

ENVIRONMENTAL SCIENCE

T.Y.B.Sc

Course code: S.LSC.5.AC

Course title: Environment and Environmental Pollution

60 Lectures

Learning objectives:

The course must enable the student to:

1. Describe the various life support systems that exist on earth
2. Understand the importance of these life sustaining resources to man
3. Recognize the implications of overuse or misuse of these resources

UNIT I Life's Support Systems

15 lectures

1. Atmosphere – Origin, composition, structure; variables – temperature, pressure, humidity; atmospheric observations using radar systems and satellite imagery (3)
3. Hydrosphere – Characteristics; Hydrological cycle; Ocean, snow & ice, fresh water systems; El Niño, La Niña (3)
4. Lithosphere – Formation, Zonal structure, Soil studies – origin, profile, texture, physic-chemical properties, classification, soil as a habitat (3)
5. Biogeochemical cycles – C, N, O, P, S, Ca, Mg (3)
7. Abiotic Factors – Temperature, Light (3)

UNIT II Environment as an Over-Exploited Resource

15 lectures

1. Fossil fuels – Coal, Petroleum & Natural Gas (prospecting, mining, refining and utilization of each) (3)
2. Mineral resources – Environmental impact of mineral mining (Case Study – Kudremukh, Vedanta, Mining in Goa) (2)
3. Forest resources: Use and over exploitation, deforestation, case studies, timber extraction (2)
4. Ocean resources: (2)
5. Implications of uncontrolled exploitation of marine resources: fishing, continental shelf & deep sea mining
6. Water resources: (3)
 - a. Use and over utilisation of surface and ground water (Case Study – Coca Cola)
 - b. Conflicts over water
 - c. Dams – benefits and problems (Case Study - Narmada, Yangetze)
7. Land resources: Land as a resource, man-induced land-slides, soil degradation soil erosion and desertification, land use change. (1)
8. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture (eg. GM crops), fertilizer - pesticide problems, water logging, salinity, case studies (2)

Unit III : Environmental Pollution

15 lectures

A. Water Pollution

1. Sources and classification of water pollutants (2)
2. Water pollution parameters and their biological significance (7)
 - a) Physical parameters: colour, odour, temperature, turbidity, and density

- b) Chemical parameters: suspended solids, total and dissolved solids, hardness of water, acidity, alkalinity, pH, dissolved oxygen, Ions- iron, copper, manganese, nickel, potassium, calcium, nitrate, phosphate, fluorides, chlorides
- 3. Detergents
- 4. Biological pollutants- Coliforms, faecal streptococci, BOD, COD and their significance as pollution indicators
- 5. Thermal pollution: Waste heat and its uses, cooling ponds and towers, effect of thermal pollution on life and atmosphere (2)
- 6. Ground Water pollution (case studies: Love Canal) (1)

B Noise Pollution (3)

- 1. Sources and types of noise
- 2. Sonic boom, measurement of noise
- 3. Effects of noise and control of pollution.

Unit IV 15

A. Air pollution (10)

- 1. Types & Classification of air pollutants
- 2. Gaseous inorganic air pollutants: NO_x, SO_x, CO, CO₂, H₂S, NH₃, O₃.
- 3. Organic air pollutants- aliphatic and aromatic compounds
- 4. Particulate matter-types, properties and effects
- 5. Acid rain, Photochemical smog
- 6. Depletion of ozone layer,
- 7. Green house effect
- 8. Economic impact of air pollutant

B. Chemical Toxicology (5)

Sources and biochemical effects of Arsenic, Mercury Cadmium, Lead, Cyanide, peroxyacetyl nitrate (PAN), pesticides, carcinogens, radioactive pollutants, Dioxins

PRACTICALS

1. Determination of pH – pH paper and pH meter
2. Determination of Hardness
3. Determination of Acidity
4. Determination of Alkalinity
5. Determination of Chlorinity
6. Sulphate Estimation
7. Nitrite Estimation
8. Phosphate Estimation
9. Determination of Conductivity
10. Dissolved Oxygen (DO)
11. Most Probable Number (M.P.N.)
12. Copper Estimation

LIST OF REFERENCES FOR COURSE:

1. G.T. Miller Jr. *Living in the Environment (15th Edition)*; Thompson Brooks/ Cole
2. D.B.Botkin and E.A.Keller *Environmental Science (4th Edition)*; John Wiley & Sons Inc.
3. M.L.Cain, W.D. Bowman and S.D. Hacker *Ecology*; Sinauer Associates Inc.
4. R.M. Harrison (Ed.) *Understanding Our Environment*; Royal Society of Chemistry Press
5. E. Agaudo and J.E. Burt *Understanding Weather and Climate (2nd Edition)*
6. Alan Strahler and Arthur Strahler *Introductory Physical Geography and Science of Human Environment (3rd Edition)*; Transparency Acetates
7. NASA Earth System Study Guide (free-online guide)
8. K.Omasa, H.Saji, S. Yousseficin *Air Pollution and Plant Biotechnology (2007)*; Springer International Edition
9. S.P. Mahajan *Pollution Control in Process Industries (1985)*; Tata MsGrawHill Company
10. G.S. Sodhi *Fundamental Concepts of Environmental Chemistry (2005)*
11. A.K. Bhagi and G.R. Chatwal *Environmental Chemistry (2003)*; Himalaya Publishing House
12. A. Sharma and Kaur *Environmental Chemistry*