WIRELESS AND MOBILE COMMUNICATION

ELC 401

UNIT - 1

Introduction

History of wireless communication, Evolution of Mobile Communication, Mobile and Wireless devices. A market for mobile communications. A simplified reference model for mobile communications, Large scale path loss: propagation models, reflection, diffraction, scattering, practical link budget design using path loss model.

UNIT-2

Wireless-transmission

A brief introduction of frequencies for radio transmission, signals propagation, Multiplexing, Modulation, spread spectrum, cellular system, Frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, improving coverage and capacity in cellular systems, 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-3

Spread spectrum modulation techniques

Pseudo-noise sequence, direct sequence spread spectrum (DS-SS), frequency hopped spread spectrum(FHSS), performance of DS-SS, performance of FH-SS, modulation performance in fading and multipath channels, fundamentals of equalisation, equaliser in communication receiver, survey of equalisation techniques, linear equaliser, linear equaliser, non-linear equalisation, diversity techniques, RAKE receiver.**Medium Access Control:** Introduction to MAC, Telecommunication systems, GSM, DECT, TETRA, UMTS & IMT-2000

UNIT-4

Satellite System

Review of the System, Broadcast System-Review. **Wireless LAN**: IEEE 802-11 Protocol, System Architecture, Protocol Architecture, Physical Layer & MAC Layer, Newer developments, Hiper LAN, Bluetooth Technology, Introduction to wireless networks, 2G, 3G and 4G wireless systems, wireless standards.

UNIT-5

Mobile Network Layer

Mobile IP, Mobile host configuration Network, Mobile ad-hoc networks **Mobile transport Layer:** Traditional TCP, classical TCP improvement TCP over wireless network, performance Enhancing, proxies.**Support for Mobility:** File systems, World Wide Web, wireless application protocol, i-mode, Sync ML, WAP2-0 etc. Architecture of future Network & Applications.

- 1. "Wireless Communications: Principles and Practice" by T. S. Rappaport, Pearson Pub.
- 2. "Mobile Cellular Telecommunications" by William C. Y. Lee, Mc-Graw Hill Pub.
- 3. "Mobile and Personal Communication systems and services" by Raj Pandya, PHI Pub.
- 4. "MIMO Wireless Communications" by Ezio Biglieri, Cambridge University Press.
- 5. "Mobile Communication Engineering" by William C.Y. Lee, Mc-Graw-Hill
- 6. "Wireless and Digital Communications" by Dr.Kamilo Feher, Prentice-Hall.

MICROPROCESSOR AND MICROCONTROLLER

ELC 402

UNIT 1

Introduction to Microprocessor:

Evolution of Microprocessors, Register structure, ALU, Bus Organization, Timing and Control. Introduction to 8085: Architecture, pin diagram, memory interfacing, memory mapping and organization, timing diagram of different cycles

UNIT-2

Assembly Language Programming

Instruction format and addressing modes, Data transfer instructions, Arithmetical and logical instructions, Program control Instructions (jumps, conditional jumps), stacks and subroutines, interrupts.

UNIT- 3

Basic of Interfacing:

Programmed I/O, Interrupt driven I/O, Parallel I/O (8255-PPI), 8259 Programmable Interrupt Controller, 8237-DMA Controller, 8253/8254 Programmable Timer/Counter,(8279) Keyboard and display interface.

UNIT-4

Fundamentals of 8086 Microprocessor

Internal organization of 8086, Bus interface unit, Execution unit, Register organization, Sequential memory organization, Bus cycle. Signal Description of pins of 8086 and 8088, Clock generation, Address and data bus, demultiplexing, Buffering memory organization, Read and Write cycle Timings, Interrupt structures, Addressing modes and their features.

UNIT-5

8051 Microcontroller

architecture, configuration, I/O port Structure, registers, memory organization, Instruction set, Basic Assembly language programming concept.

- 1. "Microprocessor Architecture, Programming and Applications" by R. S. Gaonkar, Penram International Pub.
- 2. "Microprocessors and Interfacing" by Douglas V.Hall, TMH Pub.
- 3. "Microprocessor & Microcontroller" A.P. Godse and D.A. Godse, Technical Publication.
- 4. "Introduction to 8086, 80186,80286, 80386, 80486, Pentium and Pentium Pro Processors" by B. Bray, Tata Mc-Graw Hill Pub.
- 5. "The 8051 Microcontroller architecture, programming and application" by K. J. Ayala, Cengage Learning.
- 6. "The 8051 Microcontroller and Embedded Systems" by M. Ali Mazidi, J. G. Mazidi & Rolin, Pearson Prentice Hall.

OPTTOELECTRONICS AND OPTICAL COMMUNICATION

ELC 403

UNIT 1:

Introduction:

Historical developments, Optical fiber communication system, Principle of optical communication, Advantages of optical fiber communication, Total internal reflection, Acceptance angle, Numerical aperture, Skew rays, Cylindrical fiber.

Structure and types of optical cable: Structure of optical fibers, Single and multimode fibers, Step index and graded index optical fiber.

UNIT 2:

Transmission Characteristics of Optical Fibers:

Mid-infrared and Far-infrared transmission, Inter-modal and Intra-modal dispersion, Overall fiber dispersion, Polarization.

Losses in optical fibers: Attenuation, Material absorption losses, Linear scattering losses, Non-linear scattering losses and Fiber bends loss and Joint loss.

Preparation methods of optical fibers: Liquid phase (melting) and Vapour phase deposition techniques.

UNIT 3:

Optical Fiber Connection:

Joints, Fiber alignment, Splices, Connectors, Couplers.

Optical sources: Absorption and emission of radiation, Einstein's relation, Population inversion, Optical emission from semiconductors, Semiconductor LASER, LED power and efficiency characteristics. Optical transmitter and receiver.

UNIT 4:

Optical Detectors:

Optical detection principles, Absorption and emission, Quantum efficiency, Responsivity, Long wavelength cutoff, p-n photodiode, p-i-n photo diode, photo transistors.

Optical fiber measurements: Fiber attenuation measurements, Dispersion measurements, Refractive index profile measurements, Cut-off wavelength measurements, Numerical aperture measurements.

UNIT -5

Digital Transmission Systems

Point to point links, system considerations, link power budget, rise time budget, modulation formats for analog communication system, introduction to WDM concepts, Introduction to advanced multiplexing strategies.

- 1. "Optical Electronics" by A. Yariv, HRW Pub.
- 2. "Optoelectronics: An introduction" by J.Wilson and J.F.B.Hawkes, PHI Pub.
- 3. "Optical Fiber Communication" by Gerd Keiser, TMH Pub.
- 4. "Optical Fiber Communication" by A. Selvarajan S. Kar and T Srinivas, TMH.
- 5. "Optical fiber communications, Principles and Practice" by John M. Senior, PHI Pub.
- 6. "Optical fiber systems, Technology design and applications" by Charles K Kao, Mc- Graw Hill Pub.

POWER ELECTRONICS ELC 404 (A)

UNIT 1

Power semiconductor Devices:

Power semiconductor devices their symbols and static characteristics. Characteristics and specifications of switches, types of power electronic circuits. Operation and steady state characteristics of MOSFET and IGBT. Thyristor – Operation & V- I characteristics, two transistor model, methods of turn-on Operation of GTO, MCT and TRIAC, Protection of devices. Series and parallel operation of thyristors, Commutation techniques of thyristor

UNIT 2

DC-DC Converters:

Principles of step-down chopper, step down chopper with R-L load, Principle of step-up chopper, and operation with RL load, classification of choppers.

UNIT 3

Phase Controlled Converters

Single phase half wave controlled, rectifier with resistive and inductive loads, effect of freewheeling diode. Single phase fully controlled and half controlled bridge converters. Performance Parameters, Three phase half wave converters, Three phase fully controlled and half controlled bridge converters, Effect of source impedance, Single phase and three phase dual converters.

UNIT 4

AC Voltage Controllers

types of AC voltage controllers, integral cycle control, single phase voltage controllers, with R and RL loads, single-phase transformer tap changers, single-phase sinusoidal voltage controllers, working of three-phase controllers with star & delta loads.

Cycloconverters: Principle of cycloconverter operation, single-phase to single-phase circuit, step-up and step-down cycloconverter, three-phase half wave cycloconverter, output voltage equation of a cycloconverter, load commutated cycloconverter.

UNIT 5

Inverters

Single phase series resonant inverter, Single phase bridge inverters, Three phase bridge inverters Voltage control of inverters, Harmonics reduction techniques, Single phase and three phase current source inverters.

- 1. "Power Electronics" by Mohan, Undeland and Robbins, John Wiley Pub..
- 2. "Power Electronics Circuit Devices and Applications" by Rashid M. H., PHI Pub.
- 3. "Modern Power Electronics and AC Drives" by Bimal K Bose, Pearson Pub.
- 4. "Power Electronics" by Bimbhra P S, Khanna Publishers.
- 5. "Power Electronics" by Vedam Subrahmanyam, New Age International.
- 6. "Power Electronics: Circuits, Devices and Applications" by H. Rashid, Pearson Pub.

DIGITAL SIGNAL PROCESSING

ELC 404 (B)

UNIT -1

Introduction

Limitations of analog signal processing, Advantage digital signal processing, discrete time characterization of signals & systems some elementary discrete time sequences and systems, concepts of stability, causality, linearity time invariance and memory, linear time invariant systems, and their properties, linear constant coefficient difference equations.

Frequency domain representation of discrete time signal and systems complex exponentials as Eigan function of LTI systems, Fourier transform of sequences.

UNIT -2

Processing of Continuous Time Signals

Discrete time processing of continuous time signals and vice – versa; decimation & interpolation, changing the sampling rate by integer and non integer factors using discrete time processing.

Discrete fourier transform: DFT and its properties ; linear, periodic and circular convolution , linear filtering methods based on DFT, filtering of long data sequences; fast Fourier transform algorithm using using decimation in time and decimation in frequency techniques ; linear filtering approaches to computation of DFT.

UNIT -3

Transform Analysis of LTI Systems

Frequency response of LTI systems, system function for system characterized by linear constant coefficient difference equations. Relationship between magnitude and phase, all pass systems, minimum phase systems. **Structure for discrete time systems** Signal flow graph representation, transposed forms, lattice structures.

UNIT -4

Design of Digital Filters

Linear phase FIR filters; FIR differentiator and Hilbert transforms, FIR filter design by impulse invariance, bilinear transformation; Matched Z – transformation; frequency transformation in the analog and digital domain.

UNIT -5

Finite Precision Effects

Fixed point and floating point representations, effect of coefficient quantization, effect of round off noise in digital filters, limit cycles.

Digital signal processors Architecture and various features of TMS/ADSP, series of digital signal processors; Instruction set and few applications of TMS 320CXX.

- 1. "Digital Signal Processing" by Terrell T. J. and Lik-Kwan Shark, Palgrave Macmillan Pub.
- 2. "Discrete time signal processing" by Alan V, Oppenheim and Ronald W Shafer, PHI Pub.
- 3. "Introduction to Digital Signal Processing" by Kur R., McGraw Hill Pub.
- 4. "Theory and Applications of Signal Processing" by L. R. Rabiner and B. Gold, Prentice Hall Pub.
- 5. "Digital Signal Processing" by Avtar Singh and Srinivasan S, Thomson Pub.
- 6. "Introduction to digital Signal Processing" by J. G. Proakis and DG Manolakis, Prentice Hall Pub.
- 7. "Introduction to Digital Signal Processing" by Roman Kue, McGraw Hill Pub.

BIO – MEDICAL ELECTRONICS ELC 404 (C)

UNIT – 1

Introduction:

The age of Biomedical Engineering, Development of Biomedical Instrumentation, Man-Instrumentation System, Components, Physiological system of the body, Problems encountered in measuring a living system.

Transducers & Electrodes: The transducers & transduction principles, Active transducers, Passive transducers, Transducers for Biomedical Applications.

Source of Bioelectric potentials: Resting and Action potentials, propagation of active potential. The Bioelectric potential – ECG, EEG, EMG and Envoked responses.

Electrodes: Electrode theory, Biopotential Electrodes – Microelectrodes, Body Surface Electrodes, Needle Electrodes, Biochemical Transducers, Reference Electrodes, pH Electrodes, Blood Gas Electrodes.

UNIT – 2

Cardiovascular Measurements:

Electrocardiography – ECG amplifiers, Electrodes and leads, ECG – Recorders – Three channel, Vector Cardiographs, ECG system for stress testing, Continuous ECG recording (Holter recording), Blood pressure measurement, Blood flow measurement, Heart sound measurements. **Patient Care and Monitoring:** Elements of intensive care monitoring, Patient Monitoring displays, Diagnosis, Calibration & Reparability of patient monitoring equipment, Pacemakers & Defibrillators.

UNIT - 3

Measurements of Respiratory System:

Physiology of respiratory system measurement of breathing mechanics – Spiro meter, Respiratory therapy equipments: Inhalators ventilators & Respirators, Humidifiers, Nebulizers & Aspirators.

UNIT – 4

Diagnostic Techniques:

Ultrasonic Diagnosis Eco - Cardiography, Eco- Encephalography, Opthalmic scans, X-Ray & Radio-isotope instrumentation, CAT scan, Emission Computer Tomography, MRI.

UNIT – 5

Bio-Telemetry:

The components of a Biotelemetry system, Implantable units, Telemetry for ECG measurement during exercise for Emergency patient monitoring. Other Prosthetic devices like Hearing Aid and Myoelectric Arm, Special aspects- Safety of Medical Electronic Equipments, Shock hazards from electrical equipment and prevention against them.

- 1. "Biomedical Instrumentation" by R.S. Khandpur, TMH Publications.
- 2. "Introduction to Biomedical Engineering Technology" by Laurence J. Street, CRC Press.
- 3. "Biomedical Instrumentation Systems" by Shakti Chatterjee and Aubert miller, Cengage Learning.

EMBEDDED SYSTEM

ELC 404-D

UNIT 1

Hardware Considerations:

Introduction: Overview, design metrics, processor technology, design technology. Custom singlepurpose processors- introduction, RT-level combinational & sequential components, custom single purpose processor design, Optimizing program, FSMD, data path & FSM.

General purpose processors and ASIP's: Basic architecture and operation of general purpose processors, programmer's view, development environment - ASIP's – microcontrollers, DSP and less general ASIP environments.

UNIT 2

Standard Processor Peripherals:

Timers, counters and watchdog timers, applications, UART, PWM application, LCD controller, keypad controllers, stepper motor control, ADC and DAC. Memory: Different types of ROM & RAM, cache system design

UNIT 3

Interfacing:

introduction to interfacing, communication basics, basic protocol concepts, interrupts and DMA, arbitration, multilevel bus architectures, communication - serial parallel and wireless protocols, I²C, CAN, USB, FireWire, parallel and wireless protocols.

UNIT 4

Software Considerations:

Basics of real time concepts, bus transfer mechanism, software

concepts, system concepts, real time definitions, events and determinism, synchronous and asynchronous events, time loading, real time design issues, examples of real time systems.

the software life cycle: phases of the software life cycle, interrupts: basics - shared data problem, interrupt latency.

Survey of software architecture: round robin, round robin with interrupts, function queues, scheduling, RTOS architecture, selection an architecture.

UNIT 5

Introduction to RTOS :

tasks, states, data – semaphores and shared data. More operating system services – message queues, mail boxes and pipes, timer function, events, memory management, interrupt

Basic design using RTOS: Principles, an example, encapsulating semaphores and queues, hard real time scheduling considerations, saving memory, space and power.

Embedded software development tools: Host and target machines, linkers/locators for embedded software.

- 1. "Embedded system Design" by Frank Vahid and Tony Givargis, John Wiley.
- 2. "An Embedded Software Primer" by David E.Simon, Pearson Education.
- 3. "Real Time System Design and Analysis" by Phillip A Laplante, PHI Pub.

FOUNDATION OF NANO ELECTRONICS ELC-404 (E)

UNIT 1

Region of nanostructures, scaling of devices in silicon technology, estimation of technology limits, Uncertainty principle, Experiments on duality, Schrodinger's equation and its applications to square well potential, square potential barrier (1D).

UNIT 2

Infinite array of potential wells, Barrier penetration, applications to tunnel diode, Josephson effect, Perturbation theory and its applications, Scattering. Binomial and related distributions, Phase space,

UNIT 3

Statistical ensembles, applications of classical statistical mechanics, Quantum statistics, Brownian motion, Random walk problem. Concept of Chemical potential, partition function and its applications in computing thermodynamic quantities.

UNIT 4

Quantum electronic devices, electrons in mesoscopic structures, short channel MOSFET, split-gate transistor, electron wave transistor, electron spin transistor, quantum cellular automata, Bioelectronics, molecular processor, DNA analyzer as biochip, Molecular electronics, Fullerenes, nanotubes, switches based on Fullerenes and nanotubes,

UNIT 5

Nanoelectronics with tunneling devices, resonant tunneling diode(RTD), three terminal RTDS, RTD based memory, basic logic gates and dynamic logic gates, Principle of single electron transistor, Coulomb blockade.

- 1. "Nanotechnology: Science, Innovation and Opportunity" by Lynn E. Foster, Prentice Hall.
- 2. "Handbook of Nanotechnology: Volume 1&2" by B.Bhushan, Springer Verlag. Second ed.
- 3. "Nanoelectronics and Nanosystems" by K.Goser, P. Glosekotter and J. Dienstuhl, Springer
- 4. "Introduction to Nanotechnology" by Charles P Poole Jr., and Frank J. Ownes, John Wiley Sons.
- 5. "Nanotechnology-A gentle introduction to the Next Big Idea" by Mark Ratner and Danial Ratner, Perason
- 6. "Encyclopedia of Nanoscience & Nanotechnology" by H. S. Nalwa, American Scientific Pub.

PROCESSES IN DEVICE FABRICATION ELC 404 (F)

UNIT-1

Crystal Growth and Wafer Preparation –Electronic Grade silicon, Czocharski Single Crystal growth technique, Zone refining, Silicon Shaping – from ingot to finished wafer, Defects in the crystal.

UNIT-2

Epitaxial Growth, VPE, LPE and MBE techniques, Mechanism, Equipment, Methods of Evaluation, Epitaxial defects, Buried layers Oxidation

UNIT-3

Oxidation, Deal Grove model of thermal oxidation, dry, wet, rapid thermal, and pyrogenic oxidation, chlorine enhanced oxidation, anodic and plasma oxidation, dependence on process and substrate parameters, oxide properties – masking, oxide charges, oxide stress, quality of oxide, oxidation induced stacking faults, oxidation of Polysilicon.

UNIT-4

Lithography, Types, Optical lithography – resists, contact, proximity and projection printing, mask making, Equipment, limitations, Electron Beam Lithography – Equipment, resists, pattern writing, mask generation, limitations, X-ray lithography - Equipment, X-ray sources resists, masks generation, limitations.

UNIT-5

Characterization and analytical techniques: Thickness measurement, I-V measurement, C-V measurements, Resistance measurement – two probe and four probe, spreading resistance, Dielectric property measurements, XRD, XPS, FTIR, SEM, Ellipsometer, UV-VIS spectrometer, Raman spectroscopy.

- 1. "VLSI Fabrication Principles" by S.K. Gandhi, John Willey & Sons Pub.
- 2. "VLSI Technology" by S.M.Sze, McGrawHill Pub.
- 3. "Semiconductor & Integrated Fabrication Techniques" by P.E. Gise and R. Blanchard, Restonn Pub.
- 4. "Large Scale Integration" by M.J. Hower and D.V.Morgan, JohnWiley Pub.

ARTIFICIAL INTELLIGENCE ELC 404-(G)

Unit – 1

Introduction to Artificial Intelligence. Natural and artificial intelligence. Role of representation of knowledge, Description matching and goal reduction, exploiting natural constraints in problem solving, Exploiting alternative paths, Best paths.

Unit – 2

Reasoning, Logic and Theorem proving: Deductive and inductive reasoning. heuristic methods, proof by resolutions and constraint propagation, problem solving paradiagrams.

Unit – 3

Knowledge replacement : First order predicate calculus, Skolemlsation, Resolution principle, Unification nementic networks, frame, system value inheritance, introduction to prolog, Introduction to expert systems, application of expert system and various shells.

Unit – 4

Application of artificial intelligence methods in various disciplines: database management, computer aided.

Unit - 5

Design principles of pattern recognition system,Sstatistical pattern recognition,Parameter estimation methods-PrincipleComponentAnalysis(PCA) and Linear discriminant analysis (LDA),Classification Techniques,Nearest Neighbor(NN) Rule,Bayes Classifier, Support Vector Machine (SVM)

- 1. "Artificial Intelligence" by Elaine Rich and Kelvin Knight, TMH Pub.
- 2. "Introduction to Artificial Intellegence" by E charniak and D McDermott, Pearson Pub.
- 3. "Artificial Intellegence and expert systems" byDan W Patterson,PHI Pub.
- 4. "Artificial Intellegence A Modern Approach" by Stuart Russell and Peter Norvig, Pearson Education.

INFORMATION THEORY AND CODING

ELC 404 (H)

UNIT 1

Source Coding:

Introduction to Information Theory, Uncertainty and Information, Average Mutual Information and Entropy, Information Measures for Continuous Random Variables, Source Coding Theorem, Huffman Coding, The Lempel- Ziv Algorithm, Rate Distortion Function, Optimum Quantizer Design.

UNIT 2

Channel Capacity and Coding:

Introduction, Channel Models, Channel Capacity, Channel Coding, Information Capacity Theorem. The Shannon Limit, Random Selection of Codes.

UNIT 3

Linear Block Codes for Error Correction:

Introduction to Error Correcting Codes, Basic Definitions, Matrix Description of Linear Block Codes, Equivalent Codes, Parity Check Matrix, Decoding of a Linear Block Code, Syndrome Decoding, Error Probability after Coding (Probability of Error Correction), Perfect Codes

Hamming Codes, Optimal Linear Codes, Cyclic Codes, Introduction to Cyclic Codes, Polynomials.

The Division Algorithm for Polynomials, A Method for Generating Cyclic Codes, Matrix Description of Cyclic Codes, Fire Code, Golay Codes, Cyclic Redundancy Check (CRC) Codes

Introduction to BCH Codes, Primitive Elements, Minimal Polynomials, Generator Polynomials in Terms of Minimal Polynomials, Some Examples of BCH Codes, Decoding of BCH Codes

Reed-Solomon Codes, Implementation of Reed-Solomon Encoders and Decoders, Nested Codes.

UNIT 4

Convolutional Codes:

Introduction to Convolutional Codes, Tree Codes and Trellis Codes, Polynomial Description of Convolutional Codes (Analytical Representation), Notions for Convolutional Codes, The Generating Function, Matrix Description of Convolutional Codes, Veterbi Decoding of Convolutional Codes, Distance Bounds for Convolutional Codes, Performance Bounds, Known Good Convolutional Codes, Turbo Codes, Turbo Decoding 792.14 C, Concluding Remarks 788.15 Po

UNIT 5

Trellis Codes Modulation:

Introduction to TCM, The concept of Coded Modulation, Mapping by Set Partitioning, Ungerboeck's TCM Design Rules, TCM Decoder, Performance Evaluation for AWGN Channel, Computation of dfree, TCM for Fading Channel.

- 1. "Introduction to Coding Theory" by Van Lint, J.H., Springer.
- 2. "Information Theory, Coding & Cryptography" by Bose, Ranjan. Tata McGraw Hil Pub.
- 3. "Digital Communications" by Proakis, John G., McGraw Hill Pub.
- 4. "Error Correcting Codes" by Shulin & Costello, Prentice Hall Pub..
- 5. "Principles of Communication Systems" by Taub & Schilling, Tata McGraw Hill Pub.
- 6. "Information Theory, Coding & Cryptography" by Bose, Ranjan, Tata McGraw Hill Pub.

INDUSTRIAL ECONOMICS AND MANAGEMENT ELC-404 (I)

UNIT -1

Definition and scope of engineering economics,Concept of supply and demand,Price elasticity and cross elasticity of demand,Production,Engineering costs and cost estimation,Concept of time value of money,Cash flow analysis

UNIT-2

Perfect competition, Monopoly, Monopolistic competition

UNIT-3

National Income, GDP, Inflation, Deflation and treatment

UNIT-4

Introduction to Industrial management, Brief history of industries in India, Brief definition of management, organization and administration. Characteristics of management, Principle of management, Function of management like, planning, organization, direction, co-ordination etc.

UNIT-5

Level of management, skills of management, inter relation between skills and levels of management, scientific management, Introduction to Schools of Management thoughts, introduction to organization, study of basic type of organization for ex. Line and staff organization, project organization, metrics organization, Informal organization, Introduction to industrial Psychology, Motivation theory and study of Maxlow, Need, Hierarchy Theory, Planned Location, Planned Layout. Study of different forms of layout like line layout, process layout, product layout, combinational layout, sixth position layout etc.

<u>RECOMMENDED BOOKS</u>:

- 1. "Industrial Engineering and Management" by P. Khanna, Dhanpatrai publications.
- 2. "Industrial Economics Issues and Perspectives" by Ferguson, Paul R. and Glenys J. Ferguson, Macmillan, London.
- 3. "The Economics of industrial Organisation" by Shepher, William G., Prentice Hall, Inc.
- 4. "Industrial Management" by L.C.Jhamb and Savitri Jhamb, Everest Publishing House

MICROPROCESSOR LAB

- 1. Write programme for Addition/Subtraction of 8 and 16t numbers using 8085.
- 2. Write programme for Multiplication/Division of 8 and 16 numbers using 8085.
- 3. Write programme to compute the factorial of an integer using 8085.
- 4. Write programme for Addition and Subtraction of two packed BCD's numbers using 8085.
- 5. Write programme to find the largest signed number in a given series of data using 8085.
- 6. Write programme to find sum of a given series of numbers using 8085.
- 7. Write programme to find the largest and smallest number from a given unordered array of 8bit numbers using 8085.
- 8. Write programme to perform BCD addition using 8085.
- 9. Write programme for BCD to Binary and Binary to BCD conversion using 8085.
- 10. Write programme to convert BCD into its equivalent binary number using 8085.
- 11. Write programme convert Binary number into its equivalent unpacked BCD number using 8085.
- 12. Write programme to arrange the data array in ascending and descending order using 8085.
- 13. Write a programme to control the operation of a steeper motor using 8085 and 8251 PPI.
- 14. Program 8253 in mode 3 to generate square wave.
- 15. Program 8255 in mode 0 i.e. simple I/O mode. Program Port A in I/P mode, Port B in input mode. Read data from Port A & B, add it & display the result in Port C.
- 16. Interface 8251 with 8085 M.P.U. and program it in asynchronous transmitter mode, use 8251 Group A.
- 17. Interface 8251 with 8085 M.P.U. and program it in asynchronous receiver mode, use 8251 Group A.
- 18. Study of master 8259 in stand-alone mode. Generate and interrupt request-using 8259 and display the respective interrupt in address field.
- 19. Write programme to add first ten natural numbers using 8051.
- 20. Write programme for Multiplication of two numbers using 8051.
- 21. Write programme to toggle the bits of an I/O port using 8051.
- 22. Write programme to convert Hexadecimal to Decimal number using 8051.
- 23. Write an 8051 ALP to generate 10 KHz square wave on any pin of port 0.
- 24. Write programme to obtained 1 sec delay using 8051.
- 25. Write an 8051 ALP to generate 10 KHz square wave on any pin of port 0 using interrupts.

Note: - 20% experiments other than this list of equal standard relevant to syllabus can also be set.