Subject Code : N4B11C

ENVIRONMENATAL CHEMISTRY

UNIT –I

Introductory aspect and Atmospheric Chemistry

Scope of Environmental Chemistry. Environmental segments:
Composition of atmosphere, hydrosphere and lithosphere; their impact on the biosphere; Sinks of atmospheric gases.

Air pollution – Defintion; primary air pollutants – oxides of C,S and N, hydrocarbons and particulates – sources, sinks, concentration profile and their effects – Green house effect, ozone depletion by chlorofluorocarbons; secondary air pollutants – cause and consequences, PAN, Smog-classical and photochemical; Acid rain – definition, theory, effect and control. Effect of air pollutants on human beings, animals, plants and materials. Air quality standards. Sampling and measurements of airpollutants – SO_2, NO_2, CO_2 atmospheric oxidants.

Hydrocarbons and particulate matter, Trace elements – Pb, Cd and Hg. Environmental Protection Agencies (EPA) primary and secondary standards. Sampling and analysis of air pollutants – Analytical techniques – Chemiluminiscence, Non Dispersive infrared photometry, spectrophotometry mass spectrometry, Gas Chromatrography, emission spectrometry Control of Air pollution.(18 hours).

UNIT – II

Aguatic Chemistry

Composition and properties of natural water-surface water and under ground water- Potable water standards. Hard water – Softening and purification. Water pollution- Definition. Water quality indicators and their significance. Testing parameters – DO, BOD, COD, Ph, turbidity, hardness, salinity, chloride, sulphate, fluoride, calcium and heavy metals, microbial quality of water – E.Coil and total bacteria.
Eutrophication – Types, effects, control, Chemical toxicology of heavy metals – Mercury, Arsenic, Cadmium, Lead and Selenium, Acid mine drainage. Thermal pollution – sources, effects and control methods: Detergent and pesticide pollution. Chemistry of domestic sewage treatment – Primary, secondary and tertiary treatments of waste water, disinfection.

Sludge treatment and disposal. Aerobic/anaerobic oxidation water pollution control Board's standards Treatment of effluents from paper and pulp, beverage, textile and leather industries and oil refineries.

Marine pollutants – sources and distribution. Effects of pollution by metals, organochlorinated compounds, biocides and oil spills. (18 hours).

UNIT – III

SOIL CHEMISTRY

Sources of soil pollution, Absorption of toxic metals and chemicals by soil, soil pollution by soluble salts, mining, waste water and solid waste, salt stress in soil. Detrimental effects of soil pollutants – effects of industrial pollutants, urban waste products, radioactive uclides, agrotechnology pesticides. Diseases caused by soil pollution. Impact of soil pollutants on air quality. Soil sediments as pollutants, aggregation and sedimentation, measures to check sedimentation. Soil erosion – Types, Detrimental effects of soil erosion, Controlling soil erosion and soil pollution. Degradation of pesticides in soil – Biodegradation, chemical degradation and photochemical degradation. (18 hours).

UNIT – IV

RADIOACTIVE POLLUTION

Definition and its difference from other types of pollution. Sources of radioactive pollution – Natural sources and anthrapogenic sources Distribution of radio active fall – outs. Concentration factor for Sr-90 (Strontium –90) in various parts of the food web. Classification and effects of radiation. Effects of ionizing and non-ionizing radiations, microwave and radio frequency radiations, fall out radiation and X-rays.

Effect of plutonium as carcinogen, nuclear radiation on polymers, effects of Kr-85 on global weather. Disposal methods of radioactive wastes – Dilute and disperse method, delay and decay method, concentration and contain method. Methods of dispose critically dangerous radio wastes – Low, intermediate and high level wastes. Recent disposal methods – Reprocessing and immobilization techniques. (18 hours).

UNIT – V

SUSTAINABLE DEVELOPMENT

Classification of waste materials, chemistry of composting – mechanism of aerobic and anaerobic digestion of organic materials. Solid waste disposal – chemistry of incineration and pyrolysis. Waste recycling : paper, plastics & glass Renewable energy sources as remedial measures to environmental pollution. – Solar, Wind, Bio-gas, Bio-mass, and Geothermal energy – ISO 14000. (18 hours).

TEXT BOOKS & REFERENCES :

1. Sharma, B.K.Kaur, H. 'Environmental Chemistry', 2nd edn., Goel Publications, 1995.
2. Goel, P.K., 'Water Pollution', New Age International (P) ltd., 1997.
3. Rai, G.D., Non-Conventional Energy Sources, 5th Edn., Khanna Publishers, 1998.
4. Anil Kumar De., 'Environmental Chemistry', 3rd Edn.1998.
5. Dara S.S., 'A Text Book of Environmental Chemistry',1994.
6. Khopkar, S.M., 'Environmental Pollution Analysis', New Age International (P) Ltd., 1995.
7. Rai, G.D.'Solar Energy Utilisation', 5th edn., Khanna Publishers, 1997.