

Unit I

Introduction to Chemical instrumental analysis, advantages over classical methods, Classification: Spectral, electro analytical and separative methods, Laws of photometry (Beer and Lambert's law), Basic Components of analytical instruments.

Chromatography: Classification, Gas chromatography: principle, constructional details, GC detectors, Estimation of oxygen, hydrogen, methane, carbon dioxide, CO, etc. in binary or complex gas mixtures. Zirconia-probe oxygen analyser. Paramagnetic oxygen meters.

Unit II

Colorimeters, spectrophotometers (UV-Visible), monochromators, filters, grating, prism, dual wavelength and double monochromator systems, rapid scanning spectrophotometers, IR spectrophotometers.

Unit III

Flame Photometry: Principle, constructional details, flue gases, atomizer, burner, optical system, recording system. Atomic absorption spectrophotometers: Theoretical concepts, instrumentation: hollow cathode lamps, burners and flames, plasma excitation sources, optical and electronic system

Unit - IV

Measurement of pH, Conductivity, particle counting, detection on the basis of scattering- Nephelometer, Laboratory Instruments: Centrifuge, oven, waterbath, Incubators, stirrers, Densitometer,

Unit-V

Mass Spectrometer (MS): Principle, ionization methods, mass analyzer types - magnetic deflection type, time of flight, quadrupole, double focusing, detectors for MS, applications X-ray spectrometry: Instrumentation for X-ray spectrometry, X-ray diffractometer.

Some Suggested Textbooks/ Reference books:

1. Instrumental Methods of Analysis, Willard, Merritt, Dean, Settle, CBS Publishers & Distributors, New Delhi, Seventh edition.
2. Handbook of Analytical Instruments, R. S. Khandpur, Tata McGraw-Hill Publications, 3rd edition
3. Instrumental Methods of Chemical Analysis, Galen W. Ewing, McGraw-Hill Book Company, Fifth edition.
4. Introduction to Instrumental Analysis, Robert D. Braun, McGraw-Hill Book Company

Unit I

Introduction to Microprocessor – Architecture & pin diagram of typical 8 bit microprocessor- Intel 8085, Study of Functional units, Function & generation of various control signals, Timing Diagrams, Memory Interfacing, Peripheral mapped I/O, Memory Mapped I/O techniques, Interrupts in 8085.

Unit-II

Instruction set of 8085, Types of Instructions, Addressing modes, Programming Techniques of 8085: Counters and Time Delays, Stack and Subroutines, Code Conversion, 16 bit data operations,

Unit-III

Interfacing of 8085 to general purpose programmable peripheral devices - Programmable peripheral interface (PPI) 8255, Programmable interval timer 8253/8254, Programmable interrupt controller 8259A, DMA controller 8257.

Unit-IV

Interfacing of 8085 with keyboards, LEDS, ADC, DAC, motors, and stepper motors and Introduction to Programmable keyboard/display interface.
Serial I/O & Data communication, USART (8251), RS 232C, Modems and various bus standards.

Unit-V

Introduction to the 16-bit 8086 family of microprocessors: Architecture Overview, Memory Organisation, Instruction set and Addressing modes of 8086, Minimum and Maximum mode operation of 8086, Assembler Directives and Operators, Elementary 8086 programming.

Suggested Text Books/Reference Books

1. Microprocessors And Interfacing: R.S.Gaonkar
2. Advanced Microprocessors and Peripherals, A.K.Ray and K.M.Bhurchundi, TMH

UNIT-I

Introduction to Telemetry Principles

Introduction, The basic system, Classification, Non-electrical Telemetry systems, Voltage and Current Telemetry systems, Local transmitters and converters, Frequency Telemetry, Power line carrier communication (PLCC).

Bits and Symbols, Time-function pulses, Line and channel codings, Modulation codes, Intersymbol interference, Error rate and probability of Error.

UNIT-II

Frequency Division Multiplexed Systems

FDM: An Introduction, IRIG Standards, FM circuits, Phase Modulation Circuits, The Receiving End, Phase Locked Loop, Mixers.

UNIT-III

Time Division Multiplexed System

Introduction, TDM-PAM System, PAM/PM System, TDM-PCM System, Digital Multiplexer, PCM Reception, Coding for varying levels, Differential PCM (DPCM), Conclusion and Standards.

Introduction to Modems, Quadrature Amplitude Modulation, Modem Protocol.

UNIT-IV

Basics and Satellite Telemetry

Introduction, General Considerations, TT&C Services, Digital Transmission System in Satellite Telemetry, TDM, The Antenna, Some Aspects of TT&C- subsystems, Satellite Telemetry and Communications: MA Techniques

UNIT-V

Fibre Optical Telemetry

Introduction, The Optical Fibre Cable, Dispersion, Losses, Connectors and Splices, Sources and Detectors, Transmitter and Receiver Circuits, Coherent Optical Fibre Communication System, Wavelength Division Multiplexing, Internet based Telemetry, Remote control.

Suggested Text Books:

1. Telemetry Principles, D. Patranabis, Tata McGraw–Hill Publications

Unit-I

Basic idea of control systems and their classification - differential equations of systems - linear approximation - Laplace transform and transfer function of linear system - Model of physical system (Electrical, mechanical and electromechanical)- block diagram - signal flow graph - Mason's gain formula - return difference and return ratio.

Control system components :- Error detectors , servomotor, tachogenerator, servo amplifier, magnetic amplifier, rotating amplifier.

Unit-II.

Time domain analysis - Representation of deterministic signals - First order system response - S-plane root location and transient response - impulse and step response of second order systems - performance - characteristics in the time domain - effects of derivative and integral control - steady state response - error constant - generalised definition of error coefficients - concepts of stability - Routh - Hurwitz criterion.

Unit-III.

Frequency domain analysis - frequency response - Bode plot, Polar plot, Nicol's chart - closed loop frequency response and frequency domain performance characteristics . Stability in the frequency domain . Nyquist criterion.

Unit-IV.

Root locus method - Basic theory and properties of root loci - procedure for the construction of root loci - complete root locus diagram. Design and compensation of feed back control system :- approaches to compensation - cascade compensation networks and their design in the frequency domain - simple design in S-plane.

Unit-V.

State variable methods:- introduction to state variable concepts - state variable description of linear dynamic systems - representation in matrix forms - block diagram and signal flow graph representation of state equations - Transfer matrix from state equations - transition matrix - general solution for linear time invariant state equations. Basic principles of adaptive control systems.

Suggested Books/References

- 1) Ogata K, " Modern Control Engineering", Prentice Hall
- 2) Kuo B. C , "Automatic Control System", Prentice Hall
- 3) Nagarath & Gopal, " Control System Engineering", Wiley Eastern

Introduction to the principles of operating systems and concurrent programming. Operating system services, multiprogramming, time sharing system, storage structures, system calls, multiprocessor system. Basic concepts of CPU scheduling, Scheduling criteria, Scheduling algorithms, algorithm evaluation, multiple processor scheduling.

Concepts of memory management, logical and physical address space, swapping, contiguous and non-contiguous allocation, paging, segmentation, paging combined with segmentation. Concepts of virtual memory, demand paging, page replacement algorithms, allocation of frames, thrashing, demand segmentation.

Process concept, process scheduling, operations on processes, threads, inter-process communication, precedence graphs, critical section problem, semaphores, classical problems of synchronization. Deadlock problem, deadlock characterization, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock, Methods for deadlock handling.

UNIT-I

Fundamentals of Management: Management - Evolution, process, development, characteristics, principles, nature and functions. MBO, MBE their importance , characteristics and applications, uses of Computer in Management .

UNIT-II

Fundamentals of Organizational Behavior : Organizational Behavior, Human behavior, group dynamics, Leadership theories, motivation approaches and theories, communication, barriers and breakdowns, management information system.

UNIT-III

Personnel Management : Employees, Personnel Management practices, methods, recruitment , selection, interviews, group discussions, training, placement and employees development , wages and incentives, labour welfare, conflict , Negotiations.

UNIT-IV

Marketing Management:

Introduction to Marketing and Sales Management , Marketing Mix , 5 P's of Marketing, Marketing concept , principles, functions, market survey and research, concepts of sales and distribution, channels of distribution, salesmanship, sales promotions, methods of advertising, copy right , sales management practices.

UNIT-V

Financial Management : Nature and scope of Financial Management, goals of financial management , Sources of finance, aims and importance of long term, Short term finance, financial decisions , Break-even Analysis, Cost Volume profit analysis.

Suggested Text books and references:

1. Marketing Management- Stonier & Freeman
2. Principles of Marketing - Philip Kotler
3. Industrial Management - K.K. Ahuja
4. Financial Management- S.K. Banerjee
5. Financial Management- Sharma and Gupta , Kalyani Publications

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA BHOPAL

Credit Based Grading System

Electronics and Instrumentation Engineering, V-Semester

Elective I -EI- 5005 (3) Power Plant Instrumentation

UNIT-I

General concepts of different power plant setups and energy conversion process. Thermal power plant instrumentation –controlling, monitoring and testing of boilers, turbines, condensers, generators, coal-handling units and auxiliary systems, quality monitoring of air, water and exhaust gas. Instrumentation for safety- interlocks, protective devices; emergency measures; alarms and alarm analysis, monitoring of environmental pollution. Data-handling systems: data acquisition, processing, accounting, logging and display-storage systems. Introduction to power plant simulators.

Power plant: Unit, overview, Types of boiler, Exhaust Gas Boilers and Incinerators, turbine generators, condensers, material handling systems.

UNIT-II

Boiler Instrumentation: Control and optimization, Combustion control, air to fuel ratio control, 3-element drum level control, steam temperature and pressure control, oxygen/CO₂ in flue gases, furnace draft, boiler interlocks, sequence event recorder, supervisor control, data acquisition controls, burner management systems and controllers. Start-up and shut-down procedures, Boiler safety standard, Boiler inspection procedures. Boiler load calculation, boiler efficiency calculation.

UNIT-III

Instrumentation for Boiler ancillaries viz. water treatment, electro-static precipitator, soot blower, economizer, de aerator, super heater, chemical dosing systems, air pre-heater, coal and ash handling systems, fuel storage and distribution, Bag House Filters.

UNIT-IV

Turbine instrumentation and control, start-up and shut-down, thermal stress control, condition monitoring & power distribution instrumentation. Synchronous, Induction generators.

UNIT-V

Hydroelectric power generation, regulation & monitoring of voltage & frequency of output power, Pollution & effluent monitoring & control, Energy Management, electrical sub-station controls.

Power Generation using non-conventional energy sources viz. Wind Power, solar Power, Tidal Power, Plant safety & redundancies. Nuclear Power Generation & control Station. Diesel Generator Controls.

Comparison of thermal power plant, hydroelectric power plant, Nuclear power plant, solar power plant, Wind power plant.

Suggested Text Books:-

1. Power Plant Control and Instrumentation - D. Lindsley, David Lindsley
2. The Control of Boilers, Sam G. Dukelow, Instrument Society of America, 1991
3. Industrial Instrumentation and Control(3rd edition) - S. K.Singh
4. Industrial Instrumentation - Umesh Rathor
5. Instrumentation and Control – Patranabis.
6. Power Plant Engineering- P.K. Nag, Tata McGraw Hill, 2001
7. Power Plant Instrumentation- K.Krishnaswamy.

Unit-I

Introduction to CMOS circuit, Circuit & System representation Behavioral representation, structural representation. Physical representation, MOS transistor theory, NMOS and PMOS enhancement transistor, Threshold voltage, body effect. MOS device design equation, Basic DC equation, second order effects, MOS models.

Unit-II

The complementary CMOS inverter-DC characteristics, Static load MOS inverters. The differential inverter, Tristate inverter, Bipolar devices, diodes, transistors, BiCMOS inverters.

Unit-III

Review of silicon semiconductor technology: crystal growth, wafer preparation, oxidation, epitaxial layer growth, lithography, diffusion, ion implantation, metallization. Basic CMOS technology-n-well and p-well process, Interconnect and circuit Twin-tub process, layout design rules and latch-up, latch-up triggering and prevention.

Unit-IV

Circuit characterization and performance estimation resistance and capacitance estimation, Switching characteristics, CMOS gate transistor sizing, power dissipation. Basic physical design of simple logic gates, CMOS logic structure.

Unit-V

CMOS design methods, Design strategies, Programmable logic, programmable logic structure, reprogrammable gate arrays, Xilinx programmable gate array, Algotonix, concurrent logic, sea of gate and gate array design VHDL as a tool.

Suggested Text Books:

1. Neil, H.E. Weste, Kamran Eshraghian, Principles of CMOS VLSI design, Pearson Education.
2. Wayne Wolf, Modern VLSI Design-system on silicon, PHI.
3. Phillip E. Allen and Douglas R holding, CMOS Analog Circuit Design, 2nd edition, Oxford University press.

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Credit Based Grading System

Electronics and Instrumentation Engineering, V-Semester

EI- 5006 LabView Programming

Introduction to LabView Programming, Program writing concepts, its applications, and various programming examples.