Second Semester

EC -201: Environmental and Pollution Control M.M.: 85

Unit-I: Air Pollution
Atmospheric pollution, classification of air pollutants, sources of air pollution and methods of control, sampling of aerosols, sampling of gaseous pollutants, analysis of SO\textsubscript{2}, NO\textsubscript{x}, CO-CO\textsubscript{2}, hydrocarbons, effects of air pollutants on animals, ozone layer, chlorofluorocarbons, acid rain, green house effect.

Unit-II: Water Pollution
Sampling and preservation of water, physical examination of water-colour, alkalinity, TDS, conductivity, temperature, odour, turbidity, hardness, chemical examination of water-determination of carbonates and bicarbonates, sulphate, chloride and fluoride, nitrite and nitrate, iron, manganese, silica, cadmium, lead, mercury, biological examination of water-dissolved oxygen, BOD, COD, MPN. Organic pollutant analysis-phenols and detergents.

Unit-III: Water treatment
Quality of water, standards of raw and treated water, objectives of waste water treatment, A brief idea of sedimentation, coagulation and flocculation, filtration, disinfection of water, activated sludge process, trickling filters, sludge treatment and disposal.


Unit-V: (A) Soil Pollution
A brief idea of chemistry of soil. Trace element analysis in soil-B, Cd, Cu, Fe, Mn, Mo, Zn, Pb, Pesticides and pollution, classification and degradation of pesticides, methods of pesticides analysis.

(B) Noise Pollution
Sources, measurement, effects and control.

Books Recommended

EC -202: Spectro-analytical Methods of Analysis- II

Unit-I: Atomic Absorption and Emission Spectroscopy.
Theory of atomic spectroscopy, the origin of spectral transition, the populations of energy levels, the factors influencing spectral width, atomic absorption spectroscopy, instrumentation, interferences, applications, various non-flame emission sources, applications, comparison of atomic emission and atomic absorption methods.

Unit-II: Infrared Spectroscopy
Theory of Infrared absorption, vibrational modes, vibrational coupling, Near IR Spectroscopy instrumentation, dispersive and non-dispersive instrument, FTIR, sampling techniques, qualitative applications and interpretation of spectra, quantitative applications. A brief idea of Raman spectroscopy.

Unit-III: Nuclear Magnetic Resonance Spectroscopy
Theory of NMR, chemical shift and spin-spin splitting, relaxation process of saturation, environmental effects on NMR spectra, instrumentation, CW or FT NMR instrument, Rules governing the interpretation of first order spectra, applications to quantitative analysis.

Unit-IV: Carbon-13 NMR
Historical development, proton decoupling-broad band, Off-resonance and pulsed or gated decoupling, nuclear overhauser enhancement, polarization transfer experiments-DEPT and INEPT chemical shifts, spin-spin coupling impacts, application of $^{13}$C NMR to structure determination, two-dimensional NMR spectroscopy, principle, the COSY experiment, the COSY experiment with double quantum filter (COSY-DQF), the NOESY experiment, three-dimensional NMR experiment.

Unit-V: Mass Spectrometry
Theory of mass spectrometry, practical considerations, ion production, depletion of ions, ion detector, calibration, other ionization techniques: chemical ionization, fast atom bombardment (FAB), and electrospray, interpretation of the mass spectrum of the compound, Mc Lafferty rearrangement, Mass analyzers, determination of molecular formula, nitrogen rule, general fragmentation modes, applications of mass spectrometry.

Books Recommended

EC -203: Computer in Chemical Analysis

Unit-I: Fundamentals of Computers

An introduction, uses of computer in modern society, computer generation, classification of computers, block diagram of computer, components of computer, hardware & software of computer, input and output devices, memory (storage)- primary and secondary, exposure to number system: binary, octal, decimal, hexadecimal, conversion of numbers. A brief idea of the role of computer and microprocessors in analytical chemistry.

Unit-II: Operating Systems

Introducing operating System - Definition and functions, microsoft disk operating system (MS-DOS) internal and external commands, brief introduction to WINDOWS and UNIX. Protecting software and computer-related innovations.

Unit-III: Ms Office (MS - Word 97 and MS Excel 97)

MS Word 97: Introduction, components of screen, opening a file, typing, editing, copying, moving, inserting and saving the document, formatting features for font and characters, others features - page breaks, page set up, borders and shading, preview and printing of documents. Creating tables and columns in MS- Word 97.

MS Excel 97: Introduction to worksheets and charts, components of a worksheet, opening a new worksheet, working with a worksheet, saving, printing, editing and formatting of worksheet. Creating, modifying, saving and printing a chart in MS-Excel 97.

Unit-IV: Introduction to 'C'

Low level and high level languages, programming languages, getting started with 'C', programme structure in 'C', exposure to input/output, variables, constants, operators and control statements if, Else.......if, while, for, do......while and switches.

Unit-V: Instrument and multimedia

Internet: Concept and definition, types of internet connection,
modem. E-mail: Introduction, WWW and different browsers
Multimedia: Introduction and application.

Books Recommended

EC -204: Elementary Electronics in Chemical Instrumentation

Unit-I: Fundamentals

Idea of potential difference, current, resistance and resistivity, idea of fixed and variable resistors, colour code, Ohm's law, Kirchoff's law, principle of Wheatstone bridge, electrical capacity, parallel plate capacitor, self inductance, mutual inductance, transformer - introduction to its construction. Frequency, time period, phase and average values of alternating currents, motion of charged particle in electric and magnetic fields.

Unit-II: Transducers and Measuring Instruments

Principles of moving coil galvanometer (dead beat type), voltmeter, ammeter and ohmmeter, basic principle of electronic analogue voltmeter, thermocouple, thermister, LED, LCD, photoconductivity and photo-cell, concept of piezoelectricity, principle of scintillation, basic design of CR tube, photo emission and PMT. Principle of electrical oscillations, Hartley and Colpitts oscillators.

Unit-III: Semiconductor Devices -I

Qualitative ideas about free electron model. Intrinsic and extrinsic semiconductors. Conductivity and mobility and their temperature dependence. P-N junction diode. I-V characteristics and rectification.

Unit-IV: Semiconductor Devices -II

Zener diode and voltage regulation. Bipolar transistor, characteristics, load line and biasing in CE configuration. Current gain and basic CE amplifier, operational amplifier-ideal characteristics. Inverting and non-inverting amplifiers, summing amplifiers, integrator and differentiator.

Unit-V: Few Basic Circuits

Regulated constant voltage and constant current power supply, chopper stabilized DC amplifier, idea of invertors, interfacing a resistive transducer to an electrical circuit, idea of temperature measurement, schematic of a lamp regulator, direct reading spectrophotometer, conductivity meter, pH meter, basic gates, flip-flop, registers and counters.

Books Recommended