VEER NARMAD SOUTH GUJARAT UNIVERSITY

M.Sc. – ENVIRONMENTAL CHEMISTRY

SEMESTER-3

TO COME IN FORCE FROM JUNE-2008

PAPER- (I) INSTRUMENTAL TECHNIQUES IN ENVIRONMENTAL ANALALYSIS

COURSE NO. - CES- 301

Max. Marks: 70 Total Periods: 60

SECTION -1

UNIT-I : Ultraviolet Spectroscopy: (10 Periods)

Electromagnetic spectrum & its absorption by organic molecules, Electronic transitions & selection rules, Bear-Lambert law, Designation of UV bands, Instrumentation, Applications in the analysis of Air, Water and Soil.

UNIT-II : Infrared Spectroscopy: (10 Periods)

Introduction basic theory instrumentation, Combination, Overtons, Fermi resonance & mechanical coupling, Spectral features of major functional groups, Fuorier Transform Infrared Spectroscopy (FTIR), Non Dispersive Infrared Spectroscopy. (NDIR), Applications in the analysis of Air, Water and Soil.

UNIT-III : Nuclear Magnetic Resonance Spectroscopy: (10 Periods)

Introduction, nuclear spin, energy absorption & relaxation. Basic ideas about instrument, chemical shift & factors affecting it, magnetic anisotropy, spin-spin coupling, coupling constant, Pople notation, first order & non first order splitting for two, three & four interacting nuclei., long range coupling, FT NMR, Applications.

SECTION -2

UNIT-IV : Mass Spectroscopy: (10 Periods)

Principal and theory, Instrumentation, different ionization techniques, (EI, CI, FAB, FD) General modes of fragmentation, fragmentation patterns of various classes of compound, Maclafferty rearrangement, Applications.

UNIT-V : Atomic Absorption and Atomic Fluorescence Spectrometry (10 Periods)

Sample Atomization Techniques, Atomic Absorption Instrumentation, Interference in atomic Absorption Spectroscopy, Atomic Absorption Analytical Techniques, Atomic Fluorescence Spectroscopy.

UNIT-VI : Atomic Emission Spectrometry (10 Periods)

Emission Spectroscopy base on plasma sources, Emission Spectroscopy Based Arc and Spark Sources, Miscellaneous Sources for optical Emission Spectroscopy.

Reference Books:

1. Practical NMR Spectroscopy, M.L. Martin, J.J. Delpeuch and G.J. Martin, Heyden.
2. Spectrometric identification of Organic compounds, R.M. Silverstein, G.C. Bassler and T.C. Morrill, John Wiley.
3. Introduction to NMR Spectroscopy, R.J. Abraham, J. Fisher and P. Loftus, Weily.
4. Application of Spectroscopy of Organic compounds, J.R. Dyer, Prentice Hall.
5. Spectroscopy Methods in Organic Chemistry, D.H. Williams, I. Fleming,Tata McGraw-Hill.
6. Spectroscopy of Organic compounds, P.S. Kalsi, New Age International Ltd.
7. Environmental Chemistry 3rd Edit. By De A.K.

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PAPER- (II) ENVIRONMENTAL TOXICOLOGY

COURSE NO. - CES- 302

Max. Marks: 70 Total Periods: 60

SECTION -1

UNIT-I Toxicology-I (10 Periods)

- Introduction and basic concepts,
- Principles of toxicology.
- Types of Toxic pollutants.
- TLV (Threshold limiting Value)
- Common toxic effects
- Toxic effects- Description, Terminology, Nature
- Dosage- potency **VS** Toxicity, Lethal dosage (LD)
- Response considerations- Frequency response and cumulative response.

UNIT-II Toxicology-II (10 Periods)

- Factors influencing toxicity
- Biological- Biotransformation, Biodistribution
- Chemical factor- Toxicity influence of the routs of administration, Route of exposure, Abnormal response to chemicals
- Basis of selective toxicity- Design and conduct of toxicology studies, Hazard and risk assessment
- Assessment of acute toxicity, Procedures, Alternative approaches.

SECTION -2

UNIT-III Toxicology of Organic Compounds (10 Periods)

- Alkanes, Alkenes and Alkynes Compounds
- Benzene and Other Aromatic Hydrocarbon
- Nitrogen, Sulphur, Phosphorus and Halide Containing Organic compounds

UNIT-IV Toxicity in Inorganic compounds (10 Periods)

- Cyanide
- Carbon Monoxide
- Nitrogen oxide
- Hydrogen Halides
- Inorganic compounds of Silicon, Sulphur and Phosphorous
- Inter halogen Compounds and Halogen oxides
- Organ metallic Compounds- Organolead and Organo Tin.

UNIT-V Toxic element and Elemental Forms (10 Periods)

- Ozone
- White Phosphorous
- Elemental Halogens

- Heavy Metals- Cadmium, Lead, Arsenic, Mercury.
- Toxic metals and their Analysis

UNIT-VI Genotoxicity (10 Periods)

- Genetic code
- Teratogens and Teratogenesis
    - Mechanism of actions
    - Example of Teratogens (Alcohol, Methyl mercury, Rubella, Thalidomide)
- Mutagens and Mutagenesis
    - Types of Mutagens
    - Expression of Mutations and DNA repair
- Carcinogens and Carcinogenesis
    - Types of Carcinogens
    - Tumors
    - Development of Cancer

Reference Books:

1. Toxicology Principles and Applications By Raymond J.M. Niesink, John de Vries and Mannfred A. Hollinger. CRC Press NewYork.
2. Basic Concept of environmental Chemistry by Des. W. Connell.
3. Chemistry for environmental engineering and science, 5th Ed., by sawyer, McCarty and Parkin.
4. Environmental Chemistry, 7th Ed., By S. E. Manahan.
5. Chemistry for environmental Engineering 4th Ed., By sawyer, McCarty and Parkin.
6. The Chemistry of Industrial Toxicology; By Hervey B. Elkins, John Wiley & Sons, New York. (2nd Edit.)
7. Environmental Chemistry, By S. C. Bhatia, CBS Publisher, New Delhi.

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PAPER- (III) Air Pollution

COURSE NO. - CES- 303

Max. Marks: 70 Total Periods: 60

SECTION -1

UNIT-I Air Pollution (10 Periods)

- Chemical composition, Sources of air pollutants, Sources of dust, fumes, smoke and mist, Sources of gaseous pollutants, Effects of air pollutants on man and his environment
- **Introduction:** Definition, Classification and Properties of air pollutants, Classification, Emission sources, Photochemical smog, Effects of Air pollution on health, Vegetation & Materials, Air quality,

UNIT-II Global Atmosphere (10 Periods)

- Green house effect
- Global Worming
- Acid Rain
- Vehicular pollution
- Photochemical smog formation
- Radiation
- Ozone Problems

UNIT-III (10 Periods)

- Collection of Gaseous air pollutants
- Adsorption in Liquid
- Adsorption on solids
- Collection of Particulate matters
- Sedimentation, HVS
- Tape Sampler
- Impingement
- Electrostatic precipitation
- Thermal precipitation
- Stack sampling system(Train)
- Particulate sampling Gaseous Sampling
- Preservation of samples.

SECTION -2

UNIT-IV AIR POLLUTION MONITORING TECHNIQUES (10 Periods)

- Analysis of Air pollutants –Determination of particulate matter
- Analysis of Air pollutants- Oxides of Sulphur, Nitrogen, Carbon, H_2S, Mercaptons
- Non Dispersive IR Gas Analysers , Modern Elemental Analyser

UNIT-V AIR POLLUTION CONTROL METHODS AND EQUIPMENTS (10 Periods)

- Removal, Recovery and Destruction of SO_2, NO_2, Cl_2, H_2S, Organic Vapours and Particulates matters from production houses

- Settling chambers
- Electrostatic precipitation
- Particulates Scrubbers
- Filters Absorption and Adsorption Devices
- Combustion and Condensation control of hazardous and radio active waste – Bio remediation.
- Air pollution Control Methods and Equipments: Source, Collection methods, cleaning of gaseous effluent, particulate emission, absorption, adsorption, Odour control units.

UNIT-VI INDUSTRIAL AIR POLLUTION PROBLEMS AND REMEDIES

(10 Periods)

- Petroleum refinery
- Cement industries
- Iron and Steel industries
- Fertilizer industries
- Thermal power plants
- Chemical Process industries.

References:

1. C.S. Rao, Environmental Pollution Control Engineering. Wiley Eastern Ltd. 1991.
2. John H. Seinfeld Air pollution:Physical and Chemical Fundamental McGraw Hill1998.
3. M.N. Rao and H.V. Rao Air Pollution, Tata Mcgraw Hill Book Co. 1989.
4. Hand book of Air Pollution , Prevention and control: Nicholas P. Cheremisinoff Elesvier 2nd edition.

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