Dr. APJ ABDUL KALAM TECHNICAL UNIVERSITY, UTTAR PRADESH, LUCKNOW

STUDY AND EVALUATION SCHEME OF ELECTRICAL & ELECTRONICS ENGINEERING

Forth Year

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<th>S.NO.</th>
<th>SUBJECT CODE</th>
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LIST OF DEPARTMENTAL ELECTIVE-III
NEN-031 POWER SYSTEM OPERATION AND CONTROL
NEN-032 ADVANCED MICROPROCESSORS AND MICROCONTROLLERS
NEN-033 FLEXIBLE AC TRANSMISSION SYSTEMS
NCS-039 OBJECT ORIENTED SYSTEMS AND C++

LIST OF OPEN ELECTIVE-I
NOE-071 ENTREPRENEURSHIP DEVELOPMENT
NOE-072 QUALITY MANAGEMENT
NOE-073 OPERATIONS RESEARCH
NOE-074 INTRODUCTION TO BIO TECHNOLOGY
PROPOSED STUDY AND EVALUATION SCHEME OF ELECTRICAL & ELECTRONICS ENGINEERING

Forth Year

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**LIST OF DEPARTMENTAL ELECTIVE IV**
- NEE-041 EHVAC&DC TRANSMISSION
- NEE-042 POWER QUALITY
- NEN-043 IMAGE PROCESSING
- NEN-044 SATELLITE COMMUNICATION

**LIST OF OPEN ELECTIVE 2**
- NOE-081 NON-CONVENTIONAL ENERGY RESOURCES
- NOE-082 NON LINEAR DYNAMIC SYSTEMS
- NOE-083 DATABASE MANAGEMENT SYSTEM AND DATA MINING AND WAREHOUSING
- NOE-084 AUTOMATION & ROBOTICS
NEE701/NEN 701: Electric Drives

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

UNIT-II: Dynamics of Electric Drive: Dynamics of motor-load combination Steady state stability of Electric Drive Transient stability of electric Drive
Selection of Motor Power rating: Thermal model of motor for heating and cooling, classes of motor duty, determination of motor power rating for continuous duty, short time duty and intermittent duty. Load equalization

UNIT-III: Electric Braking: Purpose and types of electric braking, braking of DC, three phase induction and synchronous motors
Dynamics During Starting and Braking: Calculation of acceleration time and energy loss during starting of DC shunt and three phase induction motors, methods of reducing energy loss during starting. Energy relations during braking, dynamics during braking

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

UNIT-V: Power Electronic Control of AC Drives:
Three Phase induction Motor Drive:
Static Voltage control scheme, static frequency control scheme (VSI, CSI, and cyclo – converter based) static rotor resistance and slip power recovery control schemes.
Three Phase Synchronous motor:
Self controlled scheme
Special Drives:
Switched Reluctance motor, Brushless dc motor. Selection of motor for particular applications

Text Books:

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

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

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

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

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

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

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

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


Text Books:

Reference Books:
NEC702A: Analog & Digital Communication

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

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

UNIT III:

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

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

Text Books:

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

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

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

UNIT-IV: Automatic Voltage Control: Schematic diagram and block diagram representation, different types of Excitation systems & their controllers.
Voltage and Reactive Power control: Concept of voltage control, methods of voltage control-control by tap changing transformer. Shunt Compensation, series compensation, phase angle compensation

UNIT-V
State Estimation:Detection and identification, Linear and non-linear models.
Flexible AC Transmission Systems:
Concept and objectives FACTs controllers: Structures & Characteristics of following FACTs Controllers. TCR,FC-TCR, TSC, SVC, STATCOM, TSSC, TCSC, SSSC, TC-PAR, UPFC

Text Books:

Reference Books:
Unit-I: Mode of operation of higher order processors: Real mode and protected mode Memory addressing, access right byte, Memory paging, System descriptors, Multi Tasking & TSS.

Unit-II: Instruction Set of higher order processors(8086 to Pentium): Comparison with 8086 in real mode: Generalized instruction set format Addressing Mode: DRAM & BRAM Categorization of instruction set of INTEL processors.
Integer instructions: Data transfer instructions, arithmetic and logical operations, string instructions, branch control instructions, procedure call instruction and return instruction.

Unit-III: Processing of CALLS, INTERRUPTS & EXCEPTIONS: Privilege levels; ENTER and LEAVE Instructions, INT N. IRET. Interrupt processing sequence, Protected mode interrupts.

Unit-IV: Assembly Level Programming: ROM BIOS Routines, MS DOS BIOS Routines, Assembling a program using Assembler, exe and. com programs. Mixed Language Programming: using Assembly with C/C ++

Unit-V
Microcontrollers: Introduction, basic functions, applications of 8-bit and 16-bit microcontrollers.
8-bit microcontrollers INTEL 8051: Internal Architecture, signals, memory organization and interfacing,Timing and control, port operations, interrupts and I/O addressing. Instruction Set and programming.

Text Books:

Reference Books:
3. Rajkamal, “The concept and feature of microcontrollers 68HC11, 8051 and 8096”, S.Chand Publisher, New Delhi
UNIT I: Introduction: Reactive power control in electrical power transmission lines - Uncompensated transmission line – series compensation – Basic concepts of Static Var Compensator (SVC) – Thyristor Controlled Series capacitor (TCSC) – Unified power flow controller (UPFC).

UNIT II: Static Var Compensator (SVC) And Applications

UNIT III: Thyristor Controlled Series Capacitor (TCSC) And Applications

UNIT IV: Voltage Source Converter Based Facts Controllers

TEXT BOOKS:

REFERENCES:
NCS – 039: OBJECT ORIENTED SYSTEMS AND C++

Unit-I
Object & classes, Links and Associations, Generalization and Inheritance, Aggregation, Abstract classes, Generalization, Multiple Inheritance, Meta data.

Unit-II
Events and States, Operations and Methods, Nested state diagrams, Concurrency, Relation of Object and Dynamic Models.

Unit-III
Functional Models, Data flow diagrams, Specifying Operations, Constraints, OMT Methodologies, examples and case studies to demonstrate methodology

Unit-IV
Principles of object oriented programming, Tokens, Expressions, classes, Functions, Constructors, Destructors, Functions overloading, Operator Overloading, I/O Operations.
Real life applications, Inheritance Extended Classes, Pointer, Virtual functions, Polymorphisms, Working with files, Class templates, Function templates, Exception handling, String manipulation.
Translating object oriented design into implementations.

Unit-V:
Introduction to Unix/Linux operating systems. Concept of file system, handling ordinary files, concept of shell, vi editor, Basic file attributes, concept of process, Basic system administration.

Text Books:
3. Sumitabha Das “Unix concepts & application” TMH

Reference Books:
2. Lipman, Stanley B, Jonsce Lajoie, "C++ Primer Reading", AWL, 1999
OPEN ELECTIVES- I

NOE-071: ENTREPRENEURSHIP DEVELOPMENT

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

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

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

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

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

Text / Reference Books:
UNIT-I
Quality Concepts:
Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design,
Review of design, Evolution of prototype.
Control on Purchased Product
Procurement of various products, evaluation of supplies, capacity verification, Development of
sources, procurement procedure.
Manufacturing Quality
Methods and techniques for manufacture, inspection and control of product, quality in sales and
services, guarantee, analysis of claims.

UNIT-II
Quality Management
Organization structure and design, quality function, decentralization, designing and fitting,
organization for different type products and company, economics of quality value and contribution,
quality cost, optimizing quality cost, seduction program.
Human Factor in quality
Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of apparatus error and corrective methods.

UNIT-III
Control Charts
Theory of control charts, measurement range, construction and analysis of R charts, process
capability study, use of control charts.
Attributes of Control Chart
Defects, construction and analysis of charts, improvement by control chart, variable sample size,
construction and analysis of C charts.

UNIT -IV
Defects diagnosis and prevention defect study, identification and analysis of defects, correcting
measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the
product, evaluation of reliability, interpretation of test results, reliability control, maintainability,
zero defects, quality circle.

UNIT -V
ISO-9000 and its concept of Quality Management
ISO 9000 series, Taguchi method, JIT in some details.

Text / Reference Books:
UNIT-I
Introduction:
Definition and scope of operations research (OR), OR model, solving the OR model, art of modelling, phases of OR study.

Linear Programming:
Two variable Linear Programming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, sensitivity analysis.

UNIT-II
Transportation Problems:
Types of transportation problems, mathematical models, transportation algorithms,
Assignment:
Allocation and assignment problems and models, processing of job through machines.

UNIT-III
Network Techniques:
Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.
Project Management:
Phases of project management, guidelines for network construction, CPM and PERT.

UNIT-IV
Theory of Games:
Rectangular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model.
Quality Systems:
Elements of Queueing model, generalized poisson queing model, single server models.

UNIT-V
Inventory Control:
Models of inventory, operation of inventory system, quantity discount.
Replacement:
Replacement models: Equipments that deteriorate with time, equipments that fail with time.

Text / Reference Books:
NOE-074: INTRODUCTION TO BIOTECHNOLOGY

UNIT-I
Introduction: Concept nature and scope of biotechnology.
Cell Structure and Function: Eukaryotic and prokaryotic cells, cell wall, membrane organization, cell organelles, Nucleus, Mitochondria, endoplasmic reticulum, chloroplast, viruses and toxins into cells.
Cell Division: Mitosis and Meiosis.

UNIT-II
Biomolecules: A brief account of structure of carbohydrates, Lipids and Proteins.
Genes: Brief idea about Mendel’s laws and chromosomes, nature of genetic materials, DNA and RNA, DNA replication.

UNIT-III
Gene Expression: Central dogma, genetic code, molecular mechanism on mutations, regulations of gene expression, house keeping genes, differentiation and development mutations and their molecular basic.
Genetic Engineering: Introduction, cloning (vectors and enzymes), DNA and genomic libraries, Transgenics, DNA fingerprinting, genomics.

UNIT-IV
Applications of Biotechnology: Bioprocess and fermentation technology, cell culture, Enzyme technology, biological fuel generation, sewage treatment, environmental biotechnology, biotechnology and medicine, biotechnology in agriculture, food and beverage technology, production of biological invention.

UNIT-V
Safety and Ethics: Safety, social, moral and ethic considerations, environmental ethics, bioethics and stem cell research, safety of new biotechnology foods, agro biodiversity and donor policies.

Text Books/ Reference Books:
2. P.K. Gupta, “Elements of Biotechnology” Rastogi
Note: At least 10 experiments should be performed out of which 3 should be simulation based.

(A) Hardware Based:
1. To determine direct axis reactance (xd) and quadrature axis reactance (xq) of a salient pole alternator.
2. To determine negative and zero sequence reactances of an alternator.
3. To determine sub transient direct axis reactance (xd) and sub transient quadrature axis reactance (xq) of an alternator
4. To determine fault current for L-G, L-L, L-L-G and L-L-L faults at the terminals of an alternator at very low excitation
5. To study the IDMT over current relay and determine the time current characteristics
6. To study percentage differential relay
7. To study Impedance, MHO and Reactance type distance relays
8. To determine location of fault in a cable using cable fault locator
9. To study ferrantiy effect and voltage distribution in H.V. long transmission line using transmission line model.
10. To study operation of oil testing set.

(B) Simulation Based Experiments (using MATLAB or any other software)
11. To determine transmission line performance.
12. To obtain steady state, transient and sub-transient short circuit currents in an alternator
13. To obtain formation of Y-bus and perform load flow analysis
14. To perform symmetrical fault analysis in a power system
15. To perform unsymmetrical fault analysis in a power system

Text Books:
NEC752B: ANALOG AND DIGITAL COMMUNICATION LAB

Note: The minimum 10 experiments are to be performed from the following:
1. To study amplitude modulation using a transistor and determine depth of modulation.
2. To study generation of DSB-SC signal using balanced modulator.
3. To study generation of SSB signal
4. To study envelope detector for demodulation of AM signal and observe diagonal peak clipping effect.
5. To study super heterodyne AM receiver and measurement of sensitivity, selectivity and fidelity.
6. To study frequency modulation using voltage controlled oscillator.
7. To detect FM signal using Phase Locked Loop.
8. To measure noise figure using a noise generator.
9. To study PAM, PWM and PPM.
10. To realize PCM signal using ADC and reconstruction using DAC and 4 bit/8bit system. Observe quantization noise in each case.
11. To study Delta Modulation and Adaptive Delta Modulation.
12. To study PSK-modulation system.
13. To study FSK-modulation system.
14. To study sampling through a Sample-Hold circuit and reconstruction of the sampled signal and observe the effect of sampling rate & the width of the sampling pulses.
15. To study functioning of colour television
16. Fabricate and test a PRBS generator
17. Realization of data in different forms, such as MRZ-L,NRZ - M&N,NRZ-S.
18. Manchester coding & decoding (Biphase L) of NRZ-L data.
UNIT – I
Crystal Structure of Materials:
A. Bonds in solids, crystal structure, co-ordination number, atomic packing factor, Miller Indices, Bragg’s law and x-ray diffraction, structural Imperfections, crystal growth

UNIT – II
Conductivity of Metals:
Electron theory of metals, factors affecting electrical resistance of materials, thermal conductivity of metals, heat developed in current carrying conductors, thermoelectric effect, superconductivity and super conducting materials, Properties and applications of electrical conducting and insulating materials, mechanical properties of metals

UNIT – III
Mechanism of Conduction in semiconductor materials:
Types of semiconductors, current carriers in semiconductors, Half effect, Drift and Diffusion currents, continuity equation, P-N junction diode, junction transistor, FET & IGFET, properties of semiconducting materials.

UNIT – IV
Magnetic Properties of Material:
Origin of permanent magnetic dipoles in matters, Classification Diamagnetism, Paramagnetism, Ferromagnetism, Antiferromagnetism and Ferrimagnetism, magnetostriction, properties of magnetic materials, soft and hard magnetic materials, permanent magnetic materials.

Text Books :
1 A.J. Dekker, “Electrical Engineering Materials” Prentice Hall of India

References :
2 Ian P. Hones,” Material Science for Electrical and Electronic Engineering,” Oxford University Press.
NEE-043/NEC-802: Embedded Systems

Unit-I
Introduction to embedded systems: Classification, Characteristics and requirements, Applications

Unit-II
Timing and clocks in Embedded systems, Task Modeling and management, Real time operating system issues.

Unit-III
Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing.
Modeling and Characterization of Embedded Computation System.

Unit-IV
Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

Unit-V
Fault-Tolerance, Formal Verification., Trends in Embedded Processor, OS, Development Language

References:
UNIT-I: Introduction:
Need of EHV transmission, standard transmission voltage, comparison of EHV AC & DC transmission systems and their applications & limitations, surface voltage gradients in conductor, distribution of voltage gradients on sub-conductors, mechanical considerations of transmission lines, modern trends in EHV AC and DC transmission.

UNIT-II: EHV AC Transmission:
Corona loss formulas, corona current, audible noise – generation and characteristics corona pulses their generation and properties, radio interference (RI) effects, over voltage due to switching, ferroresonance, reduction of switching surges on EHV system, principle of half wave transmission.

UNIT-III: Extra High Voltage Testing:
Characteristics and generation of impulse voltage, generation of high AC and DC voltages, measurement of high voltage by sphere gaps and potential dividers.

Consideration for Design of EHV Lines:
Design factors under steady state limits, EHV line insulation design based upon transient over voltages. Effects of pollution on performance of EHV lines.

UNIT-IV: EHV DC Transmission – I:
Types of dc links, converter station, choice of converter configuration and pulse number, effect of source inductance on operation of converters.
Principle of DC link control, converter controls characteristics, firing angle control, current and excitation angle control, power control, starting and stopping of DC link.

UNIT-V: EHV DC Transmission – II:
Converter faults, protection against over currents and over voltages, smoothing reactors, generation of harmonics, AC and DC filters, Multi Terminal DC systems (MTDC): Types, control, protection and applications.

Text Books:

Reference Books:
NEE-042: POWER QUALITY

Unit-I
Introduction to Power Quality:
Terms and definitions of transients, Long Duration Voltage Variations: under Voltage, Under Voltage and Sustained Interruptions; Short Duration Voltage Variations: interruption, Sag, Swell; Voltage Imbalance; Notching D C offset; waveform distortion; voltage fluctuation; power frequency variations.

Unit-II
Voltage Sag: Sources of voltage sag: motor starting, arc furnace, fault clearing etc; estimating voltage sag performance and principle of its protection; solutions at end user level- Isolation Transformer, Voltage Regulator, Static UPS, Rotary UPS, Active Series Compensator.

Unit-III
Electrical Transients: Sources of Transient Over voltages- Atmospheric and switching transients- motor starting transients, pf correction capacitor switching transients, ups switching transients, neutral voltage swing etc; devices for over voltage protection.

Unit-IV
Harmonics: Causes of harmonics; current and voltage harmonics: measurement of harmonics; effects of harmonics on – Transformers, AC Motors, Capacitor Banks, Cables, and Protection Devices, Energy Metering, Communication Lines etc. harmonic mitigation techniques.

Unit-V
Measurement and Solving of Power Quality Problems: Power quality measurement devices- Harmonic Analyzer, Transient Disturbance Analyzer, wiring and grounding tester, Flicker Meter, Oscilloscope, multimeter etc.
Introduction to Custom Power Devices-Network Reconfiguration devices; Load compensation and voltage regulation using DSTATCOM; protecting sensitive loads using DVR; Unified power Quality Conditioner. (UPQC)

Text Books:
UNIT-I 
Image:  
Image formation, image geometry perspective and other transformation, stereo imaging elements of  
visual perception Digital Image-sampling and quantization serial & parallel Image processing

UNIT-II  
Signal Processing - Fourier, Walsh-Hadmard discrete cosine and Hotelling transforms and their  
properties, filters, correlators and convolvers Image enhancement-Contrast modification, Histogram  
specification, smoothing, sharpening, frequency domain enhancement, pseudo-colour enhancement

UNIT-III  
Image Restoration-Constrained and unconstrained restoration Wiener filter , motion blur remover,  
geometric and radiometric correction Image data compression-Huffman and other codes transform  
compression, predictive compression two tone Image compression, block coding, run length coding,  
and contour coding.

UNIT-IV  
Segmentation Techniques-thresholding approaches, region growing, relaxation, line and edge  
detection approaches, edge linking, supervised and unsupervised classification techniques, remotely  
sensed image analysis and applications

UNIT-V  
Shape Analysis – Gestalt principles, shape number, moment Fourier and other shape descriptors,  
skelton detection, Hough transform, topological and texture analysis, shape matching.  
Practical Applications – Finger print classification, signature verification, text recognition, map  
understanding, bio-logical cell classification.

Text Books:  

References:  
Vikas Publications.
UNIT-I
Elements of Satellite Communication Orbital mechanics, look angle and orbit determination, launches & launch vehicle, orbital effects, Geostationary Orbit.

UNIT-II
Satellite subsystems, attitude and orbit control systems, TTC&M, communication subsystem, satellite antenna satellite link design: basic transmission theory, system noise temperature and G/T ratio, downlink design, uplink design, satellite systems using small earth station, design for specified C/N.

UNIT-III
Modulation and multiplexing techniques for satellite links: FM, pre-emphasis and de-emphasis, S/N ratios for FM video transmission, digital transmission, digital modulation and demodulation, TDM. Multiple access: FDMA, TDMA, DAMA and CDMA.

UNIT-IV
Error control for digital satellite links: error detection and correction, channel capacity, error control coding, convolutional codes, linear and cyclic block codes. Propagation effects and their impact on satellite-earth links: attenuation and depolarization, atmospheric absorption, rain, cloud and ice effects etc.

UNIT-V
Introduction of various satellite systems: VSAT, low earth orbit and non-geostationary, direct broadcast satellite television and radio, satellite navigation and the global positioning systems.

Text Books:
2. Satellite Communications / Dennis Roddy / McGraw-Hill
OPEN ELECTIVES- II
NOE-081: NON-CONVENTIONAL ENERGY RESOURCES

UNIT-I : Introduction: Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits.

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


UNIT-III: Geothermal Energy: Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations.


UNIT-IV: Thermo-electrical and thermionic Conversions:
Principle of working, performance and limitations.

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

UNIT-V: Bio-mass: Availability of bio-mass and its conversion theory.


Text/References Books:
NOE-082: NON-LINEAR DYNAMIC SYSTEMS  

UNIT-I  
Dynamic systems:  
Concept of dynamic systems, importance of non-linearity, nonlinear dynamics of flows (in 1, 2, and 3 dimensions) and Maps (1 and 2 dimensions) in phase space, Equilibrium, Periodicity. Picard’s theorem, Peano’s theorem, boundedness of solutions, omega limit points of bounded trajectories.

UNIT-II  
STABILITY-I:  
Stability via Lyapunov’s indirect method, converse Lyapunov functions, sublevel sets of Lyapunow functions, Lasalle’s invariance principle.

UNIT-III  
Stability-II  
Lyapunov’s direct method, converse Lyapunov’s theorems, Brokett’s theorem, applications to control system, stable manifold theorem, centre manifold theorem, normal form theory and applications to nonlinear systems.

UNIT-IV  
Bifurcation:  
Elementary Bifurcation theory, catastrophe, strange attractor, fractals, fractal geometry and fractal dimension.

UNIT-V  
Chaos:  
Deterministic Chaos, routes to chaos (period doubling, quasiperiodicity, intermittency, universality, renormalization); Measurement of Chaos (Poincare section, Lyapunov index, entropy); control of chaos.

Reference Books:  
Unit-I: Introduction: An overview of database management system, database system v/s file system, Database system concepts and architecture, data models schema and instances, data independence and database language and interfaces, data definitions language, DML, overall database structure.

Data modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, concepts of super key, candidate key, primary key, generalization, aggregation, reduction of an ER diagrams to tables extended ER model, relationships of higher degree.

Unit-II: Relational data Model and Language: Relational data model concepts, integrity constraints: entity integrity, referential integrity, keys constraints, domain constraints, relational algebra, relational calculus, tuple and domain calculus.

Introduction to SQL: Characteristics of SQL-Advantage of SQL data types and literals, types of SQL commands, SQL operators and their procedure tables, views and indexes, queries and sub queries, aggregate functions, insert, update and delete operations. Joins, Unions, Intersection, minus, cursors in SQL.

Unit-III: Data Base Design & Normalization: Functional dependencies, normal forms, first, second and third normal forms, BCNF, inclusion dependences, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.


Data Mining: Introduction to data mining

Text Books:
2. Date C.J., An Introduction To Database System., Addition Wesley
3. Alex Berson & Stephen J. Smith, Data Warehousing, Data Mining & OLAP., Tata Mc.Graw Hill.

Reference Books :
2. Bipin C. Desai, An Introduction to Database Systems, Galgotia Publication
1. **Introduction**: Definition, Classification of Robots, geometric classification and control classification.

2. **Robot Elements**: Drive system, control system, sensors, end effectors, gripper actuators and gripper design.

3. **Robot Coordinate Systems and Manipulator Kinematics**: Robot co-ordinate system representation, transformation, homogenous transform and its inverse, relating the robot to its world.
   - Manipulators Kinematics, parameters of links and joints, kinematic chains, dynamics of kinematic chains, trajectory planning and control, advanced techniques of kinematics and dynamics of mechanical systems, parallel actuated and closed loop manipulators.

4. **Robot Control**: Fundamental principles, classification, position, path velocity and force control systems, computed torque control, adaptive control, Seroo system for robot control, and introduction to robot vision.

5. **Robot Programming**: Level of robot programming, language based programming, task level programming, robot programming synthesis, robot programming for welding, machine tools, material handing, assembly operations, collision free motion planning.

6. **Applications**: Application of robot in welding, machine tools, material handling, assembly operations parts sorting and parts inspection.

**Text/Reference Books:**