

**B.TECH ELECTRICAL ENGINEERING SYLLABUS
VIII SEMESTER**

**POWER SYSTEM CONTROL & STABILITY
Subject Code: E-451**

UNIT-I EXCITATION SYSTEMS

Excitation system requirement, Elements of an excitation system, types of excitation systems, comparison of the various excitation system, Development of Block diagram of excitation system and the transfer function. Recent development and future trends.

UNIT-II LOAD FREQUENCY CONTROL

Introduction, Nature of control problems, Basic concept of Governor Mechanism and their performance in steady state, Turbine and Generator model. Load frequency control of an isolated power system. Division of load between Generators, Basic concept of control area.

UNIT-III CONTROL OF VOLTAGE AND REACTIVE POWER

Introduction, Generation and absorption of reaction power, relation between voltage, power and reactive power at a node, methods of voltage control. Injection of reactive power, use of tap changing transformers, combined use of tap changing transformers and reactive power injection.

UNIT-IV POWER SYSTEM STABILITY

Introduction, power angle curve, transfer reactance, swing equations, steady state stability theoretical and practical, transient stability using equal area criterion and step by step method.

UNIT-V METHODS OF IMPROVING STABILITY

Introduction, Methods of improving stability using traditional techniques and new approaches eg. High speed fault clearing, reduction of transmission system reactance, regulated shunt compensation, Dynamic braking, Independent pole operation of circuit breaker acting automatic voltage regulation.

Reference Books:

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| 1. Power system engineering | -Nagarath & Kothari |
| 2. Electric Power System | -B.M.Weedy |
| 3. Power System Stability & Control | -P.Kundur |
| 4. Electrical Power System | -C.L. Wadhwa |

ELECTRICAL DRIVES

Subject code: E-452

UNIT I INTRODUCTION OF ELECTRICAL DRIVES

Introduction of Electrical Drives, Choice of Electrical Drives, Dynamics of Electrical Drives, Fundamental torque equation, speed torque conventions and Multiquadrant operation. Equivalent values of drives parameters, components of load torques, nature and classification of load torques.

UNIT II DC DRIVES

DC Motors and their performance, starting, braking, speed control, controlled rectifier fed DC drives single phase and three phase, power factor improvement chopper controlled DC drives and their industrial applications.

UNIT III INDUCTION MOTOR DRIVES

Three phase induction motor analysis and performance starting, Braking, speed control, variable frequency control from voltage source and from current source. Various PWM methods, harmonics analysis. Slip power recovery, Rotor resistance control and their industrial applications.

UNIT IV CONTROL OF ELECTRICAL DRIVES

Modes of operation, speed control and drives classification, closed loop control of drives, current limit control, closed loop torque control, closed loop speed control, closed loop speed control of multi-motor drives, speed sensing, current sensing, phase locked loop (PLL) control, closed loop position control.

UNIT V SYNCHRONOUS & OTHER SPECIAL MOTOR DRIVES

Synchronous motor, operation from fixed frequency supply, synchronous motor variable speed drives, Energy conservation in Electrical Drives, Introduction of Brushless DC motor, Stepper motor and switched reluctance motor drives and their industrial applications.

Reference Books:

1. Fundamental of Electrical Drives – G.K.Dubey
2. Power Semiconductor controlled drives – G.K.Dubey
3. Thyristor DC Drives – P.C.Sen
4. Power Electronics and AC Drives – B.K.Bose

ELECTIVE-IV: SYSTEM ENGINEERING

Subject code: E 461

UNIT-I

System philosophy, systems concepts, system modeling, system analysis, system optimization, classification of systems, topological models of system, Analogy among different systems. Introduction to linear graph theory.

UNIT-II

Modeling of systems with two terminal component, component graph and their model, system graph, interconnection equation and development of system model using Branch formulation, chord formulation and state space formulation.

UNIT-III

Modeling of systems with multiterminal components, component graph, model of n-terminal dissipative component, linear perfect couplers and Gytrators, model of two port components, system models using multiterminal components using graph theoretic approval and state space modeling.

UNIT-IV

Introduction to fuzzy logic, fuzzification, defuzzification, rule base, Design of rules & membership functions, Applications of fuzzy logic control.

Fundamental concepts and models of Artificial Neural Network, Multilayer feedforward networks, Applications & implementation of Neural Algorithms and systems.

UNIT-V

Stability, sensitivity, controllability, observability of the system, system optimization using linear and dynamic programming. Technological forecasting methods.

References :

1. Systems Modelling and Analysis, I.J. Nagrath & M.Gopal, Tata Mc.Graw Hill
2. Analysis of Discrete Physical System by Koenig and Tokad, Mc. Graw Hill
3. Introduction to Artificial Neural Systems – J.M.Zurada
4. Neural Networks – Simon Haykin
5. Theory and problems of operations research Schaum's Series Mc-Graw Hill Int. Book Co.

ELECTIVE IV: POWER SYSTEM DEREGULATION

Subject code: E 462

UNIT I

Need and conditions for deregulation. Introduction of Market structure, Market Architecture, Spot market, forward markets and settlements. Review of Concepts- marginal cost of generation, least-cost operation, incremental cost of generation.

Power System Operation: Old vs. New

UNIT II

Electricity sector structures and Ownership /management, the forms of Ownership and management. Different structure model like Monopoly model, Purchasing agency model, wholesale competition model, Retail competition model.

UNIT III

Framework and methods for the analysis of Bilateral and pool markets, LMP based markets, auction models and price formation, price based unit commitment, country practices

UNIT IV

Transmission network and market power. Power wheeling transactions and marginal costing, transmission costing. Congestion management methods- market splitting, counter-trading; Effect of congestion on LMPs- country practices

UNIT V

Ancillary Services and System Security in Deregulation. Classifications and definitions, AS management in various markets- country practices. Technical, economic, & regulatory issues involved in the deregulation of the power industry.

Reference Books:

1. Power System Economics: Designing markets for electricity - S. Stoft
2. Power generation, operation and control, -J. Wood and B. F. Wollenberg
3. Operation of restructured power systems - K. Bhattacharya, M.H.J. Bollen and J.E. Daalder
4. Market operations in electric power systems - M. Shahidehpour, H. Yamin and Z. Li
5. Fundamentals of power system economics - S. Kirschen and G. Strbac
6. Optimization principles: Practical Applications to the Operation and Markets of the Electric Power Industry - N. S. Rau
7. Competition and Choice in Electricity - Sally Hunt and Graham Shuttleworth

ELECTIVE-IV: COMMUNICATION ENGINEERING

Subject code: E 464

UNIT I

Need for Modulation, Amplitude Modulation, AM Demodulator, SSB Modulation, Vestigial Sideband Modulation, AM transmitter and Receiver, Noise and bandwidth in AM, Carrier Communication, Basic Principles of Pulsed and CW Radar.

UNIT II

Frequency Modulation, FM Demodulator, Phase Modulation, FM transmitter and receiver, Noise and bandwidth in FM, Ground wave, sky wave and space wave propagation, Basic Principles of BW and Colour TV.

UNIT III

Sampling theorem, PAM, PWM, PPM, Pulse Code Modulation, Noise in PCM, Delta Modulation, Adaptive Delta modulation, DPCM, M'ary system, FDM and TDM.

UNIT IV

Digital Modulation, ASK, FSK, PSK, DPSK, Basic Principles of Optical Communication, Satellite Comm., Mobile Comm.

UNIT V

Entropy, Mutual Information, Channel Capacity, Shannon Theorem, Shannon-Hartley Theorem, Shannon-Fano code, Huffman code, Parity Check Code, Hamming's Single Error Correction Code.

Reference Books:

1. Electronics Communication System - G.Kennedy
2. Communication System-Analog & Digital - R.P.Singh & S.D.Sapre

ELECTIVE V: ADVANCED MICROPROCESSORS

Subject code: E 471

UNIT I

Introduction to 16-bit microprocessors, internal architecture of 8086, various types of segments used like CS, DS, ES & SS, study of various registers used in 8086, various types of addressing modes like immediate addressing, register addressing, direct addressing mode & indirect addressing modes.

UNIT II

Instruction set of 8086, conversion of high level statements like assignment statement, if statements, for loops, while loops, procedures, functions etc. to 8086 statements, programming using 8086.

UNIT III

Interrupts in 8086, maskable & non-maskable interrupts, hardware & software interrupts, conditional interrupts, type 0, type 1, type 2 and other such types of interrupts, timing diagrams for interrupts, steps for interrupt handling.

UNIT IV

Introduction to microcontroller 8051, architecture, instruction set, assembly language programming and applications.

UNIT V

Introduction to PLC, architecture, programming & applications.

Reference books :

1. Microprocessor architecture, programming & applications with 8085 – R.Gaonkar, Wiley Eastern publication.
2. Microprocessors & interphasing by D.V.Hall, McGraw Hill
3. 8051 Microcontroller by K.J. Ayala, Penram Int. Pub.

ELECTRICAL MACHINES AND ELECTRONICS

Subject code E 276

UNIT I POLYPHASE SYSTEMS

Introduction to polyphase system, phase sequence, star & delta connections, phasor diagrams, analysis of 3-phase balanced & unbalanced circuits. Measurement of 3-phase power for balanced & unbalanced loads, measurement of reactive volt amperes.

UNIT II TRANSFORMERS

Single phase and 3-phase transformers, Routine tests of transformer, equivalent circuit and vector diagram, losses, efficiency and regulation, Welding transformer.

UNIT III INDUCTION MOTORS

Production of rotating magnetic field, construction and principle of operation of a 3-phase machines. Slip-torque characteristics, 3-phase induction motor starters, Single phases induction motor, principle of operation and methods of starting, Testing of single phase and three phase Induction Motors.

UNIT IV SELECTION AND APPLICATIONS OF INDUSTRIAL MOTORS

Introduction, factors affecting selection of motors, Types of loads, steady state and Dynamic characteristics of Electric drives, size of motor, Load equalization, application of motors for Industrial use.

UNIT V INDUSTRIAL ELECTRONICS

Thyristors and their characteristics, turn-on and turn-off methods, basics of chopper rectifiers and inverters. Control of a.c. and d.c. motors using power electronic devices.

Reference Books:

1. Basic Electrical Engineering – V. N. Mittle & A. Mittal
2. Power Electronics - M.D.Singh
3. Electrical Machines - J.B.Gupta
4. Principle of Elect. Machine and Power Electronics - P.C.Sen
5. Generation, Distribution & Utilization of Electric Energy - C.L. Wadhwa

ELECTRICAL TECHNOLOGY

Subject code E 211

UNIT I POLYPHASE SYSTEMS

Introduction to polyphase system, phase sequence, star & delta connections, phasor diagrams, analysis of 3-phase balanced & unbalanced circuits. Measurement of 3-phase power for balanced & unbalanced loads, measurement of reactive volt amperes.

