ES 101: Environmental Science (2-0-0: 2)

General:

Basic ideas of environment, basic concepts related to environmental perspective, man, society and environment, their inter relationship.

Mathematics of population growth and associated problems, definition of resource, types of resource, renewable, nonrenewable, potentially renewable, effect of excessive use vis-a-vis population growth, definition of pollutant and contaminant. Environmental impact assessment.

Environmental degradation:

Acid rain, toxic element, particulates, noise pollution, air pollution and its effect on man.

Overall methods for pollution prevention, environmental problems and sustainable development, components of environment.

Ecology:

Elements of Ecology: System, open system, closed system, definition of ecology, species, population, community, definition of ecosystem, biotic and abiotic components. Ecological balance and consequence of change: Effect of abiotic factor on population, flow chart of different cycles with only elementary reaction [oxygen, nitrogen, phosphate, sulphur, food chain [definition and one example of each food chain]

Air Pollution and Control:

Atmospheric Composition: Troposphere, stratosphere, mesosphere, thermosphere, tropopause, stratopause and mesopause.

Energy Balance: Conductive and convective heat transfer, radiation heat transfer, simple global temperature modal (Earth as a black body, earth albedo), problems.

Green-house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food.

Climate, weather: Difference between climate and weather, Global warming and its consequence: Adiabatic lapse rate, atmospheric stability, temperature inversion, radiation inversion, Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, smokestack plumes and atmospheric lapse rate. (The point-source Gaussian plume model excluded.)

Source and effect of pollutants: Toxic chemicals in the environment, toxic chemicals in air, suspended particulate matter, carbon dioxide, sulphur dioxide, nitric oxide, lead, carbon monoxide.

Primary and secondary pollutants: Emission standard, criteria pollutant, oxides of carbon, oxide of nitrogen, oxide of sulphur, particulate, PAN.

Depletion Ozone layer: CFC, destruction of ozone lair by CFC, impact of other greenhouse gases, effect of ozone modification.

Standards and control measures: Industrial, commercial and residential air quality air quality standard, Control measure (ESP, Cyclone separator, bag house, catalytic converter, scrubber (ventury). Statement with brief reference)

Water Pollution and Control :

Hydrosphere: Hydrological cycle.

Natural water, Pollutants: their origin and effects: Oxygen demanding wastes, pathogens, nutrients, salts, thermal application, heavy metals, pesticides, volatile organic compounds.

River / lake / ground water pollution:

River : DO, 5day BOD test, BOD reaction rate constants, temperature dependents of BOD, effect of oxygen demanding wastes on river [Deoxygenation, reaeration], COD, Oil, Grease, pH.

Lake: Eutrophication [Definition, source and effect]

Ground Water: Aquifers, hydraulic gradient, ground water flow. (Definition only)

Standard and control: Waste water standard [BOD,COD,Oil, Grease], Water treatment system [coagulation and flocculation, sedimentation and f1ltration, disinfection, hardness and alkalinity, softening], wastewater treatment, primary treatment, secondary treatmens [Trickling f1lters, rotating biological contractor, activated sludge, sludge treatment, oxidation ponds], tertiary treatment definition.

Arsenic pollution: Biochemical effect, contamination, speciation

Land Pollution: Lithosphere Composition, Pollutants: Municipal, industrial, commercial, agricultural, hazardous solid wastes; Recovery and conversion method Waste and waste management Land filling, incineration, composting.

Noise Pollution, Sources, effects: Definition of noise, effect of noise pollution, noise classification, transport noise, occupational noise, neighbourhood noise, definition of noise intensity, noise threshold limit value.

Books:

1. Masters, G.M., Introduction to Environmental Engineering and Science, Prentice Hall of India Pvt. Ltd., 1991
2. Nebel, B.J., Environmental Science, Prentice Hall Inc., 1987
3. Odum, E.P., Ecology: The Link between the natural and social sciences, IBH Publishing Co. Delhi.