## UTTARAKHAND TECHNICAL UNIVERSITY
### Program: B. Tech-ECE

**Year:** Session: 2011 – 2012

### Scheme and Evaluation Pattern

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#### Semester: 5th

**Theory**

1. TEC-501 Automatic Control Systems 3 1 0 30 20 50 100 150
2. TEC – 502 Digital Signal Processing 3 1 0 30 20 50 100 150
3. TEC – 503 VLSI Technology 3 1 0 30 20 50 100 150
4. TEC – 504 Advanced Microprocessors 3 1 0 30 20 50 100 150
5. TEC – 505 Antenna And Wave Propagation 3 1 0 30 20 50 100 150
6. TCS – 507 Concepts of Programming and OOPs 2 1 0 15 10 25 50 75

**Practical/Design**

1. PEC-551 Advanced Microprocessors Lab. 0 0 2 0 0 25 25 50
2. PCS-554 Concepts of Programming and OOPs (C++, Java) Lab. 0 0 2 0 0 0 25 25
3. PEC-552 DSP Lab. 0 0 2 0 0 25 25 50
4. Discipline 0 0 2 0 0 50 0 50

#### Semester: 6th

**Theory**

1. TEC – 601 Microwave Techniques 3 1 0 30 20 50 100 150
2. TEC - 602 VLSI Circuit Design 3 1 0 30 20 50 100 150
3. TEC – 603 Telecommunication Switching Systems 3 1 0 30 20 50 100 150
4. TEC - 604 Digital Communication 3 1 0 30 20 50 100 150
5. TCS – 607 Data Structures Using C++ 3 1 0 30 20 50 100 150
6. THU – 608 Principles of Management 2 1 0 15 10 25 50 75

**Practical/Design**

1. PEC-651 Digital Communication Lab. 0 0 2 0 0 25 25 50
2. PCS-654 Data Structure Lab. 0 0 2 0 0 0 25 25
3. PEC-652 Microwave Lab. 0 0 2 0 0 25 25 50
4. Discipline 0 0 2 0 0 50 0 50
UNIT 1
INTRODUCTION TO OPEN LOOP AND CLOSED LOOP CONTROL SYSTEMS: feedback characteristics of control systems, Mathematical Representation of physical systems Electrical, Mechanical, Hydraulic, Thermal systems, Block diagram algebra and signal flow graphs, Mason’s gain formula. (5)

UNIT 2
TIME DOMAIN ANALYSIS: Standard Test Signals, Time response of First, Second and Higher order systems, Performance Indices. (4)
ERROR ANALYSIS: Static and Dynamic Error Coefficients, Effect of adding poles and zeroes to the system, response of P, PI, and PID controllers. (7)

UNIT 3
CONCEPT OF STABILITY: Concept of stability, Asymptotic and conditional stability, Routh-Hurwitz Criterion, Root Locus technique (Concept and construction) (7)
FREQUENCY RESPONSE ANALYSIS: Correlation between time and frequency response, polar and inverse polar plots, Nyquist stability criterion, Bode plots. All pass and minimum phase systems, M and N circle. (7)

UNIT 4
DESIGN THROUGH COMPENSATION TECHNIQUES: Realization of lag, lead and lag-lead compensators, Design of closed loop control system using root locus and Bode plot Compensation (5)
ROBUSTNESS. Uncertainty and performance weights. Robust stability test. Robust performance test. Loop shaping necessary and sufficient conditions. (3)

UNIT 5
STABLE VARIABLE ANALYSIS: Introduction, State space representation, State modes of linear systems, State equations, transfer matrices, diagonalization solution of state equations, controllability and observability, effect of pole zero cancellation in transfer function. (5)
BASIC NON-LINEAR ANALYSIS: Linearization, describing function and phase plane methods, stability concepts and Lyapunov functions. (3)

SUGGESTED BOOKS:

1. B C Kuo, Automatic Control Systems; John Wiley (India)
2. Control System, N C Jagan, BSP, Hyderabad
4. Dr D Ganesh Rao, Control System; Sanguine Technical Publisher, Bangalore
5. K Ogata, Modern Control Engineering; PHI.
UNIT 1

UNIT 2
**EFFICIENT COMPUTATION OF DFT**: Efficient Computation of the DFT: FFT Algorithms, Direct Computation of the DFT. Radix-2 FFT algorithms. Efficient computation of the DFT of two real sequences, computations, efficient computation of the DFT of 2N-Point real sequences. (Coding of FFT algorithms)

UNIT 3
**FILTER STRUCTURES**: Direct form (I & II), LATTICE for FIR & IIR Filters.

UNIT 4
**DESIGN OF DIGITAL IIR FILTERS**: Impulse invariant and bilinear transformation techniques for Butterworth and chebyshev filters; cascade and parallel. (Coding of Butterworth and chebyshev filters)

**DESIGN OF FIR FILTERS**: windowing, optimum approximation of FIR filters, multistage approach to sampling rate concession. Design of Hilbert transforms. (Coding of windowing for FIR Filters)

UNIT 5
**ADAPTIVE WIENER FILTER AND LMS ALGORITHM**: Application of adaptive filtering to echo cancellation and equalization.

**APPLICATION OF DSP AND CODING**: Audio and Video coding, MPEG coding standardization, DCT, Walsh and Hardmard Coding.

**SUGGESTED BOOKS:**

5. Roman KUC, Digital Signal Processing, BSP HYderabad
UNIT 1.
Introduction to VLSI Technology: Classification if ICs, Scale of integration, semiconductor and hybrid ICs Features of ICs,
CRYSTAL GROWTH: monolithic and hybrid ICs, crystal growth, Czochralski technique of crystal growth, wafer preparation and specifications, testing, measurements of parameters of crystals, Fabrication steps,
OXIDATION: Theory of growth of Silicon di oxide layer, calculation of SiO₂ thickness and oxidation kinetics, Dry wet and high pressure oxidation, plasma oxidation, properties of oxidation, defects induced due to oxidation.

UNIT 2.
EPITAXIAL PROCESS: Epitaxy and its concept, Growth kinetics of epitaxy, epitaxial growth, Low-temperature epitaxy, Si-epitaxy- growth chemistry of Si epitaxial layer, autodoping apparatus for epitaxial layer, apparatus for epitaxy, MBE system
DIFFUSION PROCESS: Diffusion models of solid, Ficks theory of diffusion, Solution of Fick`s law, diffusion parameters measurements schemes, Ion implantation- Scattering phenomenon, range theory, channeling, implantation damage, ion-implantation systems, Annealing

UNIT 3
LITHOGRAPHY: photolithography and pattern transfer, Optical and non optical lithigraphy, electron, X-ray and ion-beam lithography, contact/proximity and projection printers, alignment. Photoresist and ETCHING:Types of photoresist, polymer and materials, Etching- Dry & Wet etching, basic regimes of plasma etching, reactive ion etching and its damages, lift-off, and sputter etching.

UNIT 4
METALLIZATION: Applications and choices, physical vapor deposition, patterning, problem areas.
VLSI PROCESS INTEGRATION: PMOS,NMOS and CMOS IC technology, MOS memory IC technology, bipolar IC fabrication.

UNIT 5
ASSEMBLY TECHNIQUE AND PACKAGING: Package types, packaging design consideration, VLSI assembly technologies.
YIELD AND RELIABILITY: Yield loss in VLSI, yield loss modeling, reliability requirements, accelerated testing.
SUGGESTED BOOKS:
2. R. K. SINGH /VLSI (Technology, Design & Basic Of Micro Elec.), Kataria & Sons
3. S.A. Campbell / The Science and Engineering of Microelectronic Fabrication / Oxford University Press
UNIT 1
8–BIT MICROPROCESSOR (8085*): Architecture, addressing modes, Assembly Language Programming.
* Programming should be covered in Labs
16-bit Microprocessors (8086*): Architecture, Physical address, segmentation, memory, difference between 8085 & 8086, Assembler Directives.
* Programming should be covered in Labs

UNIT 2
DATA TRANSFER SCHEMES: Introduction, Types of transmission, 8257 (DMA), 8255 (PPI), Serial Data transfer (USART) 8251, Keyboard-Display controller (8279), Programmable Priority Controller (8259), 8253 Timer.

UNIT 3
ADVANCE MICROPROCESSORS: Introduction to 80186, 80286, 80486, Pentium Microprocessors, Introduction to Dual core, core to Duo.

UNIT 4
8051 MICRO CONTROLLER- Architecture I/O ports, memory organization in 8051, timer, serial comm.-Addressing mode, Instruction sets, Assembly Language programming.

UNIT 5
INTERFACING OF 8051 AND ITS APPLICATIONS: LEDs:, push buttons, latch connection, keyboards, 7-segment display, LCD interfacing. Different waves generation.

SUGGESTED BOOKS:
1. R.S Gaonkar: Microprocessor Architecture, Programming and Applications with 8085/8080, Penram Publication
UNIT 1

UNIT 2
ANTENNA ARRAYS: Two point element antenna array, Horizontal patterns in broadcast arrays, Linear arrays, Multiplication of patterns, effect of the earth on vertical patterns, Binomial array, Chebyshev array.

UNIT 3
PRACTICAL ANTENNAS: Effect of antenna height, Polarization, Directivity, Aperture, Yagi-Uda, Parabolic, Horn, Log periodic antenna, loop antenna. Introduction to phase measurement; Gain measurement: Comparison Method, Near field method, Introduction to current distribution measurement, Microstrip Antenna.

UNIT 4
ANTENNA MEASUREMENT: Measurements of antenna efficiency, Measurement of noise figure and noise temperature of an antenna polarization measurement.

UNIT 5
WAVE PROPAGATION: Modes of Propagation, Plane Earth Reflection, Space wave and Surface Wave, Reflection and Refraction waves by the Ionosphere Troposphere wave. Ionosphere Wave Propagation in the Ionosphere in the ionosphere, Virtual Height, MUF, Critical Frequency, Skip Distance, Duct propagation, Space wave. Introduction to planar (Rectangular) waveguides- Derivation of TE and TM modes, TEM mode.

SUGGESTED BOOKS:
UNIT 1

UTILIZATION: Developer fundamentals such as editor, integrated programming environment, UNIX shell, modules, libraries.

PROGRAMMING FEATURES: Machine representation, primitive types, arrays and records, objects, expressions, control statements, iteration, procedures, functions, and basic I/O.

APPLICATIONS: Sample problems in engineering, science, text processing, and numerical methods.

UNIT 2


UNIT 3


UNIT 4


SUGGESTED BOOKS:

1. Object oriented to C++, Shukla, Wiley India
2. Object oriented programming in C++, Kamthane, Pearson
6. An introduction to object oriented Programming in C++, Graham Seed, BSP, Hyderabad
PEC-551 MICROPROCESSOR & CONTROLLERS LAB

1. To perform Addition/ Multiplication of two 8 bit numbers
2. To Find the maximum value in an array
3. To perform BCD to Hex conversion & Hex to BCD conversion
4. To Design Counter using timer
5.1. Programming with 8086 –16-bit, 32 bit multiplication/division
6. Interfacing with 8085/8086/8051 – 8255, 8253
7. Interfacing with 8085/8086/8051 – 8279,8251
8. Stepper motor interfacing, Seven Segment display interfacing using 8051

NOTE: The institution may add 2 more practical in above prescribed list.

PCS-557 CONCEPT OF PROGRAMMING & OOPs LAB.

Students should implement the following during Practical hours: (illustrative only)

1. Programs using C & OOPs Language
2. Queries using MY-SQL
3. Using Alice Tool :
   a. Write a method for an Alice object
   b. Condition Construct
   c. Repetition Construct
4. Group Project

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<td>RDBMS</td>
<td>My-SQL</td>
<td>Alternate: Oracle 9i</td>
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The purpose of 1hour(s) tutorial per week is to help slow learning students bring upto speed all the students. The assignments for CHSSC, Programming Fundamentals, and Relational Data base Management System will be given by the instructor which is to be completed as a part of Tutorial.
1. Sampling & Waveform Generation, Quantization
2. PCM Encoding
3. Delta Modulation
4. Digital Modulation Schemes (ASK, PSK, FSK)
5. DFT Computation.
7. FIR Filter implementation, IIR Filter implementation.
8. Computational Experiments with Digital bank of Filters
9. Echo Cancellation generation and Filters implementation

NOTE: The institution may add 2 more practical in above prescribed list.
TEC-601 MICROWAVE TECHNIQUES

UNIT 1
ELEMENTS OF MICROWAVE/MILLIMETER wave integrated circuits: classification of Transmission lines: Planar, quasi-planar and 3D structure and their properties, field distribution and range of application, Transverse transmission the techniques for multi-dielectric planar structure, Analysis of discontinuities in planar and non-planar transition line.

UNIT 2
PROPAGATION THROUGH WAVEGUIDES: Rectangular and circular waveguides solution of wave equation for TE & TM modes, degenerate and dominant modes, power transmission power loss, Excitation of wave guides, Non existence of TEM mode in waveguide, Introduction to stripline and Microstrip-line.

UNIT 3
MICROWAVE CAVITY RESONATORS: Rectangular and cylindrical cavities, Quality factor and Excitation of cavities. Microwave Components: Waveguide couplings, bends and tourists, Design and circuit realization of filters, couplers, phase shifters, E-plane, H-plane and hybrid Tees, Hybrid ring wave meters: Isolators and circulators, tunable detectors, slotted line carriage, VSWR meter.

UNIT 4
MICROWAVE MEASUREMENTS: measurement of frequency, wave length, VSWR, impedance, Attenuation Low and high power radiation patterns. Limitation of Conventional active devices at microwave frequency.

UNIT 5
MICROWAVE TUBES: Klystron, Reflex klystron, magnetron, TWT, BWO: principle of operation and its performance characteristic and application.

SUGGESTED BOOKS:

2. Microwave Engg. , Radhakrishna, BSP Publication
3. Collin, R.E. Foundations for Microwave Engineering; TMH 2nd Ed.
4. Rizzi, Microwave Engineering: Passive Circuits; PHI.
UNIT 1
 REVIEW: Current conduction in MOSFET, Electrical Properties of MOS and BiCMOS, The Pass Transistor, CMOS.

UNIT 2
 CMOS Inverter: Static CMOS inverter, layout, switching threshold and noise margin concepts and their evaluation, dynamic behavior, power consumption. NMOS MOS pass transistor inverter.
 COMBINATIONAL LOGIC: Static CMOS design, rationed logic, pass transistor logic, dynamic logic, cascading dynamic gates, CMOS transmission gate logic.

UNIT 3
 SEQUENTIAL LOGIC: Static latches and registers, bi-stability principle, MUX based latches, static SR flip-flops, master-slave edge-triggered register, dynamic latches and registers, concept of pipelining, Timing issues.

UNIT 4
 MEMORY AND ARRAY STRUCTURE: ROM, RAM, peripheral circuitry, memory reliability and yield, SRAM and DRAM design, flash memory, PLA, PAL, FPGA.

UNIT 5
 DESIGN FOR TESTABILITY: Logic Testing, sequential Logic Testing, Guidelines to be adopted in Design for Test, Scan Designing Techniques, Built-In self Test (BIST) Techniques.

SUGGESTED BOOKS:

1. Basic VLSI Design by D.A. Pucknell & Eshraghian (PHI)
2. Modern VLSI Design Systems on Silicon by Wayne Wolf (Pearson Pub.)
UNIT 1
INTRODUCTION: Message switching, circuits switching, functions of a switching system, register-translator-senders, distribution frames, crossbar switch, a general trunking.

UNIT 2
DIGITAL SWITCHING: Switching functions, space division switching, multiple stage switching, non-blocking switches, blocking Probabilities DCS hierarchy, integrated cross connect equipment, digital switching in environment, zero loss switching.

UNIT 3

UNIT 4

UNIT 5

SUGGESTED BOOKS:
UNIT 1

UNIT 2
DIGITAL BASE BAND TRANSMISSION
PCM Coding, DM, DPCM, ADCM, Data Transfer Rate, Line Coding and Its Properties, NRZ & RZ Types, Signalling Format For Unipolar, Polar, Bipolar(AMI) & Manchester Coding Matched Filter Receiver, Derivation of Its Impulse Response and Peak Pulse Signal to noise ratio, ISI, Rectangular, sync & Raised cosine pulse comparison

UNIT 3
DIGITAL MODULATION TECHNIQUES

UNIT 4
ADVANCED MODULATION TECHNIQUES
Introduction to M-ary modulation techniques 16 PSK, QPSK, QAM, Continuous phase shift keying, MSK, GMSK. Direct sequence spread spectrum, processing gain Frequency hop Spread spectrum.

UNIT 5
ERROR CONTROL CODING
Error Free Communication Over a Noise Channel, Hamming code, Relation Between Minimum Distance and Minimum Distance Error Correcting & detection Capability, Linear Block Codes, Encoding and Syndrome Decoding, Cyclic Codes, Encoder and Decoder For Cyclic Codes, Convolution Coding & Viterbi decoding, introduction to burst error correction codes

SUGGESTED BOOKS:
3. Prokis J.J / “Digital Communications” / Pearson /
5. Communication System, B P Lathi, BSP, Hyderabad
UNIT 1
**COMPLEXITY ANALYSIS:** Time and Space complexity of algorithms, asymptotic analysis, big O and other notations, importance of efficient algorithms, program performance measurement, data structures and algorithms.

**LINEAR LISTS:** Abstract data type, sequential and linked representations, comparison of insertion, deletion and search operations for sequential and linked lists, list and chain classes, exception and iterator classes for lists, doubly linked lists, circular lists, linked lists through simulated pointers, lists in STL, skip lists, applications of lists in bin sort, radix sort, sparse tables.

UNIT 2
**STACKS AND QUEUES:** Abstract data types, sequential and linked implementations, exception handling in classes, representative applications such as parenthesis matching, towers of Hanoi, wire routing in a circuit, finding path in a maze, simulation of queuing systems, equivalence problem.

UNIT 3
**HASHING:** Search efficiency in lists and skip lists, hashing as a search structure, hash table, collision avoidance, linear open addressing, chains, uses of hash tables in text compression, LZW algorithm.

UNIT 4
**TREES:** Binary trees and their properties, terminology, sequential and linked implementations, tree traversal methods and algorithms, heaps as priority queues, heap implementation, insertion and deletion operations, heapsort, heaps in Huffman coding, leftist trees, tournament trees, use of winner trees in mergesort as an external sorting algorithm, bin packing.

UNIT 5
**GRAPHS:** Definition, terminology, directed and undirected graphs, properties, connectivity in graphs, applications, implementation – adjacency matrix and linked adjacency chains, graph traversal – breadth first and depth first, spanning trees.

SUGGESTED BOOKS:
6. C and datastructure, Padnabham, BSP, Hyderabad
UNIT 1

INTRODUCTION TO MANAGEMENT: Theories of management: Traditional behavioral, contingency and systems approach. Organization as a system.

UNIT 2

MANAGEMENT INFORMATION: Interaction with external environment. Managerial decision making and MIS.

UNIT 3

PLANNING APPROACH TO ORGANIZATIONAL ANALYSIS: design of organization structure; job design and enrichment; job evaluation and merit rating.

UNIT 4


- Minor Project: submission of 15 pages of Case studies on above.

SUGGESTED BOOKS

PEC-651 DIGITAL COMMUNICATION LAB

To perform following experiments based on Digital communication Trainer and Using Communication Simulink:

1. To study sampling and reconstruction of the sampled signal
2. To study Delta Modulation and Adaptive Delta Modulation.
3. To study ASK, PSK, FSK, -modulation system.
5. To Study DHSS, FHSS.
6. To Study Error Control Coding using Simulink.
7. To Study different Line Coding Techniques.

• NOTE: The institution may add 3 more practical in above prescribed list.

PCS-604 DATA STRUCTURE LAB.

Problems in "C / C++/JAVA" using Data Structures involving arrays, stacks, queues, strings, linked lists, trees, graphs.

1) Using STACK to check matching left and right characters such as parantheses, curly braces and square brackets in a given string.
2) Single server queuing system and gathering statistics.
3) Operations on Stacks.
4) Sparse Matrices
5) Linear linked list implementation
6) Operations on Doubly Linked List and Circular List with a test application
7) Operations on Ordered Binary Trees.
8) Graph Traversal Techniques
9) Implementation of Quicksort, Mergesort and Heapsort
10) Operations on Binary Trees
11) Shortest Path Problem
1. Study of various microwave components and instruments like frequency meter, attenuator, detector & VSWR meter.
2. Draw V-I characteristics of microwave source like Gunn diode/ Reflex Klystron.
4. Measurement of VSWR (small as well as large values) & reflection coefficient.
5. Measure unknown impedance with smith chart.
6. Draw the following characteristics of Gunn Diode
   (i) Output power and frequency as a function of voltage
   (ii) Square wave modulation by PIN diode.
7. Drawing polar pattern of Horn antenna.
8. To observe the action of directional coupler and its use in separating incident & reflected wave.

- NOTE: The institution may add 2 more practical in above prescribed list.
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Semester: 7th

**Theory**

1. **TEC-701** Optical Fibre Communication Systems 3 1 0 30 20 50 100 150
2. **TEC – 702** Wireless Communication Systems 3 1 0 30 20 50 100 150
3. **TEC – 703** Satellite Communication 3 1 0 30 20 50 100 150
4. **TEC-01X** ELECTIVE-I 3 1 0 30 20 50 100 150
5. **TOE-XX** Open Elective 3 1 0 30 20 50 100 150

**Practical/Design**

1. **PEC-751** Project 0 0 4 0 0 50 50 100
2. **PEC-752** Industrial Interaction 0 0 2 0 0 25 25 50
3. **PEC-753** OFC & VLSI Simulation Lab. 0 0 2 0 0 25 25 50
4. **Seminar** 0 0 2 0 0 50 0 50

Semester: 8th

**Theory**

1. **TEC - 801** Radar & Navigation 3 1 0 30 20 50 100 150
2. **TEC-802** Data Communication Networks 3 1 0 30 20 50 100 150
3. **TEC-02X** ELECTIVE-II 3 1 0 30 20 50 100 150
4. **TEC-03X** ELECTIVE-III 3 1 0 30 20 50 100 150

**Practical/Design**

1. **PEC-851** Project 0 0 6 0 0 100 200 300
2. **PCS-854** CAD of Electronics Lab. 0 0 2 0 0 25 25 50
3. **Discipline** 0 0 2 0 0 50 0 50
ELECTIVE-I

TEC 011  Digital System Design Using VHDL
TEC 012  Artificial Neural Networks and Fuzzy Logic
TEC 013  Principles of Secure Communication
TEC 014  Mobile Computing

ELECTIVE-II

TEC 021  Spread Spectrum Systems
TEC 022  Reliability Engineering
TEC 023  Selected Topics in Communication
TEC 024  Digital Image Processing

ELECTIVE-III

TEC 031  Random Signal Theory
TEC 032  Optical Networks
TEC 033  Adaptive Signal Processing
TEC 034  Embedded Systems
UNIT 1
INTRODUCTION: Demand of Information Age, Block Diagram of Optical fiber Communication System, Technology used in OFC System, Structure and types of Fiber, modes and Configuration, mode theory for circular guide modal equation, modes in optical fiber, linearly polarized modes, attenuation factors, pulse broadening in optical fiber, single mode fiber, mode field diameter, single distortion in single mode fiber, Derivation of material dispersion and waveguide dispersion. Attenuation, Signal Degradation in Optical Waveguides, Pulse Broadening in Graded index fiber Waveguides, Mode Coupling.

UNIT 2
OPTICAL SOURCES:
LED: Visible LED, Infrared LED, LED structure and configuration, Loss mechanism, Application of LED, operating Characteristics materials for Visible LED.
LASER: Principle of LASER Action, Efficiency of LASER Diode, principles and structures, index guided and gains guided lasers, mode separation, quantum well laser, laser modulation.

UNIT 3
OPTICAL DETECTORS: Optical Absorption in semiconductors, Types of Photo Diodes, Principle of photo detection, working and structures of p-i-n and APD photo detectors, noises in photo detectors, SNR, detector response time effects, comparison of various photo detectors.

UNIT 4
ANALYSIS AND PERFORMANCE OF OPTICAL RECEIVER: Receiver Sensitivity, Photodiode for optical receiver, Optical Receiver Design, recent receiver circuits, System configuration and power budget.

UNIT 5
OPTICAL NETWORKS: WDM concepts and principles, passive components, SONET/SDH networks, performance of WDM.

SUGGESTED BOOKS
UNIT 1
SERVICES AND TECHNICAL CHALLENGES: Types of Services, Requirements for the services, Multipath propagation, Spectrum Limitations, Noise and Interference limited systems, Principles of Cellular networks, Multiple Access Schemes.

UNIT 2
WIRELESS PROPAGATION CHANNELS: Propagation Mechanisms (Qualitative treatment), Propagation effects with mobile radio, Channel Classification, Link calculations, Narrowband and Wideband models, propagation models, Path loss components.

UNIT 3

UNIT 4

UNIT 5
ADVANCED TRANSCEIVER SCHEMES
Spread Spectrum Systems- Cellular Code Division Multiple Access Systems- Principle, Power control, Effects of multipath propagation on Code Division Multiple Access, application of Orthogonal Frequency Division Multiplexing in GSM, IS–95, IS-2000 and Third Generation Wireless Networks and Standards

SUGGESTED BOOKS:
UNIT 1

UNIT 2

UNIT 3

UNIT 4

UNIT 5

SUGGESTED BOOKS:
2. Timothy Pratt – Charles Bostian & Jeremy Allmuti, Satellite Communications, John Willy & Sons
PEC-753 OFC & VLSI SIMULATION LAB

Design of following ckt using appropriate software like VHDL/ FPGA and OFC kits.

1) 3-input NAND gate.
2) Half adder, Full Adder
3) D-Latch, T Flip Flop
4) Serial in-serial out shift register, Bidirectional shift Register
5) 3 Bit synchronous counter
6) To set up Fiber Optic Analog link.
7) To set up fiber Optic Digital link.
8) Measurement of Propagation loss and numerical aperture.
9) Characterization of laser diode and light emitting diode.

- NOTE: The institution may add 2 more practical in above prescribed list.
UNIT 1
INTRODUCTION TO VHDL: VHDL description, combinational networks, modeling flip-flop using VHDL, VHDL model for multiplexer, compliance and simulation of VHDL, codes, modeling a sequential machine, variables, signals and constants, arrays VHDL operators, VHDL functions, VHDL procedures, packages and libraries, VHDL model for a counter. Attributes, transport and inertial delays, operator over loading, multi valued logic and signal resolution, IEEE-1164, standard logic, generic, generates statements, synthesis of VHDL codes.

UNIT 2
DESIGN OF NETWORKS FOR ARITHMETIC OPERATIONS: Design of serial adder with accumulator, state graph for control networks design of binary multiplier, multiplication of signed binary numbers, design of binary divider.
DIGITAL DESIGN WITH SM CHART: state machine charts, derivation of SM charts, realization of SM charts, implementation of dice game, alternative realization of SM charts using microprogramming.

UNIT 3
FLOATING POINT ARITHMETIC: Representation of floating point numbers, floating point multiplication, and other floating point operations.

DESIGNING WITH PROGRAMMABLE GATE ARRAYS AND COMPLEX PROGRAMMABLE LOGIC DEVICES: Xilinx 3000 series FPGAs, Xilinx 4000 series FPGAs, using one hot state assignment.

UNIT 4
MEMORY MODELS FOR MEMORIES AND BUSSES: Static RAM, a simplified 486 bus model, interfacing memory to microprocessor bus.

UNIT 5
DESIGN EXAMPLES: UART design, description of MC68HC05 microcontroller, design of microcontroller CPU, and complete microcontroller design.

SUGGESTED BOOKS:
Unit-I


Unit-II

Neural Networks-II (Back propagation networks): Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propagation learning methods, effect of learning rule co-efficient; back propagation algorithm, factors affecting back propagation training, applications.

Unit-III


Unit-IV

Fuzzy Logic –II (Fuzzy Membership, Rules): Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyficsations & Defuzzifications, Fuzzy Controller,

Unit-V

Application of Neural Network and Fuzzy logic: Application of neural network, case study, Inverted pendulum, Image processing. Introduction to neuro & fuzzy logic controller.

SUGGESTED BOOKS:

UNIT 1
Direct Sequence Spread Spectrum Systems: Model of SS digital communication system, direct sequence spread spectrum signal, error rate performance of the decoder, processing gain and jamming margin, uncoded DSSS signals, applications of DSSS signals in anti-jamming, low detectability signal transmission, code division multiple access and multipath channels, effect of pulsed interference on DSSS systems, Generation of PN sequences using m sequence and Gold sequences, excision of narrowband interference in DSSS systems, acquisition and tracking of DSSS system.

UNIT 2
Frequency Hopped Spread Spectrum Systems: Basic concepts, slow and fast frequency hopping, performance of FHSS in AW GN and partial band interference, FHSS in CDMA system, Time hopping and hybrid SS system, acquisition and tracking of FH SS systems.

UNIT 3
Cryptographic Techniques: Classical encryption technique, Symmetric cipher model, cryptography and cryptanalysts, Substitution techniques, transposition techniques

UNIT 4
Block Cipher and Data Encryption Standard: Block cipher principle, data encryption standard (DES) strength of DES, differential and linear cryptanalysts, block cipher design principles, simplified advanced encryption standard (S-AES), multiple encryption and triple DES, Block cipher modes of operation, stream ciphers and RC4 algorithm

UNIT 5
Public Key Cryptography: Prime numbers, Fermat and Euler’s theorem, Chinese remainder theorem, discrete algorithms, principles of public key cryptosystems, RSA algorithm, key management Diffie-Hellman key exchange, message authentication requirements and functions.

SUGGESTED BOOKS:
4. Principle of Communication systems by Taub & Schilling TMH.
5. Cryptography and secure Communications by M.Y. Rhee, Mc Graw Hill
UNIT 1
INTRODUCTION TO NETWORK TECHNOLOGIES AND CELLULAR COMMUNICATIONS: WLAN:

MOBILE COMPUTING (MC): Introduction to MC, novel applications, limitations, and architecture

UNIT 2
(WIRELESS) MEDIUM ACCESS CONTROL: Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.

MOBILE NETWORK LAYER: Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).

UNIT 3
MOBILE TRANSPORT LAYER: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission/time-out freezing, Selective retransmission, Transaction oriented TCP.

DATABASE ISSUES: Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power-aware and context-aware computing, transactional models, query processing, recovery, and quality of service issues.

UNIT 4
DATA DISSEMINATION: Communications asymmetry, classification of new data delivery mechanisms, push-based mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques.

Mobile Ad hoc Networks (MANETs): Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs.

UNIT 5
PROTOCOLS AND TOOLS: Wireless Application Protocol-WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME.

SUGGESTED BOOKS:
UNIT 1
RADAR SIGNAL MODELS: Amplitude models, distributed target forms of range equation, radar cross section, statistical description of radar cross section, Swerling model, Clutter, signal to clutter ratio, temporal and spatial correlation of clutter, noise model and signal to noise ratio, frequency models, Doppler shift, simplifies approach to Doppler shift, stop and hop assumption, spatial model, variation with angle, variation with range, projections, multipath, spectral models.

UNIT 2
RADAR WAVE FORMS: Waveform matched filter of moving targets, ambiguity function, ambiguity function of the simple matched pulse filter for the pulse burst, pulse by pulse processing, range ambiguity, Doppler response and ambiguity function of the pulse burst. Introduction to Synthetic Aperture Radar (SAR)

UNIT 3
DETECTION FUNDAMENTALS: Radar detection as hypothesis testing, Neyman-Pearson detection rule, likelihood ratio test, threshold detection of radar signals, non-coherent integration of non-fluctuating targets, Albersheim and Shnidaman equations, Binary integration

UNIT 4
RADIO DIRECTION FINDING: loop direction finder, goniometer, errors in direction finding, RADIO RANGES: LF/MF four course radio ranges, VOR, ground equipment & receiver, VOR errors.

HYBERBOLIC SYSTEM OF NAVIGATION: LORAN & Decca DME & TECAN

UNIT 5
AIDS TO APPROACH AND LANDING: ILS & GCA & MLS DOPPLER NAVIGATION: Doppler frequency, Doppler radar equipment, CW & FMCW Doppler radar, frequency trackers, Doppler range equation.

SATELLITE NAVIGATION SYSTEM: transit system, NAVSTAR, GPS, basic principles of operation, signal structure of NAVSTAR broadcasts, data message, velocity determination, accuracy of GPS & differential navigation, NAVSTAR receiver.

SUGGESTED BOOKS:

1. Fundamentals of radar signal processing, Mark A Richards, TMH.
2. Elements of Electronics Navigation, N. S. Nagraja, TMH.
TEC-802 DATA COMMUNICATION NETWORKS

UNIT 1
INTRODUCTION: Switching systems, network hardware and software, Layering, design issues for layering, reference models and their comparison, example networks
PHYSICAL LAYER: Transmission media and channel impairments, modulation, multiplexing, digital channels, mobile telephone systems

UNIT 2
DATA LINK LAYER: Design issues, framing, error control, elementary data link protocols and sliding window protocols, HDLC, data link layer in internet.

UNIT 3

UNIT 4
TRANSPORT LAYER: Transport service and primitives, Addressing, connation establishment and release, flow control, buffering, multiplexing and crash recovery. Introduction of UDP. Modeling TCP connection management, TCP congestion control. Performance issues

UNIT 5
DNS name space and DNS server, overview of www, http. Introduction of cryptography, substitution cipher and transposition cipher, DES, cipher methods, public key algorithms. Social issues- privacy, freedom of speech, copy right

SUGGESTED BOOKS:

1. Design, simulation and analysis of two input NAND and NOR gate.
3. Design, simulation and analysis of NMOS and CMOS inverter.
5. Design, simulation and analysis of Full Adder, Sub-tractors circuit.
6. Design, simulation and analysis of Up/ Down, Mod-m counter.
7. Design, simulation and analysis of 512X8 ROM.

NOTE: The institution may add 5 more practical in above prescribed list.
UNIT 1
INTRODUCTION: Introduction to spread spectrum, spread spectrum techniques, Direct sequence system, frequency hopping systems, pulse FM(chirp) system, hybrid systems

UNIT 2
CODING FOR COMMUNICATION AND RANGING- Property of codes for spread spectrum, Autocorrelation and cross correlation of codes, composite codes, code selection and signal spectra, error detection and correlation codes.

UNIT 3
MODULATION AND DEMODULATION – Balance modulator, quadric-phase modulator, frequency synthesis for spread spectrum modulation, in line and heterodyne correlation, base band recovery, phase lock loop, COSTAS loop, FM feedback, PDM and FH demodulators.

UNIT 4
NEED FOR SYNCHRONIZATION: types of synchronizers, RF link- Noise figure, co-channel users, dynamic range and AGC, propagation medium, overall transmitter and receiver design.

UNIT 5
TEST AND EVALUATION OF SPREAD SPECTRUM SYSTEM- selectivity, sensitivity, jamming margin, synch acquisition, processing gain. Transmitter measurements.

SUGGESTED BOOKS:

UNIT 1
INTRODUCTION: Definition of reliability, quality, availability, maintainability, types of failures, various parameters of system effectiveness, concept of failure modes, difference between MTTR and MTTF.

UNIT 2
RELIABILITY MATHEMATICS: Classical set theory, Boolean algebra, sample space, definition of probability, basic properties of probability, conditional probability, and random variables.

PROBABILITY DISTRIBUTION: Exponential distribution, gamma distribution, binomial distribution, normal distribution and weibull distribution.

UNIT 3
RELIABILITY DATA ANALYSIS: The reliability function, bathtub curve, data collection, storage & recovery of data, component reliability from test data, linear hazard model & exponential hazard model.

UNIT 4
SYSTEM RELIABILITY: Systems with components in series, systems with components in parallel, series –parallel systems, Fault tree techniques, K-out of m systems.

UNIT 5
ELECTRONICS SYSTEM RELIABILITY: Reliability of electronic components, component types and failure mechanics, circuit and system aspects, reliability of electronic system design, parameter variation and tolerance.

SUGGESTED BOOKS:

TEC-023 SELECTED TOPICS IN COMMUNICATION

UNIT 1
Software defined radio; Cognitive radio: Definition, spectrum management, computational intelligence, architecture and radio resource management.

UNIT 2
Review of third generation cellular systems and standards, multicarrier modulation and multiple access techniques; Broadband wireless access, OFDMA and mobile WiMAX.

UNIT 3
Space-time wireless communications, linear diversity techniques, space-time coding; MIMO detection and channel estimation, iterative detection and decoding, MIMO-OFDM; Smart antennas; Ultra wideband communication.

UNIT 4
Advanced physical and MAC layer alternatives for wireless PAN, LAN, MAN and cellular networks; Mobile ad hoc and wireless sensor networks, adaptive link, MAC and network layer, energy efficiency and cross-layer design.

UNIT 5
Wireless capacity and channel state estimation, network capacity, information theory and network architecture, capacity of ad hoc networks; Wireline and wireless cooperation strategies, multi-antenna relaying, cooperative diversity, cooperative physical layer architecture.

SUGGESTED BOOKS:

UNIT 1
INTRODUCTION: Fundamental steps in DIP, elements of DIP, Simple image model, Sampling & quantization, basic relationships between Pixels, Color image model.

UNIT 2
IMAGE TRANSFORMS: One-dimensional & Two-dimensional DFT, Cosine, Sine, Hadamard, Haar, and Slant & KL transforms.

IMAGE ENHANCEMENT: Introduction, Point operations, Histogram modeling, spatial operations, Transform operations

UNIT 3

UNIT 4
IMAGE COMPRESSION: Introduction, Pixel coding, Predictive coding, Transform coding, Inter-frame coding.

UNIT 5
IMAGE SEGMENTATION: Introduction, Spatial feature extraction, Transforms features, Edge detection, Boundary extraction, Segmentation techniques.

- Minor Project: submission of 15 pages of MATLAB Program on above.

SUGGESTED BOOKS:

1. Digital Image Processing, Rafael C. Gonzalez Richard E Woods, 2nd Ed.TMH
UNIT 1
THEORY OF PROBABILITY: Axioms of probability: set theory, probability space, conditional, probability Repeated Trials: Combined experiments, Bernoulli trials, Bernoulli’s Theorem.

UNIT 2
CONCEPT OF RANDOM VARIABLE: Introduction, distribution and density functions, specific random variables, conditional distributions.

FUNCTIONS OF ONE RANDOM VARIABLE: function and distribution of random variable, mean and variance, moments, characteristic functions.

UNIT 3
TWO RANDOM VARIABLES: Bivariate distributions, one function of two random variables, two functions of two random variables, joint moments, joint characteristic functions, conditional distributions Multiple random variables, sequences of random variables

UNIT 4
CONCEPT OF STOCHASTIC PROCESSES: Definition, systems with stochastic inputs, power spectrum, discrete-time processes.

RANDOM WALKS AND OTHER APPLICATIONS: random walks, Poisson poins and shot noise, cyclostationary Processes, band-limited processes and sampling theory, deterministic signals in noise.

SPECTRAL REPRESENTATION AND ESTIMATION: factorization and innovations, finite-order systems and state variables, spectral representation of random processes, ergodicity, spectrum estimation

UNIT 5
MEAN SQUARE ESTIMATION: prediction, filtering and prediction, Kalman filters. Entropy: Basic concepts, random variables and stochastic processes, MEM.


SUGGESTED BOOKS:
2. Probability, Random Variables & Random Signal Principles/Peyton Z. Peebles,Jr./TMH
UNIT 1

**INTRODUCTION:** Introduction to Optical Networks Characteristics of Optical Fiber (Emphasis on Non Linear Characteristics), Timing & Synchronization.

UNIT 2

**COMPONENTS:** Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers, Tunable Lasers, Switches, Wavelength Converters

UNIT 3


UNIT 4


UNIT 5

**OPTICAL SWITCHING:** OTDM, Synchronization, Header Processing, Buffering, Burst Switching. Deployment Considerations

**SUGGESTED BOOKS:**

1. Ramaswami, Rajiv & Sivarajan, Kumar N. / “Optical Networks a Practical perspective”/ Morgan Kaufmann Publishers / 2nd Ed.
UNIT 1

INTRODUCTION: Definition and characteristics, general properties open and closed loop adaptation.

UNIT 2

ADAPTIVE LINEAR COMBINER: General description, input signal and Weight vectors, desired response and error performance function, gradient and minimum mean square, alternative definition of gradient, decorelection of error and input components.

UNIT 3

THEORY OF ADAPTATION WITH STATIONARY SIGNALS: Input correlation matrix, Eigen values and eigenvectors of the correlation matrix, and their geometrical significance. Basic ideas of gradient search methods, gradient search by newton’s method and method of steepest descent, gradient component estimation by derivative measurement, effects of gradient noise, on weight vector solution, excess MSE, time constant and misadjustment, performance comparison of Newton and S.D. methods.

UNIT 4

ADAPTIVE ALGORITHMS: Least mean square algorithm, convergence, learning curve noise in Weight vector misadjustment and performances of LMS algorithms, sequential regression algorithm, adaptive recursive LMS algorithm, random search algorithm.

RECURSIVE LEAST SQUARE ALGORITHM: Preliminaries, matrix inversion lemma, exponentially weighted RLS algorithm, update recursion for the sum of weighted error squares, convergence analysis of RLS algorithm.

UNIT 5

ADAPTIVE FILTER STRUCTURES: Lattice structures, all poles and all zeroes versions, adaptive lattice predictor. Lattice LMS algorithms, and lattice SER algorithms, adaptive filters with orthogonal signals, DFT and lattice preprocessors.

ADAPTIVE FILTER APPLICATIONS: (i) Adaptive modeling and systems identification. (ii) Inverse adaptive modeling, equalization and deconvolution.

SUGGESTED BOOKS:
1. Adaptive Signal Processing, Widrow and Stearns, Pearson Education
2. Adaptive Filter Theory, Simon Haykin, Pearson Education
UNIT 1

INTRODUCTION: Embedded systems and its applications, Embedded Operating system, Design parameters of an embedded system and its significance, design life cycle, tools introduction, hardware and software partitioning and co-design.

UNIT 2

HARDWARE FUNDAMENTALS FOR THE EMBEDDED DEVELOPERS: Digital circuit parameters- Open collector outputs Tristate outputs I/O sinking and Sourcing, PLD’s, Watchdog Timers, Hardware design and development.

CUSTOM SINGLE PURPOSE PROCESSORS: Optimizing program, FSMD, Data path & FSM.


UNIT 3

INTRODUCTION TO MICROCONTROLLERS AND MICOPROCESSORS: Embedded versus external memory devices, CISC and RISC processors, Harvard and Von Neumann Architectures.

RTOS -Tasks, states, Data, Semaphores and shared data, Operating system services, Message queues, Mailboxes.

UNIT 4

ADVANCED PROCESSOR-(only architectures) 80386, 80486, ARM and DUAL CORE, Core to DUO, i3, i5, i7 (References)

COMMUNICATION BASICS: Microprocessor Interfacing I/O Addressing, Direct memory access, Arbitration, multilevel bus architecture, Serial protocols, Parallel protocols and wireless protocols.

UNIT 5

REAL WORLD INTERFACING: LCD, Stepping Motor, ADC, DAC, LED, Push Buttons, Keyboard, Latch Interconnection, PPI.

SUGGESTED BOOKS:

1. Embedded System Design-Frank Vahid/Tony Givargis, John Willey@2005.
3. An Embedded Software Primer-David E.Simon, Pearson Education @ 1999.

REFERENCES:

1. The 8051 Microcontroller and embedded systems-Muhammad Ali Mazidi and Janice Gillispie.
## LIST OF OPEN ELECTIVES

**Effective from the session – 20010-11**

[List of Open Elective of 7th Semester for B.Tech. Civil/Electrical/Electrical and Electronics/Mechanical & Allied Courses/Manufacturing Technology/Electronics and Communications & Allied Courses/ Instrumentation and Control & Allied Courses/Computer Science and Engineering & Allied Courses/ Information Technology & Allied Courses/ Agriculture (Old)/ Biotechnology/Marine Engg./Biomedical Engg. Courses.]

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<td>TOE 02</td>
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<td>TOE 03</td>
<td>Environment &amp; Ecology</td>
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<td>4.</td>
<td>TOE 04</td>
<td>Geographic Inf. System (GIS) Technology &amp; its Applications</td>
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<td>TOE 05</td>
<td>Entrepreneurship Development Programme</td>
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<td>TOE 06</td>
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<td>Nanotechnology</td>
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<td>Fundamentals of Coding Theory</td>
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<td>TOE 22 Artificial Intelligence in Manufacturing</td>
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<td>TOE 23 Health, Hospital and Equipment Management</td>
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<td>TOE 24 Introduction to Medical Physics</td>
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<td>27.</td>
<td>TOE 27 SCADA &amp; Energy Management System</td>
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**Note:** The students will choose any one subject of the course of other than their Engineering Branch.
1. INTRODUCTION

Various non-conventional energy resources - Introduction, availability, Classification, relative merits and demerits.

2. SOLAR CELLS:

Theory of solar cells. solar cell materials, solar cell power plant, limitations.

3. SOLAR THERMAL ENERGY:

Solar radiation flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

4. GEOTHERMAL ENERGY:

Resources of geothermal energy, thermodynamics of geo-thermal energy Conversion-electrical conversion, non-electrical conversion, environmental Considerations.

5. MAGNETO-HYDRODYNAMICS (MHD):

Principle of working of MHD Power plant, performance and limitations.

6. FUEL CELLS:

Principle of working of various types of fuel cells and their working, performance and limitations.

7. THERMO-ELECTRICAL AND THERMIONIC CONVERSIONS:

Principle of working, performance and limitations.

8. 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.

9. BIO-MASS:
Availability of bio-mass and its conversion theory.

10. **OCEAN THERMAL ENERGY CONVERSION (OTEC):**

    Availability, theory and working principle, performance and limitations.

11. **WAVE AND TIDAL WAVE:**

    Principle of working, performance and limitations. **Waste Recycling Plants**

**References:**

1. Andra Gabdel, "A Handbook for Engineers and Economists".
2. A. Mani , "Handbook of Solar radiation Data for India".
4. F.R. the MITTRE, "Wind Machines" by Energy Resources and Environmental Series.
5. Frank Kreith, "Solar Energy Hand Book".
7. N.G. Calvert, "Wind Power Principles".
8. W. Palz., P. Chartier and D.O. Hall, "Energy from Biomass".

**TOE – 02**

**RELIABILITY ENGINEERING**

1. **Introduction:**
   Definition of reliability, types of failures, definition and factors influencing system effectiveness, various parameters of system effectiveness.

2. **Reliability Mathematics:**
   Definition of probability, laws of probability, conditional probability, Bay's theorem; various distributions; data collection, recovery of data, data analysis procedures, empirical reliability calculations.

3. **Reliability:**
   Types of system - series, parallel, series parallel, stand by and complex; development of logic diagram, methods of reliability evaluation; cut set and tie-set methods, matrix methods event trees and fault trees methods, reliability evaluation using probability distributions, Markov method, frequency and duration method.

4. **Reliability Improvements:**
   Methods of reliability improvement, component redundancy, system redundancy, types of redundancies-series, parallel, series-parallel, stand by and hybrid, effect of maintenance.

5. **Reliability Testing:**
   Life testing, requirements, methods, test planning, data reporting system, data reduction and analysis, reliability test standards.

TOE-03

ENVIRONMENT AND ECOLOGY

1. Environment:

   Environment and its components, pollution of environment by human activity, kinds of pollution.

   Water Quality:

   Measure of water quality, water quality standards, water treatment; waste water transport and treatment, sludge treatment and disposal.
Air Quality:
Sources and effects of air pollution, major air pollutants, air quality control, treatment of emissions, dispersion of air pollutants.

Solid waste:
Collection of refuse, removal and transport, disposal of refuse.

Noise Pollution:
Effect of noise on human health and its control.

2. Ecology:
Ecology and Ecosystems, concept of ecological imbalances, physical and climate factors, biotic components, energy and material flows in ecosystems, human influence on ecosystems.

Conservation of Natural Resources: water resources, mineral resources, agricultural and forestry resources, agriculture soil and need of nutrients, fertilizers and pesticides.

Brief introduction about environmental legislation and environmental audit.

References:

TOE-04
GEOGRAPHIC INFORMATION SYSTEMS (GIS) TECHNOLOGY AND ITS APPLICATIONS:
UNIT – 1
Definition of GIS, Cartography and GIS, GIS database: spatial and attribute data; Spatial
models: Semantics, spatial information, temporal information, conceptual models of
spatial information, representation of geographic information: point, line and area
futures, top logy,

UNIT - 2
Raster and vector data, raster to vector data conversion, map projection, analytical
transformation, rubber sheet transformation, manual digitizing and semi-automatic line
following digitizer; Remote sensing data as an input to GIS data;

UNIT - 3
Attribute database: scale and source of inaccuracy; GIS functionality; data storage and
data retrieval through query, generalization, classification, containment search within a
spatial region;

UNIT - 4
Overlay: arithmetical, logical and conditional overlay, buffers, inter visibility,
aggregation; Network analysis;

UNIT - 5
Applications of GIS in planning and management of utility lines and in the field of environmental engineering, geotechnical engineering, transportation engineering and water resources engineering.

**References:**


**TOE-05 ENTREPRENEURSHIP DEVELOPMENT PROGRAMME**

Entrepreneur-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 type.

Government policy for small scale industry; stages in starting a small scale industry.

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.

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.

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.

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.

Reference:


TOE-06 ANCIENT INDIAN CULTURE

UNIT – 1

Main features of Indian Culture

(a) The orient list view

(b) The nationalist view
(c) The Marxist view
(d) Analysis and formulations

Principal Components – historical and archeo-ethic perspective
(a) Indian Civilization
(b) Vedic culture
(c) Tribal and flok culture
(d) Foreign elements

UNIT - 2

Impact of integrating, disintegrating and proliferating forces of History.
(a) Eras of political unification
(b) Foreign invasions
(c) Regional conflicts
(d) Religious movements
(e) Trade and Dissemination

UNIT - 3

Ideas and Institution
a. Political
b. Social
c. Economic
d. Religious

UNIT - 4

Achievements in Arts, Science and Technology
(a) Literature
(b) Art and Architecture
(c) Music and Dance
(d) Astronomy and Mathematics
UNIT - 5

Values and disvalues

a. Humanism and spiritualism
b. Ashinsa
c. Altmism
d. Caste
e. Unsociability
f. Religious suicide and superstition
g. Degradation of women and prostitution.

References:

3. Coomarswami, dance of Siva
4. Thapar Ramila, Ancient Indian Social History
6. Kossambi, Introduction to Indian History.
8. Altekar, A.S., Position of Women in Hindu Civilization
9. Prakash, Om, conceptualization and History.
10. Bartam, A.I., Wonder that was India.

**TOE 07  HUMAN VALUES**

**Introduction**

1. **Nature of value crisis in the contemporary Indian society and the larger human community.**
2. Meaning and nature of values; holistic view of life and its value.

**Unit-I : Material and Societal value**

1. **Role of material values in promoting human wellbeing.**
2. Role of Science and technology; problems of material development.
3. Socio-political ideologies for promoting material wellbeing
4. Conceptualizing ‘good’ society and ‘social goods’
5. Justice as a societal value.
6. Democracy and rule of law.
8. Gandhian concepts of good society; gram swaraj, sarvodaya, antyodaya

**Unit-II : Psychological and Aesthetic Values**

1. Humanistic psychology; meaning of ‘personhood’
3. Mental health
4. Psycho-spiritual Indian concepts.
5. Areas and nature of aesthetic experiences.

Unit-III : Ethical and Spiritual Values

1. Bases for moral judgments: customary morality, religious morality, reflective morality.
2. Some principles of ethics; ethical canons and their significance in modern life.
3. Virtue ethics; personal virtues for the modern times.
4. Ethics of duty and ethics of responsibility.
5. Factors to be considered in making ethical judgements: motives, means and consequences.
6. Spirituality and spiritual values: spiritual wisdom of the Upanishads; Buddha’s view.
7. Science, materialism and spirituality.
8. Spirituality in the modern times.
Unit-IV : Human Values

1. Different meaning of human values : foundational human values – freedom, creativity, love and wisdom.
2. Nature of Human freedom; individual freedom, intellectual freedom, freedom of will, spiritual freedom.
3. Creativity : its meaning and nature; different kinds of creativity.
5. Creative personality, creative environment.
6. Love as a foundational human value; different kinds of love.
7. Human wisdom; characteristics of a wise person.

Unit-V : Work Ethics and Professional Ethics

1. Different attitudes to work.
2. Demands of work-ethics, ethics at work place.
3. ‘Good’ organization and its values.
4. What is a profession?
5. Professional ethos and code of professional ethics.
7. Problems in practising the code.
8. Case studies.

Text Books & References :

1. Human Values By : Prof. A.N. Tripathi
   New Age International.
2. 7 Habits of Highly Effective People By : Dr. Stephen R. Covey
   Harper Publications.
3. Wisdom Leadership By : Prof. S.K. Chakraborty
   Wheeler Publication.
1. Introduction:

Definition, need of quality systems, role of quality standards, stages of quality assurance systems. Quality charts, control charts for variables and attributes, acceptance sampling.

2. Quality Systems:

Overall responsibility for progress of quality systems. Quality manuals, procedures and role of auditing, auditing for conformance versus quality for effectiveness, auditing a tool for quality improvement.

ISO 9000 quality systems, British Standards BS5750/ISO 9000 origin of standards, requirements, issues associated with implementation.

Registration and accreditation in quality system-certification, approval, registration of leading accessors.
References:

1. Mohamod Isiri, "Total Quality Management for Engineers".

TOE – 09

CONDITION MONITORING & DIAGNOSTICS

Unit-I
Productivity, Quality circle in Maintenance, Reliability, Reliability assurance,
Maintainability vs. Reliability.
Failure analysis, Equipment downtime analysis, breakdown analysis.

Unit-II
Maintenance type, Breakdown maintenance, Corrective maintenance,
Opportunity maintenance, Routine maintenance, Preventive and predictive maintenance, Condition based maintenance systems, Design-out maintenance.

Unit-III

Unit-IV

Unit-V
Vibration-characteristics, Vibration monitoring-causes, identification,
measurement of machine vibration.
C.M.of lubes and hydraulic systems, C.M. of pipe lines, Selection of C.M. techniques Advantages.
VALUE ENGINEERING

An Overview

Definition, value engineering recommendations, programmes, advantages.

Approach of function

Evaluation of function, determining function, classifying function, evaluation of costs, evaluation of worth, determining worth, evaluation of value.

VE Job Plan

Introduction, orientation, information phase, speculation phase, analysis phase.

Selection of Evaluation of VE Projects

Projects selection, Methods selection, value standards, application of VE methodology.

Versatility of VE

VE operation in maintenance and repair activities, value engineering in non hardware projects.

Initiating A VE Programme

Introduction, training plan, career development for VE specialities.

Fast Diagramming

Cost models, life cycle costs.

VE level of Effort
VE team, Co-ordinator, designer, different services, definitions, construction management contracts, value engineering case studies.

References:

TOE-11

NANOTECHNOLOGY

A. Introduction to Physics of Solid State:
1. Structure: Size dependence of properties; crystal structures, face centered cubic nanoparticles; Tetrahedrally bounded semiconductor structures; lattice vibrations.
2. Energy bounds: Insulators, semiconductor and conductors; Reciprocal space; Energy bounds and gaps of semiconductors; effective masses; Fermi Surfaces.
3. Localized Particles: Acceptors and deep taps; mobility; Excitons.

B. Methods of Measuring Properties:
1. Structure: Atomic Structures; Crystallography; Particle size determination, surface structure.
3. spectroscopy: Infrared and Raman Spectroscopy; Photoemission and X-ray Spectroscopy; Magnetic resonance, optical and vibrational Spectroscopy,
C. Properties of Individual Nano particles

1. Metal Nano clusters: Magic Numbers; Theoretical Modelling of Nanoparticles;
   Geometric Structure; Electronic Structure; Reactivity; Fluctuations Magnetic
   Clusters; Bulle to Nano structure.

2. Semi conducting Nanoparticles: Optical Properties; Photofragmentation;
   Coulmbic Explosion.

3. Rare Gas & Molecular Clusters: Inert Gas Clusters; Superfluid Clusters molecular
   clusters.

4. Method of Synthesis: RF Plasma; Chemical methods; thermolysis; pulsed laser
   methods.

D. Carbon Nanoparticles:


2. Carbon Clusters: Small carbon clusters; Discovery of $c_{60}$; Strictures of $c_{60}$, Alkali
   doped $c_{60}$; superconductivity in $c_{60}$; Large and smaller fullerenes; other
   buckyballs.

3. Carbon Nano tubes: Fabrication; structure, Electrical Properties; Vibrational
   properties, Mechanical Properties.

4. Applrs: Field emission & Shielding; Computers; Fuel cells, chemicals sensors;
   catalysis, Mechanical reinforcement.
E. Balle Nanostructured materials:

1. Solid Disordered Nanostructure.
2. Nanostructured Crystals

F. Nanostructured Ferromagnetism

Basics of Ferromagnetism; Effect of structuring of Magnetic properties, Dynamics of Nanomagnets; Nanopore containment of magnetic particles, Nanocarbon Ferromagnets, Giant & colossal magnetoresistance; Ferrofluids.

G. Quantum Wells, Wires and Dots

Preparation of Quantum Nanostructure; Size and Dimensionality effect, Fermigas; Potential wells; Partial confinement; Excitons; Single electron Tunneling, Infrared detectors; Quantum dot laser Superconductivity.

H. Nano-machines & Nano-device

Microelectromechanical systems (MEMS) Nanoelectromechanical systems (NEMS), Fabrication, Nanodevices and Nanomachines.

Molecular & Supermolecular switches Applications areas of Nanotechnology in Engineering.

Books

1. Introduction to Nanotechnology – C.P.Poole Jr F.J. Owens
2. Introduction to S.S. Physics - (7th Edn.) Wiley 1996.

TOE 12

SOLAR ENERGY

UNIT-1

Introduction, Energy alternative, Devices for thermal collection and storage,
on, Solar radiation
gonometry, Empirical equations for prediction the availability of solar radiation,
Solar radiation on tilted surfaces.

UNIT-2
Liquid flat-Plate Collectors: General performance analysis, Transmissivity-
absorptivity product and overall loss coefficient and heat trasfer correlations,
Collector efficiency factor, Numericals,
Analysis of collectors similar to the conventional collector. Testing procedures,
Alternatives to the conventional collector, Numericals.

UNIT-3
Solar Air Heaters: Performance analysis of a conventional air heater, Other types
of air heaters.
Concentrating Collectors: Flat plate collectors with plane reflectors, Cylindrical
parabolic collector, Compound parabolic dish collector ,Central receiver
collector, Numericals.

UNIT-4
Thermal energy storage: Sensible heat storage, Latent heat Storage, Thermo-
chemical storage.

UNIT-5

Photovoltaic Systems: Introduction doping Fermi level, P-N junction characteristics, Photovoltaic effect, Photovoltaic material, Module, Cell temperature, Numericals.
Economic analysis: Introduction, cost analysis.

BOOKS:


TOE-13

HUMAN RESOURCE MANAGEMENT

Unit-I
Scope and Importance of Human Resource management, Historical background of Evolution of HRM and HRD in 20th century, Outlining the contemporary role for HRM in organization. Goals of HRM. (Why behavioural approach?)

Unit-II
Manpower as a resource in job related behaviour and individual motivation in a work setting. Various theories of human motivation, Maslow’ s hierarchy of needs. Needs for achievement, power and affiliation, other theories, group
Unit-III

Manpower planning and recruitment, Testing procedures and their limitations.
Reservations in jobs, pre induction training.

Unit-IV

Wage and salary administration-pay roll and compensation. Job analysis and job
specification, other pay plans, employment contracts, special compensation plans
for example personnel, effect of Financial rewards on individuals performance.
Goal setting and performance evaluation, promotion policy, employee
satisfaction, turnover.

Unit-V

Assessment of training needs, forces promoting investment in HRD, Human
resource development through individual and group efforts. Training analyses
and training methods guidelines for individual development, job enlargement
and job enrichment, job rotation, special assignment, Sponsored courses cost
benefit exercise.

Importance of unions, industrial petitions and conflict analysis and resolution.
Relevant labour laws.
UNIT I

Introduction

Solid Solution
Properties of solid solutions and alloys, types binary alloys, Thermal Equilibrium Diagrams, Cooling curves, Eutectic and peritectic alloys, Intermetallic compounds.

Heat Treatment
Heat treatment principles and processes for Ferrous and non-ferrous metals and alloys, Effect on structures and Properties.

Fatigue & Creep
Fatigue loading, Mechanisms of fatigue, fatigue curve, Fatigue tests. Design criteria in fatigue, Corrosion fatigue.

UNIT II

Corrosion and its prevention
Mechanism of corrosion, Chemical Corrosion, Electro chemical corrosion, Anodic and Cathodic protection, Forms of metallic coatings. Anodising, Phosphasting.

UNIT III

Selection of materials for hazardous/ saline environment
Selection of materials of saline/ hazardous environment - Boilers, Steam and Gas turbine and Diesel engine components, Pumping, Machinery, Piping, Engine seating, Propellers and Rudders, Composition strength value and other requirements for materials used. Material Standards.
UNIT IV

Electrical and Electronics materials

Science and engineering of electrical and electronics materials such as semiconductor, super conductor, its devices and applications.

TOE-15

INDUSTRIAL INSTRUMENTATION

Unit-1


2. Units of pressure and vacuum, different type of manometer, diaphragm gauges, bellows and force balance type sensors, boudern gauge, and piezoelectric, capacitive and inductive pressure pickups.

Vacuum pressure measurements: McLeod gauge, pirani gauge, thermocouple gauge, Knudsen gauge ionization calibration procedures,

Unit-2

3. Temperature Measurements: Standards and calibration, Thermal expansion methods, bimetallic thermometer, Liquid-in-gas (thermocouples) common thermocouples, Resistance thermometers, Bulk semiconductor sensors, Radiation
thermometers, automatic null balance radiation thermometers. Optical parameters, Case studies of temperature controllers.

Unit- 3


Unit-4


6. Density, Viscosity , pH and conductivity measurement.

Unit-5


Text Books: --


2. S.K Singh,/ Industrial instrumentation and control/TMH 2nd edition

3. Eckman/Industrial Instrumentation / Wiley Eastern Ltd.

Reference Books: - 


UNIT-1

1. Introduction: Specifications of bio-medical instrumentation system, Man-Instrumentation system Components, Problems encountered in measuring a living system. Basics of Anatomy and Physiology of the body.


UNIT-2


5. Patient Care & Monitoring: Elements of intensive care monitoring, displays, diagnosis, Calibration & Reparability of patient monitoring equipment.
Unit-3

6. Respiratory system Measurements: Physiology of Respiratory system.
   Measurement of breathing mechanism – Spirometer. Respiratory Therapy
equipments: Inhalators, Ventilators & Respirators, Humidifiers, and Nebulizers &
Aspirators.

7. Nervous System Measurements: Physiology of nervous system, Neuronal
   Communication, Neuronal firing measurements.

Unit-4

8. Ophthalmology Instruments: Electoretinogram, Electro-oculogram,
   Ophthalmoscope, Tonometer for eye pressure measurement.

9. Diagnostic techniques: Ultrasonic diagnosis, Eco-cardiography, Eco-
   encephalography, Ophthalmic scans, X-ray & Radio-isotope diagnosis and
   therapy, CAT-Scan, Emission computerized tomography, MRI.

Unit-5

10. Bio-telemetry: The components of a Bio-telemetry system, Implantable units,
    Telemetry for ECG measurements during exercise, for Emergency patient
    monitoring.

11. Prosthetic Devices and Therapies: Hearing Aides, Myoelectric Arm, Dia-thermy,
    Laser applications in medicine.

TEXT BOOKS:

1. Khandpur R.S.- Biomedical Instrumentation- TMH

REFERENCE BOOKS:

3.
4.
5.
6.
7. Unit-I
FUNDAMENTALS OF CODING THEORY

Purpose of encoding, separable binary codes, Shannon-fano encoding, noiseless coding. Shannon binary encoding, Huffman encoding, discrete coding in presence of noise.

Unit-II

Error detecting and error correcting codes, Hamming single error correcting code, Elias's iteration technique for coding.

Unit-III

Block codes, encoders and decoders for block codes, syndrome and syndrome decoding.

Unit-IV

Cyclic codes. Encoders and decoders for cyclic code, Golay code, BCH code, Reed soloman code.

Unit-V

Convolution coding, code generation, decoding of convolution code, sequential decoding, state and trellis diagram.
Text Book:


TOE-18

CONSUMER ELECTRONICS

UNIT 1

Audio Systems: Microphones, Loudspeakers, Speaker baffle and enclosure, Acoustics, Mono, Stereo, Quad, Amplifying Systems, Equalisers and Mixers, Electronic Music Synthesisers, Commercial Sound, Theater Sound System

UNIT 2

Video Systems and Displays: Monochrome TV, Colour TV standards and systems, TFT, Plasma, HDTV, Digital TV, Video Telephone and Video Conferencing

UNIT 3

Domestic Appliances: Washing machines, Microwave ovens, Air-conditioners and Refrigerators, In car computers Office Systems: FAX, Xerox, Telephone Switching System, Mobile Radio System

UNIT 4

Recording and Reproduction Systems: Disc recording and reproduction, Magnetic recording and reproduction, Video tape recording and reproduction, Video disc recording and play back, Distortion and Noise reduction in Audio and Video System

UNIT 5

Power Supplies and other systems: SMPS, UPS and Preventive Maintenance, Set Top Boxes, Remote controls, Bar codes, ATM...
TOE-19 WIRELESS & MOBILE COMMUNICATION

UNIT I

EVOLUTION OF MOBILE RADIO COMMUNICATION FUNDAMENTALS. Large scale path loss: propagation models, reflection, diffraction, scattering, practical link budget design using path loss model. Small scale fading & multipath propagation and measurements, impulse response model and parameters of multipath channels, types of fading, theory of multi-path shape factor for fading wireless channels

UNIT II

SPREAD SPECTRUM MODULATION TECHNIQUES: Pseudo-noise sequence, direct sequence spread spectrum (DS-SS), frequency hopped spread spectrum (FHSS), performance of DS-SS, performance of FHSS, modulation performance in fading and multipath channels, fundamentals of equalization, equalizer in communication receiver, survey of equalization techniques, linear equalizer, linear equalizer, non-linear equalization, diversity techniques, RAKE receiver.

UNIT III

INTRODUCTION TO MOBILE COMMUNICATION: Evolution of mobile communications, mobile radio systems - Examples, trends in cellular radio and personal communications.

Cellular Concept: Frequency reuse, channel assignment, hand off, Interference and system capacity, tracking and grade of service, Improving Coverage and capacity in Cellular systems.

UNIT IV
Multiple Access Techniques:

FDMA, TDMA, CDMA, SDMA, Capacity of Cellular CDMA and SDMA.

UNIT V

WIRELESS SYSTEMS AND STANDARDS: Second Generation and Third Generation Wireless Networks and Standards, WLL, Blue tooth. AMPS, GSM, IS-95 and DECT

TEXT BOOK


REFERENCES


TOE- 20

HUMAN COMPUTER INTERACTION

Unit –I

User centered design of system & interfaces, anatomy and rational of WIMP (Window, Icon, Menus & Pointing Devices ) interfaces.
Dialogue design, Presentation design, user documentation, evaluation / usability testing of user interface.

Unit –III

Ergonomics and Cognitive issues, hypertext and the World Wide Web.1
Unit – IV

User centered design, human factors in user-centered design, development & evaluation, Interactive design – rapid prototyping.

Unit – V

Designing for usability – effectiveness, learnability, flexibility, attitude and usability goals, criteria for acceptability.

References:


TOE – 21

IT IN BUSINESS

Unit - I

Business Drivers IT's Competitive Potential
Strategic Alignment
Strategic Management and Competitive Strategy

UNIT – II

Rethinking Business Through IT Developing a Competitive Strategy
Interorganization Information Systems Business-To-Business Systems
Electronic Commerce and Market Systems

Unit - III

Forming a Corporate IT Strategy
Developing an Information Architecture

Unit - IV

Incorporating Business Innovation Into the Corporate IT Strategy
The Changing Role of IT In International business
The Changing Global IT Practices

Unit - V
Changing the Focus of Strategy

Trends: Beyond 2000

References:


TOE –22

ARTIFICIAL INTELLIGENCE IN MANUFACTURING

UNIT I

Artificial Intelligence - Definition - Components - Scope - Application Areas;
Knowledge - Based Systems (Expert Systems) - Definition - Justification -
Structure – Characterization

UNIT II

Knowledge Sources - Expert - Knowledge Acquisition - Knowledge
Representation - Knowledge Base - Interference Strategies - Forward and
Backward Chaining
UNIT III

Expert System Languages - ES Building Tools or Shells; Typical examples of Shells. Expert System software for manufacturing applications in CAD, CAPP, MRP, Adaptive control,

UNIT IV

Robotics, Process control, Fault diagnosis, Failure Analysis; Process Selection, GT etc. Linking expert systems to other software such as DBMS, MIS, MDB.

UNIT V


References

3. Introduction to Artificial Manufacturing Export system, Dan.W. Patterson

TOE 23

HEALTH, HOSPITAL AND EQUIPMENT MANAGEMENT

UNIT - I

HEALTH SYSTEM

Health organisation of the country, the state, the cities and the region, Health Financing System, Organisation of Technical Section.
HOSPITAL ORGANIZATION AND MANAGEMENT

Management of Hospital organisation, Nursing section Medical Sector, Central Services, Technical Department, Definition and Practice of Management by Objective, Transaction Analysis Human relation in Hospital, Importance to Team Work, Legal aspect in Hospital Management.

UNIT III

REGULATORY REQUIREMENT AND HEALTH CARE CODES

FDA Regulation, joint commission of Accreditation for Hospitals, National Fire Protection Association Standard, IRPC.

UNIT IV

EQUIPMENT MAINTENANCE MANAGEMENT

UNIT V

TRAINED TECHNICAL PERSONNEL

Function of Clinical Engineer, Role to be performed in Hospital, Man power Market, Professional Registration, Structure in hospital.

REFERENCES BOOKS


TOE 24

INTRODUCTION TO MEDICAL PHYSICS

UNIT - I

ATOMIC

Traditional definition of atom, periodic system of elements, mechanical properties of atom, emission of light and its frequencies. Electromagnetic spectra.

Principles of Nuclear Physics — Natural radioactivity, Decay series, type of radiation and their applications, artificially produced isotopes and its application, accelerator principles; Radionuclides used in Medicine and
UNIT - II

INTERACTION WITH LIVING CELLS

Target theory, single hit and multi target theory, cellular effects of radiation,
DNA damage, depression of Macro molecular synthesis, Chromosomal damage.

UNIT - III

SOMATIC EFFECT OF RADIATION

Radio sensitivity protocol of different tissues in human, LD 50/30 effect of
radiation on skin, blood forming organs, lenses of eye, embryo and Endocrinal
glands.

UNIT - IV

GENETIC EFFECT OF RADIATION

Threshold of linear dose effect, relationship, factors affecting frequency of
radiation induced mutation, Gene controlled hereditary disease, biological effect
of microwave and RF wave. Variation in dielectric constant and specific
conductivity of tissues. Penetration and propagation of signals effects in various
vital organs, Protection standards.
UNIT - V

PHOTO MEDICINE

Synthesis of Vitamin D in early and late cataneous effects, Phototherapy, Photohemotherapy, exposure level, hazards and maximum permissible exposure.

LASER PHYSICS — Characteristics of Laser radiation, Laser speckle, biological effects, laser safety

REFERENCE BOOKS


TOE - 25

MODERN CONTROL SYSTEM

1. Design of Control System in State Space:

   Review of controllability and observability, controller design by pole placement, Ackermann's formula, design of full order and minimum order state observers, steady state error design via integral control.

2. Robust Control Systems:

   Robust control. Quadratic Performance Index, state regulator and output regulator problems. control configurations, state regulator design through the Lyapunov equation, optimal state regulator through the matrix Riccati equation, model reference control.
3. **Optimal Control:**

Basic mathematical concepts, conditions for optimality, variational calculus approach, Pontryagin's maximum principle and Hamilton Jacobi-Bellman theory, structures and properties of optimal systems.

4. **Variable Structure System:**

Concept of variable structure system (VSS), switching of structure in **sliding** region, VSS for control of second order system, applications of VSS in power system.

**References:**

1. K. Ogata, "Modern Control Engineering", Prentice Hall of India.
1. Mechatronics and its scope:

Sensors and transducers- Displacement, position & proximity, velocity, force, pressure and level.

Signal conditioning amplification, filtering & data acquisition.

2. Pneumatic and Hydraulic actuation systems:


Building blocks of Mechanical spring, mass and damper. Drives- Electrical Drives, Fluid systems, hydraulic, servo, closedloop controllers.


4. Case Studies of Mechatronic Systems:

Industrial Robot and its control
Electromechanical disc-control.

5. **Vehicle suspension Control:**


**References:**

TOE 27

SCADA & ENERGY MANAGEMENT

SYSTEM

1. SCADA:
Purpose and necessity, general structure, data acquisition, transmission & monitoring. General power system hierarchical Structure.

Overview of the methods of data acquisition systems, commonly acquired data, transducers, RTUs, data concentrators, various communication channels- cables, telephone lines, power line carrier, microwaves, fiber optical channels and satellites.

2. **Supervisory and Control Functions:**

   Data acquisitions, status indications, majored values, energy values, monitoring alarm and event application processing. Control Function: ON/ OFF control of lines, transformers, capacitors and applications in process in industry - valve, opening, closing etc.

   Regulatory functions: Set points and feedback loops, time tagged data, disturbance data collection and analysis. Calculation and report preparation.

3. **MAN- Machine Communication:**

   Operator consoles and VDUs, displays, operator dialogues, alarm and event loggers, mimic diagrams, report and printing facilities.

4. **Data basis- SCADA, EMS and network data basis.**

   SCADA system structure - local system, communication system and central system. Configuration- NON-redundant- single processor, redundant dual processor. Multicontrol centers, system configuration.

   Performance considerations: Real time operation system requirements, modularization of software programming languages.

5. **Energy Management Center:**

   Functions performed at a centralized management center, production control and load management economic dispatch, distributed centers and power pool management.

2. George L Kusic "Computer Aided Power System Analysis", Prentice Hall of India,
