt-time characteristics of electrical apparatus, basic impulse insulation level, and insulation levels of sub-station equipment's.

MODULE 4: PROTECTIVE RELAYS -Introduction, basic requirements, operating principles and characteristics of electro-magnetic type over-current, differential, impedance and admittance relays. Detail of protection against abnormal conditions for alternators, transformers, feeders transmission lines, and bus-bars. Carrier current protection for long lines.

MODULE 5: STATIC RELAYS - Introduction, comparison with electromagnetic relays, working of instantaneous, definite time, inverse time and directional over current relays, introduction to digital relays.
Sub-Stations: Types of sub-stations, sub-station equipment's and out dooryard layout, types of bus-bars, key diagrams and bus-bar arrangements.

Text/ReferenceBooks:

1. AChakrabarti,MLSoni,PVGuptaandUSBhatnagar,"PowerSystemEngineering"DhanpatRai& Sons.
2. IJNagrathandDPKothari,"PowerSystemEngineering"TataMcGraw-Hill.
3. CLWadhwa,"ElectricPowerSystems",WileyEasternLimited.
4. SunilS.Rao,"Switchgear,ProtectionandPowerSystems",KhannaPublishers.
5. BadriramandDNVishwakarma,"PowerSystemProtectionandSwitchgear",TMH

Semester VII **B.Tech in Electrical Engineering**

BEE 703 : EHV AC/DC TRANSMISSION

3L+0T+0P+ 3C **M.M.100**

MODULE 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.

MODULE 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).

MODULE 3: VOLTAGE CONTROL - No load receiving end voltage and reactive power generation. Methods of voltage control. Synchronous phase modifier, shunt capacitors and reactors, saturable reactors, Thynstorised static VAR compensators- TCR, FC-TCR and TSC-TCR.

MODULE 4: FACTS - Introduction to FACTS controllers, types of FACTS controllers, Brief description of STATCOM, Thyristor controlled series capacitors and unified power flow controller.

MODULE 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.

Text/ReferenceBooks:

1. K.R. Padiyar – HVDC Power Transmission Systems. NEW AGE PUB
2. HVDC Power Transmission System, K.R, Padiyar, Wiley Eastern Ltd., 1990
3. E.W. Kimbark, Direct Current Transmission Vol: 1 Wiley Interscience, 1971.
4. J. Arrillaga, H.V.D.C Transmission, Peter Peregrines, 1983.
5. R.D. Begamudre, E.H.V. A.C. Transmission, Wiley Eastern Ltd., 2nd edition.
6. S. Rao, EHV-AC and H.V.D.C. Transmission Engineering Practice, Khanna publishers, 1990.
7. R. D. Begamudre, "Extra High Voltage AC Transmission Engineering" Wiley Eastern

Semester VII **B.Tech in Electrical Engineering**

BEE 704 : POWER SYSTEM MODELING & SIMULATION LAB

0L+0T+2P+ 1C **M.M.100**

1. Simulate Swing Equation in Simulink (MATLAB)
2. Simulate load model with prime mover and governor
3. Simulate load model with prime mover, governor and feedback.
4. Simulation of Automatic voltage regulator.
5. Simulation of voltage regulation using shunt compensation in transmission line
6. Simulation of voltage regulation using Series compensation in transmission line

Semester VII **B.Tech in Electrical Engineering**

BEE 705 : HIGH VOLTAGE ENGINEERING LAB

0L+0T+2P+ 1C **M.M.100**

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.
8. Design an EHV transmission line.

Semester VII **B.Tech in Electrical Engineering**

BEE 706 : PROJECT STAGE -I

0L+0T+2P+ 1C **M.M.100**

The object of Project Work-I is to enable the student to take up investigative study in the broad field of Electrical Engineering, either fully theoretical/practical or involving both the theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work. The assignment to normally include:

- Survey and study of published literature on the assigned topic;
- Working out a preliminary Approach to the Problem relating to the assigned topic; Conducting preliminary Analysis/Modeling/Simulation/Experiment/Design/ Feasibility;
- Preparing a Written Report on the Study conducted for presentation to the Department;
- Final Seminar, as oral Presentation before a Departmental Committee.

Semester VII **B.Tech in Electrical Engineering**

BME 715 : BASIC INDUSTRIAL ROBOTICS

0L+0T+2P+ 1C **M.M.100**

MODULE 1: Robot Definition: Definition of robots, Evolution of robots, Laws of robots, International Robotic Standards, Why Robots? Types of robots, Selection of robots.
2. Robot Classifications: degrees of freedom; degrees of movements, robot configuration; accuracy and repeatability, specification of a robot ,actuators and sensors, drives and transmission systems used in robotics. Applications of robots.

MODULE 2: Coordinate Transformation: Direct kinematic problem in robotics, geometry based direct kinematic analysis coordinate & vector transformation using matrices, the
orientation matrix & translator vector, homogeneous transformation matrices, three dimensional homogeneous transformations.

MODULE 3: Trajectory interpolation: Introduction, the necessity of interpolators, the generation of motion commands, the trajectory planning, basic structure of interpolators. The solvability of the inverse, kinematics problem. particular solutions for the inverse kinematics problem - two – axis planar mechanisms, example of three-axis spherical mechanism, specific solutions for six-axis manipulators.

MODULE 4: Autonomous mobile robots: Introduction, locomotion - key issues for locomotion, legged mobile robots, leg configurations & stability , examples of legged robot locomotion ,
wheeled mobile robots, wheeled locomotion-the design space, wheeled locomotion: case studies.

MODULE 5: Mobile robot kinematics: introduction, kinematics models & constraints, representing robot position, forward kinematics models, wheel kinematics constraints, robot kinematics constraints, examples robot kinematics models & constraints. Mobile robot maneuverability- degree of mobility, degree of steerability, robot maneuverability. Mobile robot workspace-degree of freedom, holonomic robots, path & trajectory considerations. Motion control - open loop control, feedback control.

Text/ Reference Books:

1. Robotics & Control – R.K. Mittal & I.J. Nagrath – TMH Publications
2. Robotics for engineers - Yoram Korean- McGrew Hill Co.
3. Industrial Robotics Technology programming and Applications - M.P.Groover, M.Weiss, R.N.Nagel, N.G.Odrey.
4. Robotics Control Sensing, Vision and Intelligence - K.S.Fu, R.C.Gonzalex, C.S.G.Lee- McGrew hill Book co.
5. Kinematics and Synthesis of linkages - Hartenberg and Denavit - McGrew Hill Book Co
6. Kinematics and Linkage Design - A.S. Hall - Prentice Hall

Semester VII **B.Tech in Electrical Engineering**

BEE 707 : SEMINAR

0L+0T+2P+ 1C **M.M.100**

OBJECTIVE

The students are to select one technical topic related its branch for Seminar. The student is to submit the synopsis for assessment and approval. Progress for preparation of the seminar topic would be continuously assessed from time to time. Two periods per week are to be allotted and students are expected to present the seminar Progress. A faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain the attendance.

Students have to give a final presentation for 15 minutes on his topic. Students are encouraged to use various teaching aids such as over head projectors, power point presentation and demonstrative models. This will enable them to gain confidence in facing the placement interviews

Semester VII **B.Tech in Electrical Engineering**

BEE 708 : CAMPUS RECRUITMENT TRAINING–II (TECHNICAL)

0L+0T+2P+ 1C **M.M.100**

As a part of the curriculum, the Campus Recruitment Training (Technical) forms an important component of education for B.Tech. student. It is an attempt to bridge the gap between conventional study and competitive exam study or campus placement. The Program, which would be a help in government jobs as well as top private companies. In the process, it provides training for the students to improve their technical skill as per requirement. This program benefits the student to understand what he/she has studied in the class room and what is being practiced in competitive exam for government and private jobs.

Campus Recruitment Training (Technical) II covers **Power Electronics:** SCR, IGBT, GTO, TRAIC, DIAC, single phase converter, three phase converter, Inverter, Voltage Regulator, cycloconveter, chopper. **Control System:** Block Diagram, PID controller, input signals and compensating networks. **Power System:** generation, transmission, line parameters, load flow analysis, Faults, Stability, Economical operation and control. **Microprocessor:** Introductions of 8085, 8086 microprocessor, construction, block diagrams. The program mainly focuses on multiple choice question which help students for their preparation.

Program Elective Course-III

Semester VII **B.Tech in Electrical Engineering**

BEE 709 : RENEWABLE ENERGY SOURCES

3L+0T+0P+ 3C **M.M.100**

MODULE 1: RENEWABLE AND NON-RENEWABLE SOURCES OF ENERGY Brief review of conventional sources of energy – energy production and world energy consumption – green-house effect and global warming. Review of non-conventional energy sources, Advantages of non-conventional energy sources

MODULE 2: PHOTOVOLTAIC CONVERSION – Conceptual description of photo voltaic effect **–** electrical characteristic of silicon PV cells and modules – solar cell material and prospects – Instruments for measurement of solar radiation – Empirical equations for predicting availability of solar radiation. Flat-plate collector, concentrating collector, para-bolidal and heliostat.

MODULE 3: WIND ENERGY Wind turbines – Horizontal axis and vertical axis with turbines, Power and energy from wind turbines – wind characteristics. Energy from oceans: wave energy – Physical principles – wave characteristics and wave power – wave energy technology. – fixed devices – floating devices

MODULE 4: BIOMASS 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.

MODULE 5: 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

FUEL CELLS – types – losses in fuel cell - application – MHD generators – application of MHD generation - micro and mini hybrid power.

References:

1. Renewable energy sources – John W, Twidell & Antony D. Wier – ELBS Publication
2. Renewable Energy - Power for sustainable Future – Edited by Godfrey Boyle – Oxford
3. University Press in association with the Open University, 1996.
4. Applied solar Energy - Meinel A B and Meinel MP, Addison Wesley Publications.
5. Renewable and Novel energy sources – SL Sah, MI Publications, New Delhi, 1995.
6. Direct Energy Conversion – George Sutton – McGraw hill Publications.

Program Elective Course-III

Semester VII **B.Tech in Electrical Engineering**

BEE 710 : COMPUTER AIDED DESIGN OF ELECTRICAL MACHINES

3L+0T+0P+ 3C **M.M.100**

MODULE 1: PRINCIPLES OF DESIGN OF MACHINES- Review of Magnetic and insulating materials. Factors and limitations in design, specific magnetic and electric loadings, output, real and apparent flux densities, separation of main dimensions for D.C., induction and synchronous machines.

MODULE 2: HEATING, COOLINGANDVENTILATION - Temperature rise calculation, continuous, short- time and intermittent ratings, types of ventilation, hydrogen cooling and its advantages.

MODULE 3: DESIGN OF TRANSFORMERS – General considerations, output equation, main dimensions,leakagereactance,windingdesign,tankandcoolingtubes,calculationof magnetizing current, losses, efficiency and regulation.

MODULE 4: DESIGN THREE-PHASE INDUCTION MOTORS –General considerations, output equation, choice of specific electric and magnetic loadings, No. of slots in stator and rotor, elimination of harmonic torques, design of stator and rotor windings, leakage reactance, equivalent resistance of squirrel cage rotor, magnetizing current, temperature rise and efficiency.

MODULE 5: DESIGN OF ALTERNATORS –Classification and their comparison, specific loadings, output coefficient, main dimensions, short circuit ratio, elimination of harmonics in generated EMF, stator winding design. Introduction to computer aided electrical machine design.

Text/ReferenceBooks:

1. ClaytonA.E.,"TheperformanceanddesignofD.C.Machines",Pitman(ELBS).
2. SayMG,"TheperformanceanddesignofA.C.Machines",Pitman(ELBS).
3. SawhneyAK,"ElectricalMachineDesign",DhanpatRai&Sons.

Program Elective Course-III

Semester VII **B.Tech in Electrical Engineering**

BCS 717 : ARTIFICIAL NEURAL NETWORKS

3L+0T+0P+ 3C **M.M.100**

MODULE 1: INTRODUCTION - Introduction and history, human brain, biological neuron, models of neuron, signal flow graph of neuron, feedback, network architecture, knowledge representation, Artificial intelligence and neural networks.
Learning Process: Error correction learning, memory based learning, Hebbian learning, competitive learning, Boltzmann learning, learning with and without teacher, learning tasks, memory and adaptation.

MODULE 2: STRUCTURE OF NEURAL NETWORK - Artificial neurons, Neural networks and architectures Introduction, neuron signal function, mathematical preliminaries, Feed forward & feedback architecture. Geometry of Binary threshold neurons and their networks Pattern recognition, convex sets and convex hulls, space of Boolean functions, binary neurons for pattern classification, non-linear separable problems, capacity of TLN, XOR solution.

MODULE 3: PERCEPTRONS AND LMS LEARNING OBJECTIVE OF TLN - pattern space & weight space, perceptron learning algorithm, perceptron convergence theorem, pocket algorithm, α– LMS learning, MSE error surface, steepest descent search, μ– LMS and application. Back propagation and other learning algorithms Multilayered architecture, back propagation learning algorithm, practical considerations, structure growing algorithms, applications of feed forward neural networks, reinforcement learning

MODULE 4: NETWORK PATTERN RECOGNITION - Statistical Pattern Recognition Bayes' theorem, classical decisions with Bayes' theorem, probabilistic interpretation of neuron function, interpreting neuron signals as probabilities, multilayered networks & posterior probabilities, error functions for classification problems. RBF Networks Regularization networks, generalized RBF networks, RBF network for solving XOR problem, comparison of RBF networks & multilayer perceptron's. Stochastic Machines Statistical mechanics, simulated annealing.

MODULE 5: ADAPTIVE RESONANCE THEORY - Building blocks of adaptive resonance, Adaptive Resonance Theory. Self Organizing Feature MAP Introduction, Maximal eigenvector filtering, principal component analysis, generalized learning laws, competitive learning, vector quantization, Mexican hat networks.

Text/Reference Books:

1. Simon Haykin, "Neural Networks", PHI
2. J. M. Zurada, "Introduction to Artificial Neural Systems", Jaico Publishers, 3rd Ed.
3. Artificial Neural Networks, Jacek M Zurada, Pws Pub Co
4. Neural Networks: A Classroom Approach, Satish Kumar, TMH
5. Artificial Neural Networks, Christina Ray, TMH
6. Neural Networks For Pattern Reconization, Bishop, Oxford
7. Neural Network In Soft Computing Framework, Swamy, Springer

Program Elective Course-III

Semester VII **B.Tech in Electrical Engineering**

BEE 711 : FLEXIBLE AC TRANSMISSION

3L+0T+0P+ 3C **M.M.100**

MODULE 1: FACTS CONCEPTS AND GENERAL SYSTEM CONSIDERATIONS- Power flow in AC systems - Definition of FACTS - Power flow control -Constraints of maximum transmission line loading - Benefits of FACTS Transmission line compensation- Uncompensated line - shunt compensation - Series compensation -Phase angle control.

MODULE 2: STATIC SHUNT COMPENSATORS - SVC and STATCOM - Operation and control of TSC, TCR and STATCOM - Compensator control - Comparison between SVC and STATCOM.

MODULE 3: STATIC SERIES COMPENSATION- TSSC, SSSC -Static voltage and phase angle regulators - TCVR and TCPAR- Operation and Control -Applications.

MODULE 4: UNIFIED POWER FLOW CONTROLLER - Circuit Arrangement, Operation and control of UPFC Basic Principle of P and Q control- independent real and reactive power flow control- Applications - Introduction to interline power flow controller.

MODULE 5: SPECIAL PURPOSE FACTS CONTROLLERS - Thyristor controlled voltage limiter – Thyristor controlled voltage regulator - Thyristor controlled braking resistor - Thyristor controlled current limiter- Custom Power - Compensation Devices - STS - SSC - SVR -Backup energy supply devices

Reference Books:

1. N.G. Hingorani, L. Gyugyi, "Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems", IEEE Press Book, Standard Publishers and Distributors, Delhi, 2001.

2. R. Sreeram Kumar (Ed) "Lecture Notes on Flexible AC Transmission Systems (FACTS)". Institution of Engineers (India), Calicut Local Centre, 2003.

3. K.S.Sureshkumar, S.Ashok , "FACTS Controllers & Applications", E-book edition, Nalanda Digital Library, NIT Calicut,2003

Program Elective Course-III

Semester VII **B.Tech in Electrical Engineering**

BEE 712 : POWER SYSTEM PLANNING

3L+0T+0P+ 3C **M.M.100**

MODULE 1: INTRODUCTION OF POWER PLANNING- National and Regional planning, structure of P.S., planning tools Electricity Regulation, Electrical Forecasting, forecasting techniques modeling

MODULE 2: GENERATION PLANNING- Integrated power generation cogeneration/captive power, Power pooling and power trading. Transmission and distribution planning. Power system Economics. Power sector finance, financial planning, private participation Rural Electrification investment, concept of Rational tariffs.

MODULE 3: POWER SUPPLY RELIABILITY - Reliability planning. System operation planning, load management, load prediction, reactive power balance Online power flow studies, state estimation, computerized management, power system simulator.

MODULE 4: COMPUTER AIDED PLANNING - Environmental effects, the greenhouse effect Technological impacts. Insulation coordination, Reactive compensation.

MODULE 5: OPTIMAL POWER SYSTEM EXPANSION PLANNING -Formulation of least cost optimization problem incorporating the capital, Operating and maintenance cost of candidate plants of different types (Thermal, Hydro, Nuclear, Non-conventional etc.) and minimum assured reliability constraint – optimization techniques for solution by programming

Text Books

1. X. Wang, J. R. Mc Donald: Modern Power System Planning, MGH. 1994
2. S. Pabla: Electrical Power System Planning, Machmillan India Ltd. 2012
3. M. Tllic, F. Faliana and L. Fink: Power System Restructuring Engineering and Economics, Kulwar Academic Publisher. 2010
4. L. L. Lie: Power System Restructuring and Deregulation, John Willey & Sons UK. 2001

Program Elective Course-III

Semester VII **B.Tech in Electrical Engineering**

BCS 718 : NEURO-FUZZY SYSTEM

3L+0T+0P+ 3C **M.M.100**

MODULE 1: INTRODUCTION TO FUZZY AND NEURO-FUZZY SYSTEM: Merits of Fuzzy and Neuro Fuzzy systems. Introduction to Architecture of a Fuzzy system. Fuzzification Rule Base Inference engine, defuzzizication.

MODULE 2: FUZZYMATHEMATICS: Fuzzy sets and operations of fuzzy sets, properties of fuzzy sets, fuzzy relations, fuzzy graphs & Fuzzy arithmetic.

MODULE 3: **ARCHITECTURE AND DESIGN ISSUES:** Fuzzification , fuzzy Rule- Base and Fuzzy – Rule Based models – implication process, defuzzification Techmiques.

ANALOG DESIGN OF FUZZY PROCESSORS : Modular design , design of a fuzzifier , knowledge base and inference engine , defuzzifier design.

MODULE 4: **IMPLEMENTATION OF A COMPLETEANALOGFUZZY SYSTEMS**: Design and microprocessor based implementation of fuzzy systems. Structure Specifications, Parameter estimation, model validation.

MODULE 5: **NEURO FUZZY SYSTEMS**: Introduction to Neural Networks, Neuro Fuzzy Architecture , Learning methodologies , genetic Algorithum , neural networks in communications.

Text/Reference Books

1. Klir & Yuan , Fuzzy Sets and Fuzzy Logic.
2. Chin – Teng Lin & Lee C S G Neural Fuzzy Systems , Prentice Hall International.
3. Bose N K , Liang P , Neural Networks Fundamentals with graphs , Algorithm and Applications, Tata McGraw Hill.

Program Elective Course-IV

Semester VII **B.Tech in Electrical Engineering**

BEE 713 :POWER SYSTEM ENGINEERING

3L+0T+0P+ 3C **M.M.100**

MODULE 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.

MODULE 2: POWER SYSTEM STABILITY - Power angle equations and power angle curves under steady state and transient conditions. Rotor dynamics and swing equation (solution of swing equation not included).Introduction to steady state and dynamic stabilities, steady state stability limit.
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.

MODULE 3: 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.

MODULE 4: INTERCONNECTED POWER SYSTEMS- Introduction to isolated and interconnected powers systems. Reserve capacity of power stations, spinning and maintenance resaves. Advantages and problems of interconnected power systems. Power systems inter connection in India.

MODULE 5: POWER SYSTEM SECURITY- Introduction to power system security. Introduction to voltage stability. Tap Changing transformer, phase angle control and phase shifting transformer. Series compensation of transmission lines, location and protection of series capacitors, advantages and problems.

Text/Reference Books

1. J. Nagrath and D.P. Kothari: Power System Engineering 2/e, MGH. 2011
2 J. J. Grainger and W. D. Stevenson: Power System Analysis, MGH. 2003
3. B. R. Gupta: Power System Analysis and Design, Third Edition, S. Chand & Co. 2008
4. C. L. Wadhwa: Electrical Power Systems, New age international Ltd. Third Edition 2009
5. W. D. Stevenson: Element of Power System Analysis, MGH. 1955
6. B. R. Gupta: Generation of Electrical Energy, S. Chand Publication. 2009

Program Elective Course-IV

Semester VII **B.Tech in Electrical Engineering**

BEE 714 : ADVANCE POWER SYSTEM

3L+0T+0P+ 3C **M.M.100**

MODULE 1: INTRODUCTION - Structure of power systems, Power system control center and real time computer control, SCADA system Level decomposition in power system Power system security. Various operational stages of power system Power system voltage stability, Deregulation and electricity market

MODULE 2: ECONOMIC OPERATION - Concept and problems of unit commitment Input-output characteristics of thermal and hydro-plants System constraints Optimal operation of thermal units without and with transmission losses, Penalty factor, incremental transmission loss, transmission loss formula (without derivation) Hydrothermal scheduling long and short terms Concept of optimal power flow

MODULE 3: LOAD FREQUENCY CONTROL - Concept of load frequency control, Load frequency control of single area system: Turbine speed governing system and modelling, block diagram representation of single area system, steady state analysis, dynamic response, control area concept, P-I control, load frequency control and economic dispatch control. Load frequency control of two area system:

MODULE 4: AUTOMATIC VOLTAGE CONTROL - Tie line power modelling, block diagram representation of two area system, static and dynamic response
Automatic Voltage Control : Schematic diagram and block diagram representation, different types of Excitation systems & their controllers.

MODULE 5: VOLTAGE AND REACTIVE POWER CONTROL - Concept of voltage control, methods of voltage control-control by tap changing transformer. Shunt Compensation, series compensation, phase angle compensation. State Estimation: Detection and identification, Linear and non-linear models.
Flexible AC Transmission Systems: Concept and objectives FACTs controllers: Structures & Characteristics.

Text/Reference Books:

1. D.P. Kothari & I.J. Nagrath, "Modern Power System Analysis" Tata Mc Graw Hill
2. P.S.R. Murty, "Operation and control in Power Systems" B.S. Publications.
3. N. G. Hingorani & L. Gyugyi, " Understanding FACTs" Concepts and Technology of Flexible AC Transmission Systems"
4. J. Wood & B.F. Wollenburg," Power Generation, Operation and Control " John Wiley
5. O.I. Elgerd, "Electric Energy System Theory" Tata McGraw Hill.
6. P. Kundur, "Power System Stability and Control Mc Graw Hill.
7. M.H. Rashid, "Power Electronics: Circuits, devices and Applications" PHI

Program Elective Course-IV

Semester VII **B.Tech in Electrical Engineering**

BCS 301 : DATA STRUCTURE & ALGORITHM

3L+0T+0P+ 3C **M.M.100**

MODULE 1: INTRODUCTION TO DATA STRUCTURES - Definition of data structures and abstract data types. Static and Dynamic implementations. Examples and real life applications, Data Structures: Arrays, Address calculation in a single and multi-dimensional array. Sparse matrices

MODULE 2: STACKS, QUEUES AND LISTS - Definition, Array based implementation of stacks, Linked List based implementation of stacks, Examples: Infix, postfix, prefix representation, Applications: Mathematical expression Evaluation Definition: Queues & Lists: Array based implementation of Queues / Lists, Linked List implementation of Queues / Lists, Circular implementation of Queues and singly linked Lists, Straight / circular implementation of doubly linked Queues / Lists, Priority queues, Applications

MODULE 3: TREES & GRAPHS - Definition of trees and Binary trees, Properties of Binary trees and Implementation, Binary Traversal - preorder, post order, in order traversal, Binary Search Trees, Implementations, Threaded trees, Balanced multi way search trees, AVL Trees, Implementations, Applications Definition of Undirected and Directed Graphs and Networks, The Array based implementation of graphs, Adjacency matrix, path matrix implementation, The Linked List representation of graphs, Shortest path Algorithm, Graph Traversal – Breadth first Traversal, Depth first Traversal, Connectivity of graphs; Connected components of graphs, Weighted Graphs, Applications.

MODULE 4: SORTING SEARCHING ALGORITHMS - Introduction, Sorting by exchange, selection, insertions, Bubble sort, Selection sort, Insertion sort, Pseudo code algorithm and their C++ implementation, Efficiency of above algorithms, Shellsort, Performance of shell sort, Merge sort, Merging of sorted arrays, The merge sort Algorithms, Quick sort Algorithm.

MODULE 5: ANALYSIS OF QUICK SORT, PICKING A PIVOT - A partitioning strategy, Heap sort, Heap Construction, Heap sort, bottom – up, Top – down Heap sort approach, Radix sort, Straight Sequential Search, Array implementations, Linked List representations, Binary Search, non – recursive Algorithms, recursive Algorithms, Indexed Sequential Search

Text/Reference Books:

1. Theory & Problems of Data Structures by Jr. Symour Lipschetz, Schaum's outline by TMH
2. Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub.
3. Data Structures and Algorithms by A.V. Aho, J.E. Hopcroft and T.D. Ullman, Original edition, Addison-Wesley, 1999, Low Priced Edition.

Program Elective Course-IV

Semester VII **B.Tech in Electrical Engineering**

BEE 715 : INDUSTRIAL AUTOMATION AND PLCS

3L+0T+0P+ 3C **M.M.100**

MODULE 1: INTRODUCTION TO SCADA- Data acquisition Systems- Evolution of SCADA - Communication Technologies-Monitoring and Supervisory Functions-SCADA Applications in Utility Automation-Industries.

MODULE 2: SCADA SYSTEMS COMPONENTS: Schemes – Remote Terminal Unit(RTU)-Intelligent Electronic Devices(IED)-Programmable Logic Controller(PLC)- Communication Network-SCADA server, SCADA/ HMI Systems

MODULE 3: SCADA ARCHITECTURE: Various SCADA Architectures- Advantages and Disadvantages of each system-single unified standard architecture- IEC 61850

SCADA Communication: Various industrial communication technologies- wired and wireless methods and fibre optics

MODULE 4: SCADA APPLICATIONS: Utility Applications- Transmission and distribution sector-Operations-Monitoring -Analysis and improvement- Substation automation structure-substation automation architecture.

MODULE 5: INTRODUCTION TO ROLE OF WIDE AREA PROTECTION- power system phenomenon with possible WAPS solution- Implementation of wide area protection- interaction of WAPS with SCADA System

Text/Reference Books:

1. Stuart.A. Boyer: SCADA – Supervisory Control and Data Acquisition, Instrument So-ciety of America Publication, USA, 1999.

2. Gordon Clarke, Deon Reynders: Practical Modern SCADA Protocol:DNP3, 60870.5 and Related Systems, Newnes Publications, Oxford UK,2004

3. ABB –Substation automation handbook

Program Elective Course-IV

Semester VII **B.Tech in Electrical Engineering**

BEE 716 : ELECTRICAL MACHINE DESIGN

3L+0T+0P+ 3C **M.M.100**

MODULE 1: FUNDAMENTAL OF MAGNETIC CIRCUIT- Basic principles of magnetic circuits – use of B-H curves in magnetic circuits – Calculations of MMF for air gap and teeth – Real and apparent flux density – Effect of saturation – flux density distribution – calculation of magnetizing current – Field Form – Introduction – carter's fringe curves – flux plotting – air gap flux distribution factor (field form factor) – actual flux distribution factor, Magnetising current calculation, Leakage Reactance calculation for various types of slots, Iron loss calculation concepts

MODULE 2: DESIGN OF ELECTROMAGNETS- Introduction – Types of Electromagnets – Design of Magnet coils – Problems on above topics – Design of small Flat-faced armature type circular magnet – Design of large-faced armature type circular magnet – Design of Horse shoe type magnet – Design of plunger type magnet – Design of magnetic clutches

MODULE 3: DESIGN OF SMALL TRANSFORMERS AND CHOKE COILS- Design of Small single-phase transformers – Design of welding transformers – Design of variable air gap single-phase choke coil Design of variable air gap three-phase choke coil Design of ballast

MODULE 4: ESTIMATING COSTING FOR RESIDENTIAL, COMMERCIAL & SERVICE CONNECTIONS (1- Ø &3-Ø)- Tenaments , Row houses , Bungalows , Flats , Multi – Storied Buildings ,Internal Wiring Estimation (Length of wire) Commercial Complexes like Offices , Hospitals , Hotels , Theatres . Internal Wiring Estimation (Length of wire) , Lighting Series & Hoardings.

MODULE 5 : ARMATURE WINDINGS-

DC windings: Simplex & Duplex windings, Lap & Wave windings, Applications, Basic terms related to armature windings, Dummy Coils, Equalizer connections, split coils.

AC windings : Introduction, No. of phases, Phase spread, concentric winding, Hemitropic winding, Whole coil winding, Mush winding, Double layer windings, Integral slot lap and wave winding. Fractional slot lap & wave windings. Performance analysis of various windings.

Text/Reference Books:

1. Electric Machinery, A.E. Fitggerald, C.Kingsley Jr and Umans, 6th Edition McGraw Hill,
2. Electric Machines, Kothari & Nagrath 3/e,TMH
3. The Performance and Design of AC machines, M.G. Say, Pit man & Sons.
4. Electric Machinery, Guru, 3E, Oxford
5. Electrical Machinery, P. S. Bimbhra, Khanna Pub.
6. Electric Machinery Fundamentals, Stephen J Chapman, McGraw-Hill
7. Electrical Machines, Husain Ashfaq , Dhanpat Rai & Sons

Program Elective Course-IV

Semester VII **B.Tech in Electrical Engineering**

BEE 717 : DESIGN ESTIMATION & COSTING

3L+0T+0P+ 3C **M.M.100**

MODULE 1: ELECTRICAL INSTALLATION - Role of national electrical code in the design of electrical installation – electrical symbols and diagrams – design considerations of electrical installations – electric supply systems – protection and protective devices for electric installation against overload – short circuit and earth fault – electric services in building – service connections – service mains – reception and distribution of main supply – sub- circuits – neutral and earth wire – earth bus – guideline for installation of fittings – design and selection of bus bars and bus bar chambers –design, selection, layout,

MODULE 2: DESIGN OF ILLUMINATION SCHEMES – various types of light sources – different types of lighting arrangement – energy efficiency in lamps and illumination – design considerations of good lighting schemes – design of lighting schemes for various purposes – lighting calculations – design of flood lighting and street lighting – electrical aspects and considerations for lifts, escalator services and standby generators – design and safety aspects of electrical installations for residential buildings, hospitals, hotels, recreational and assembly buildings and cinema theatre.

MODULE 3: ELECTRICAL INSTALLATIONS OF HIGH RISE BUILDINGS – design – schematic diagram – layout – estimation and testing of rising main – main supply board and distribution boards for high rise buildings including air conditioners and lift with provision for standby generators and its protection – lighting protection – electrical system design – estimation and costing of commercial buildings – design considerations

MODULE 4: SELECTION OF EHV AND HV LINE - power and distribution transformers and switchgears – case studies – design – layout – schematic diagram –estimation and costing – (a) 16MVA – 110/11KV outdoor substation having one or two incoming and 8 or less outgoing – (b) 11KV/415V outdoor substations upto 630KVA

MODULE 5: SUBSTATION DESIGN- 11KV/415V indoor substation upto 630KVA – (d) bus bar trunking above 630KVA – design of earthing system – earthmat design – design of plate and pipe earthing – shielding of electrical system.

Text/Reference books

1. Raina & Battacharya, Electrical System Design, Estimation & costing, Wiley Eastern
2. Gupta J.B, Electrical Installating, Estimating & Costing, Kataria & Sons ISI, National Electric Code, Bureau of Indian Standard Publications
3. Cinema Regulation (Rules) & Act

Semester VIII **B.Tech in Electrical Engineering**

BEE 801 : PRACTICAL TRAINING IN INDUSTRY (ONE SEMESTER)

0L+0T+0P+ 16C **M.M.100**

Practical Training in industry is a need to interact with industry by student to understand working and culture of industries which helps the student to get practical experience. Students will attend industrial training of six months in any industry or reputed organization in VIII semester.

The students will be assigned a faculty guide who would be the supervisor of the student. The faculty would be identified before the end of the VIII semester and shall be the nodal officer for coordination of the training.

Students will also be required to prepare an exhaustive technical report of the training during the semester which will be duly signed by the officer under whom training was taken in the industry/ organization. The covering format shall be signed by the concerned office in charge of the training. The officer-in-charge of the trainee would also give his rating of the student in the standard university format in a sealed to the higher authority.

The students will present his report about the training every month. A committee constituted by the Dean Engineering which would be comprised of at least three members comprising of the department coordinator, class coordinator and a nominee of the Dean Engineering. The students guide would be a special invitee to the presentation. The seminar session shall be an open house. The internal marks would be the average of the marks given is an open house session. The internal marks would be the average of the marks given is each member of the committee separately in a sealed envelope to the Dean Engineering

The marks by the external examiner would be based on the report submitted by the students which shall be evaluated by the external examiner and cross examination done of the student concerned.