DEPARTMENT OF ENVIRONMENTAL SCIENCE, SHIVAJI UNIVERSITY, KOLHAPUR SYLLABUS 2008 - 09

Environmental Science

EVS01 Introduction to Environmental Science (Lectures 60)

Unit 1 a) Introduction to Environmental Science :

Definition, principles background and scope of environmental science, Understanding of environment and measurements, Environmental Science and technology, Media and people, decision making and applications of Environmental

Science.

b) Environmental ethics :

Nature and origin of environmental ethics, ecological consciousness, western and eastern views, philosophy of environment, environment, community and equity, integrating ethical values and knowledge, self centered development and Environment.

Unit 2 Global and national environmental issues :

Climate change, ozone depletion, green house effect, Acid rain, sea level rise, deforestation, Biodiversity loss, desertification, disasters etc.

Unit 3 Human impact on environment and its consequences :

Hunting and gathering, agriculture societies, industrial societies, impact of cultural change on environment, population explosion, degradation of natural resources, pollution of air, water and soil, urbanization, industrialization, food security, health, energy crises.

Unit 4 a) Concept of carrying capacity :

Biotic and abiotic components of environment, The concept of Sustainability and carrying capacity, tragedy of commons, human population and food, water and energy security, present status of environment and future scenarios.

References;

public

- 1. Environmental Science Arms Karen
- 2. Principles of Environmental Science-Watt, K.E.F.(1973)MacGraw-Hill Book Company
- 3. Environmental Science –Noble ,B.J. Kormandy, E.J.(1981),The way world works .

Prentice-Hall Inc., N.J.

- 4. Environmental Science-Turk A., Turk J.Wittes J.T. and Wittes, R.E.
- 5. Environmental Issues: Measuring, Analyzing, Evaluating ,Abel, Daniel C. McConnell, Robert L.Abel, Daniel C. Edi. 2 Prentice Hall Publication

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EVS02 Environmental Chemistry (Lectures 60)

Unit – 1 a) Concept and scope of Environmental Chemistry (15)

Concept and scope of environmental chemistry, Chemistry of environmental segments-

lithosphere, hydrosphere, atmosphere, air pollutants, sources, sinks, classification and effects

b) Chemistry of Air, water, soil and waste water

Chemistry of air pollutants, sinks, classification and effects, Reactions of atmospheric O2, O₃, CO2, Nox, SOx,

Chemistry of water, water quality parameters, solubility of gases in water, Industrial water pollution,

Chemistry of soil, Inorganic and organic components of soil, Chemical factors affecting

the soil quality adsorption of contaminants in soil, Effect of modern agro-technology on quality of soil, General accounts on composition of industrial waste and urban waste.

Unit – 2. Chemistry of Organic and Inorganic chemicals in the Environment (15)

a) Organic chemicals in the environment, aliphatic aromatic hydrocarbons, soaps, detergents, cations, Genes, Pesticides, polymers, drugs, dyes, oils, grease

b)Inorganic chemicals in the environment, Inorganic gaseous pollutants, Particulate matter, trace leave toxic metals, Inorganic pesticides & fertilizers, acids, alkalis,

Unit – 3 a) Environmental monitoring and sample analysis 15)

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Sampling of air and water pollutants, Monitoring techniques and methodology pH, Dissolved Oxygen (DO), Chemical oxygen demand (COD), Biological Oxygen Demand (BOD), Speculation of metals, monitoring & analysis of CO, NOx, CO2, SOx pesticide residue, phenols and petrochemicals.

b) Instruments used in chemical analysis

Introduction to separation techniques, neutron activation analysis, Atomic Absorption Spectroscopy (AAS), Flame photometry, Inductively couple plasma emission spectroscopy. X-ray Fluorescence, Non-dispersive IR Spectroscopy (NDIR), UV- Visible spectrophotometer, High performance liquid chromatography (HPLC), Gas chromatography (GC), Electro analytical methods, NMR and Mass Spectroscopy.

Unit – 4 a) Hazardous substances in the environment

Introduction to hazardous waste, acid halides and anhydrides, cyanides ,bromides chromium, halogenated compounds pesticide residues, metallic pollutants,

(15)

Ecology

b) Toxic chemicals in the environment

Atmospheric toxicants, toxic heavy metals, Radionuclides, , carcinogens, Assessment of toxicity, assessment of environmental risks.

References:

- 1. Environmental Chemistry by B.K.Sharma S.H.Kaur Goel Publishing House, Meerut
- 2. Environmental Chemistry A.K. De, New Age Intt. Pub. Co., New Delhi,

1990

1987.

3. Toxic Chemicals, health and the Environment, Lave, L.B and Upton, A.C.

The Hopkins Press Ltd., London.

- 4. Vogel's Textbook of quantitative Chemical analysis, 5th Edition-J.H.Basett, J.Nendham and Denny,R.C.
- 5. Instrumental Methods of analysis –Chatwal and Anand

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- 6. Chemistry for Environmental Engineering, C.N.Sawyer and P L Mc Carty, McGraw Hill Kogakusha ltd., 1990
- 7. Fundamentals of Analytical Chemistry, 1982.Hobert H.Willard D.L. Merrit & J.R.J.A.Dean,

EVS03	Environmental Biology	(Lectures
60)		

Unit

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Definition of ecology and sub divisions, Ecology relation to other sciences, relevance to

a)

civilization, levels of organization hierarchy, cake and other ecological models. Concept of ecosystem, its structure and function, cybernetic nature and stability of ecosystem, Energy in ecological systems, concept of productivity, food chains, food web and trophic levels, ecological pyramids,

Concept of habitat, niche and guild, concept of ecotone and edge effect, succession, natural selection, concept of Gaia hypothesis.

b) Limiting factors and their tolerance

Liebig's law of minimum, Shelford's law of tolerance, limiting factors – temperature, radiation, and water, micronutrients etc.

Unit – 2 a) Population and community ecology

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Properties and structure of population groups, population characteristics, Population growth, Community types and community composition.

b) Animal behavior with reference to changing environment

The scope of the study of animal behaviour, stress and response, Inter and intra species competition for food and space ,Adaptations, prey-predator relationship, symbiosis, co- existence, communication, territoriality, domestication

Unit – 3 a) Bio-geography and Zoo-geography

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Bio-geographical realms, floral and faunal regions – ecological view point, oriental region – ecology of region, patterns of regional and sub regional distribution.

b) Terrestrial and aquatic habitats

Classification of habitats, terrestrial habitats - forest, grasslands, desert, mountain, island systems, coast etc.,

Aquatic habitats - freshwater, lentic and lotic systems, freshwater wetlands,

estuaries and coastal regions, continental shelves, pelagic region, marine and oceanic systems.

Unit – 4 Environmental Microbiology

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a) Prokaryotes classification of microbes, microbial communities in nature interaction within microbial communities with man, animals. and plants, dispersal of microorganisms in different environments.

Water microbiology, waterborne diseases, important microbes for soil fertility, Distribution of microorganisms in air ,Classification and enumeration of microbes in air, dust droplet and droplet nuclei. Air, borne diseases. Applications of microbes in Environmental Science

b) Bio-indicators of environmental degradation

concept of bioindicators,Bio-indicators as plants, animals, Bioindicators in man made environment, role of bioindicators in pollution control

References :

1. Ecology - E.P. Odum, 1983, Holt-Saunders International Edition

2. Concepts of Ecology. E.J.Kormondey, 1984. Indian reprint 1991 Prentice-Hall of

India.

- 3. Ecology & Environment, P.D.Sharma, Ashish publications, 1994.
- 4. Microbiology Pelzar, Reid and Chan. Tata Mc Graw Hill Publishing company Limited, 1996

EVS Optional paper 01 Information Technology in Environmental Science

(Lectures

60)

Unit 1 a) Use of information technology in environmental studies

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Definition, scope of information technology, history and present status of information technology, application of IT in environmental protection.

b) Environmental education

Concept of environmental education, history of nature education in India, environmental education and its principles, goals, need, objectives, aims, awareness and action through environmental education.

Unit 2 a) Environmental awareness through media

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Traditional journalism and environmental journalism, Print electronic media, Environment and media, electronic journalism, media environment portrayal in India, documents, Environmental awareness through mass media

b) Role and involvement of NGOs, women and youth in environmental protection

Environmental awareness through workshops, literature, exhibitions, displays, folk songs and folk lore, street plays, games, internet etc. Involvement of social, organizations, women groups, youths nature etc. in environmental protection action.

Unit 3 Traditional knowledge, IPR, and patenting

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Traditional information , knowledge and wisdom, intellectual property right (IPR), definition, scope and need in context of liberalization, privatization and globalization, history , present status and regulations of IPR in India, technology , transfer and patenting , rules and regulations of patenting.

Unit 4 Futurology

(15)

Futurology and future science, impact of changing life styles and innovative technologies resource crunch and new challenges, future needs and humanity, new ethics, space travel, robotics etc.

References :

- 1. Physical Geography S. Strahler ,John Wiley & Sons,
- 2. Earth Science Turbuck E. J.
- 3. Earths Dynamic Systems _ Hamblin W. K. & E. H. Christian
- 4. Planet Earth Cesare Emiliani,.

Semester II

EVSO4 Envt. Statistics & Computer applications (Lectures 60)

Unit – 1 : Data analysis : (15)

a) Population, Sample, variable, parameters, primary and secondary data, screening and representation of data, frequency distribution, histogram, frequency polygon, ogive curves. Mean, median, mode, quintiles, pecentiles.

b) **Measures of dispersions :** range, quintile deviation, mean deviation, standard deviation, coefficient of variation, moments, skewness, kurtosis

Bivariate data : Scatter diagram, correlation coefficient, properties (without proof) interpretation of correlation coefficient, linear regression, Fitting of lines of regression regression, coefficient, Coefficient of determination, partial and multiple correlation coefficient

Unit – 2 : Probability and distributions : (15)

a) **Probability :** Sample space, events, Definition of probability (mathematical and frequency approach) independent events, addition and multiplication laws, conditional probability examples

b) **Probability distributions :** Random lea viable p.m.f. Expectation and variance, Bernoulli, Binomial, Poisson, uniform, Normal distributions, mean and variance of these distributions (without proof) use of these distributions to describe biological medals. Example.

Unit – 3 : Testing of hypothesis (15)

a) Simple random and stratified random sampling, sampling distribution, standard deviations of sample statistic, hypothesis critical region, errors, large sample test for mean, proportion, equality of means (when variance is known and when it is unknown)

b) Chi-square test for variance, t-test for population mean and equality of population means, chisquare test for goodness of fit and independence of attributes, p-value of a statistic. Unit – 4 : Mathematical models and computer applications : (15)

a) **Mathematical models :** Exponential, logistic models for population growth, Lotka-Voltera Prey and predator model, box model, Gaussian plume, point source stream model Leslie's matrix model.

b) Computer applications : Introduction to computer : Input and output devices, computer

software's, types of software's, hardware storage devices, Operating systems, programming languages ,Introduction to MS – EXCEL, use of worksheet to enter data edit data, copy data, move data, use of in built functions for computations of various statistical constraints, use of charts, Introduction to MS-Word, word processor, editing, coping, moving, formatting, table, insertion, etc.

References :

- 1) Bio-statistic : A Foundation for analysis in the health sciences : Wayne W Daniel John wiley and sons Inc
- Survival models and data analysis : Elandt Johnson and Johnson, John wiley and sons Inc.
- 3) Statistical Method for the analysis of Biomedical data : Wool son John wiley and Sons Inc.
- 4) Statistical Methods for Environmental and Agricultural Sciences A Reza Horseman CRC Press Boca Raton Network
- 5) Text book of Environmental Engineering : P. Venugopala Rao, Prentice Hall of India Pvt. Ltd. Delhi
- 6) Computer Fundamental : P. K. Sinha BPB Publications New Delhi
- 7) Digital Computer fundamentals : Thomas C. Bastee, Mc Graw Hall international book Company Tollyo.
- 8) Mathematical models in Biology and Medicine : J. N. Kapur Affiliated East-west press Pvt. Ltd. Bangalore.

EVS 05 Environmental Pollution and Control (Lectures 60)

Unit – 1 a) Air pollution

(15)

Concept of air pollution, natural and anthropogenic sources, major air pollutants Meteorological aspects of air pollution, Oxides of nitrogen and sulphur, particulate matter, air pollution standards, Indoor air pollution, Vehicular air pollution, air pollution episodes and disasters, Effects of air pollution on human health ,animals plants, material and climate Formation of fog and photochemical smog , acid rain , Monitoring of air pollution

b) Noise Pollution

Concept of noise, sources of noise, measurement of noise, religious festival and noise, Noise exposure levels and standards, effects noise on plants animals and human beings, control of noise at source, industrial noise control, prevention of community noise control

Unit – 2 Water Pollution (15)

Principal forms of water pollution, sources of water pollution, phenomenon of eutrophication, water pollution monitoring, physicochemical and bacteriological sampling and analysis of water, water quality parameters, water quality standards, ocean pollution-sources of pollution, effects, control. Oil pollution- sources of pollution, effects, control, ground water pollution - sources of pollution, effects, control, water pollution episodes ,consequences of water pollution , water pollution prevention.

Unit – 3 a) Solid Waste Pollution

(15)

Concept and types of solid waste, Major sources of solid waste, effects of solid waste classification of waste–Domestic, Industrial, Municipal, Hospital, Nuclear, Agriculture Transfer and transport, waste minimisation technologies -recycle, reuse, recovery, conversion of solid waste to energy / manure, sea disposal, land disposal,

b) Radiation Pollution

Types, sources- natural and manmade, Measurement and detection of radiation intensity, consequences of radiation life, coefficient units for measurement of radiation, control of radiation pollution., Nuclear reactor safety, , case studies

Unit – 4 Soil Pollution

(15)

Importance of soil, concept of soil pollution, analysis of soil key parameters, soil acidity, saline and alkaline soil., causes of soil salinity, major types, physicochemical and biological methods of soil reclamation, Different causes of soil degradation, Chemical and metallic pollution in agricultural soil, Mining and soil pollution, , Control of soil pollution.

References:

1. Environmental Pollution Control, C.S. Rao, Wiley Eastern Ltd., 1993

- 2. Air Pollution Control and Engineering, De Nevers, Mc Graw? Hills, 1993
- 3 Fundamentals of Environmental Pollution, Krishnan Khannan S.Chand & Company

Ltd.,1994.

4. Environmental Chemistry, A.K.De., New Age Intl. pub Co, NewDelhi, 1990.

5. Environmental Pollution Anlysis- Khopkar

EVS06 Environmental Geo-science and Climatology (Lectures 60)

Unit – 1 a) The universe, solar system and origin of earth

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Brief introduction to universe, Sun - its structure and atmosphere physical characteristics of planets, brief description of - comets, asteroid, meteors, origin of earth.

b) Origin and evolution of biosphere

Origin and evolution of life, origin of the life, spontaneous generation of the life, abiogenic synthesis of low molecular weigth organic compounds. Chemical evolution, prokaryotic and eukaryotic cellular evolution, Evolution of organelles and genetic basis for evolution.

Unit – 2 a) Atmosphere, structure, composition and dynamics

(15)

The vertical structure of atmosphere, composition of earth's atmosphere, thermal stratification, the ionosphere, D.E.F. and G regions, solar spectra, energy transfer near earth's surface, insolation, terrestrial radiation and heat balance of the earth.

b) Definition of climate, weather, measurement of climatic parameters

Concept of weather, climate, meteorology & Climatology, Elements of weather, Measurement of premise – temperature, air pressure, turbulence & wind, rain, humidity & radiation.

Wind systems of the world, El Nino, Monsoon etc.

Wind Systems of the world, Monsoon phenomenon & its role in Indian subcontinent, El Nino, its role in global environment.

Unit – 3 a) Lithosphere - Structure, Formation and processes of change (15)

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soil

Formation and cross section of the earth crust, mantle, core, margin generation and formation of rocks, chemistry of rocks weathering, soil formation, composition of

b) Hydrosphere, Composition and circulation of surface and ground waters

Global water balance Physicochemical characteristics and composition of water,

sea

water, rain water, River water, ground water. Hydrological cycle

Unit – 4 a) Bio-geo-chemical Cycles

(15)

Gaseous and sedimentary cycles: carbon cycle, nitrogen cycle, phosphorous cycle, hydrologic cycle, oxygen cycle, human influence on matter cycling.

b) Major land forms of earth and biomes

Biomes and biosphere, terrestrial biomes- tundra, taiga, tropical rain forest, savanna, deserts, mountains, temperate grasslands, etc.,

Aquatic biomes -oceans, abyss, marina trench, lagoons, coral reefs, etc.

References:

- 1. Ecology & Environment, P.D.Sharma, Ashish publications, 1994.
- 2.Ground water Hydrology by D.K.Todd John Wiley & sons
- 3 Ground water contamination (Transport and remediation) by Philp bedient, Hanadi.
- S.Rifai& Charles. Publishers: Prentice Hall.
- 4. Environmental Hydrology by Andy. D. Ward and William J.Elliot, Lewis
- 5 Environmental Geography, Valdia ,K..S(1987)
- 6. Environmental Geography, Savindra Singh
- 7.Environmental Geology,Keller E.A. & Turk & Turk
- 8. Introduction to weather and climate-Trewartha
- 9. Physical Geography S. Strahler ,John Wiley & Sons,

Optional Paper 02 Environmental Biotechnology (Lectures 60)

Unit 1 a) Role of biotechnology in environmental science

(15)

Introduction to biotechnology, microbial ecology, concept of environmental biotechnology, public perception of biotechnology,

b) Use of biotechnology in innovative practices

Concept of bio-leaching, methods of bioleaching, micro organisms involved, advantages and disadvantages of bioleaching. Concept of bio-absorption, factors affecting bioabsorption, mechanism of bacterial metal resistance, limitations of bio absorption, Concept of bioremediation, microorganisms involved, bioremediation processes and technologies, landfill technologies

Unit 2 a) Use of biotechnology in pollution control

(15)

Biotechnology in the reduction of carbon dioxide emission biological calcification, metal pollution and its bio-abatement, Environmental applications of immobilized cells.

b) Applications of some important technologies

Genetic engineering ,Genetic concept in environment management, fermentation technology, concept and significance of tissue culture, animal biotechnology. concept of bio-safety, Fate of GEM'S in the environment

Unit 3 a) Use of ecofriendly technologies

(15)

Aerobic Vs anaerobic degradation, testing of biodegradability, bio-oxidation of phenolic compounds, bio-degradation of specific hazardous wastes, biodegradation of hydrocarbons. Study of aqua-culture, apiculture, use of vermitechnology, role of biotechnology in conservation of species.

b) Biotechnology in agro-industry and forestry

Plant biotechnology, , biological control, organic farming. Bio-fertilizers - types and production technology, Applications of biotechnology in forestry. Concept of biofuel, advantages, production.

Unit 4 a) Microbial degradation of chemical pesticides. (15)

Important micro-organisms in degradation of chemical pesticides mechanism of degradation of chemical pesticides and herbicides, concept and types of bio-pesticides and their significance.

b) Biotechnology for specific industries

Tanning industry, Distilleries, Dairies, Dye industries, Petroleum industries, Pulp and paper industry, Antibiotic Industry

References

1.Introduction to Environmental Biotechnology, A.K.Chatterji,Prentice Hall of India Pvt. Ltd, New Delhi

2.Environmetal Biotechnology-Basic Concepts and Applications Indu Shekhar Thakur I.K. International Pvt. Ltd. New Delhi.

3. Environmental Biotechnology S.K. Agawal, APH Publishing Corp., New Delhi.

4. Elements of Biotechnology , P.K. Gupta, Rastogi Publishing House, New DELHI.

5. Environmental Biotechnology ,Jogdand S.N., Himalaya Publishing House, New Delhi

6. Biotechnology, B.D. Singh, Kalyani Publishers, New Delhi

7.Molecular Buiotechnology- Principles and Applications of Recombinant DNA, Glick and Pasternak. Panima Publishiong Corporation, New Delhi

8.A Text Book of Biotechnogy, R.C. Dubey, S. Chand & company Ltd., New Delhi

Sem III EVS07 Natural Resources and their Conservation 60)

(Lectures

Unit – 1 a) Introduction to natural resources

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Definition and concept of resources, types of resources, uses and values of a resource , major abiotic resources- minerals, fossil fuels, water, soil, air, etc. ,Biotic resources – wild plants: forests, grasslands, plankton, domesticated plants, plantations, agriculture, horticulture etc., Wild animals, fisheries, domesticated animals, use of captive and cultured animals.

b) Impact of growing population on resource use

Human population growth and increasing demand for resources, Factors affecting human population distribution, Population and degradation of resource, changing life styles and technology, equity, justice and common resources, future scenario.

Unit – 2 a) Biodiversity conservation

(15)

Biodiversity as life support system for man, types of biodiversity, ecosystem, species and genetic, use of biodiversity for food, fodder, fibres, medicine, etc. Status of biodiversity today, global and national concerns of degradation of biodiversity, Convention on Biological Diversity (CBD), biodiversity conservation efforts in the country.

b) Wildlife management and conservation

Definition of wildlife, , need for wildlife conservation, in situ and ex situ conservation, Protected Areas Network- national Parks, sanctuaries, wilderness areas, wildlife management, concept of sustainable use of wildlife, Indian ethos of wildlife conservation.

Unit – 3 a) Conservation of wetlands, watersheds, ground water, surface water (15)

Definition and classification of wetlands, values of wetland, present status of wetlands in India, RAMSAR convention ,conservation of wetlands, characters and functions of watersheds, watershed conservation,

Ground water as resource, conservation of ground water in quality and quantity, The water crisis present and future, methods of water conservation, Rain water harvesting. oceans as new areas for exploration, Role of mangroves in marine ecosystem

b) Soil conservation land use,

Soil as resource, soil classification, genesis, causes of soil degradation and their effects, soil conservation practices, wasteland reclamation. Urban and rural land use in India, types of land covers and their role in conserving soils,

Unit – 4 a) Forest resources

(15)

Forest as a resource in the past and present, causes of deforestation, s, Silviculture, energy plantation, social forestry, potential and experience, forests and local people, Joint forest management programme (JFM) Agroforestry Systems Role of grasses as fodder, Role of exotics, horticulture and pastureland development multipurpose trees.

b) Natural resource conservation and Natural Resource Accounting

Concept of resource conservation and its importance, economic aspects of resource

conservation, planning for the conservation of resources, NRA for soil, water, air and biodiversity resource, Environmental Action Plan (EAP).

References:

1. Environmental Conservation : R.F. Dasman(1968) John Wiley and Sons, New York.

2. Environmental Science, Miller T.G.Jr., Wadsworth Publishing Compony

3. Environmental Biology and Toxicology, P.D. Sharma, Rastogi Publications, Meerut 1985

4.Global Biodiversity Assessment, V.H.Heywood & Watson, R.T.,

5.Essentials of Ecology and Environmental Science , Rana S.V.S ,Prentice Hill Publications , New Delhi

EVS 08 Environmental Engineering

(Lectures 60)

Unit – 1. a) Water Treatment Methods

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Methods of water treatment, optimized design, plant control and operational variables, preliminary treatment process, clarification, coagulation, aerobic oxidation, anaerobic oxidation, disinfection of water, water softening reverse osmosis, electrodialysis and other treatment methods

b) Waste water Treatments

Physical treatments-principle, flow measurement, screening, grit removal, Chemical treatments, principles of chemical treatment, coagulation, flocculation, sedimentation., Biological treatments - principle of biological treatment, microbial growth and their kinetics for substrate removal, technical considerations in biological treatment, necessary recycle systems, waste stabilization ponds, aerated logons, oxidation ditch, trickling filter, rotating biological contactors, activated sludge process.

Unit – 2. a) Reuse and recycle of water & waste water

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Primary, secondary and tertiary treatments, sludge dewatering and its disposal, water reclamation and reuse, removal of impurities, removal of residual impurities, effluent recycle and disposal.

b) Designs and functioning of ETP

Concept of ETP, need of ETP in industry, concept of CETP, major units in ETP and their functions, Design aspects of major ETP units. MIS system related to ETP in industry.

Unit - 3. a) Air and noise pollution control technologies

(15)

Meteorology and plume Dispersion, laws governing behaviour of air pollutants, thermodynamics of major air pollutants, Particulate matter control equipmentssettling chamber, cyclones, fabric filter, electrostatic precipitator, wet scrubber, control of gaseous pollutants, control technologies for oxides of sulphur and nitrogen. Principle, design and working of catalytic converters, use of catalytic converters in vehicular pollution control. Principle and working and use of noise meter, Noise reduction and control techniques.

b) Municipal, Industrial and biomedical solid wastes and their treatment

Need of solid waste treatment characteristics of municipal, industrial and biomedical wastes, collection, reduction of waste strength & volume, classification and characterization of solid waste, dry and wet waste treatments recovery and recycling metals, disposal methods for medical, industrial and biomedical wastes, composting vermin-composting.

Unit – 4 a) Parameters and standards of noise, air, water and waste water (15)

Major physico-chemical parameters, need of standards for major pollutants, types of pollutants, Significance of various parameters, standards adopted by CPCB and SPCB. Drinking water quality standards, Effluent discharge standards for disposal on land, rivers and streams

b) Innovative techniques for prevention and control of Pollution

Use of solar radiation in industrial effluent treatment, solar detoxification process, carbon adsorption, adsorption media filters, micro-screening and other low cost treatment methods. Removal of chromium, phenol, mercury, nitrogen etc. from industrial effluents.

References:

of

and

1. Waste water engineering, Met Calf and Eddy, INC, Tata Mc Graw Hill

2.Indian Standard For Drinking Water, BSI, New Delhi.

3. Environmental Pollution Control, C.S.Rao, Wiley Eastern Ltd., 1993

4. Air Pollution Control and Engineering, De Nevers, Mc Graw Hills, 1993

5. Fundamentals of Air Pollution, Samuel, J.W., 1971, Addison Wesley Publishing

6.Fundamentals of Environmental Pollution, Krishnan Khannan S.Chand & Company Ltd., 1994.

7. Noise Pollution, Vandana Pandey, Meerut Publishers, 1995

EVS 09 Environmental Policy and Legislation (Lectures 60)

Unit – 1 a) International Environmental Policies

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Nature of Environmental Policies, Stockholm Conference (1972), Rio Conference (UNCED, 1992), merits of the Conference (Agenda 21), failure of the conference.

b) International Agreements and Treaties

Concept of agreement and treaty, Need of international agreements and treaties, Johannesburg treaty, GAAT and Environment, CITES, Montreal Protocol.

Unit – 2 a) National Policy on Environment

(15)

National Committee on Environment and Planning (NCEP), Tiwari committee, Establishment of MoEF, National Forest Policy, National Water Policy and National Energy Policy, CPCB and SPCBs.

b) Constitutional provisions for Environmental Protection

Historical Background of constitutional provisions, Article 14, 15, 19, 21, 32,39, 47, Article 48(A), Art. 49, Art. 51A (g) as fundamental duties of citizen and directive principles of state policy, Art. 243, 243(G) and (W), Art. 246, 248 and other articles related to Environment, Writ provisions for the protection of environment.

Unit – 3 a) National Environmental Legislation related to water, air, mining etc.

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The Water (Prevention and Control of Pollution) Act, 1974. The Air (Prevention and Control of Pollution) Act, 1981. The Environment (Protection) Act, 1986, their aims, objectives and major contents, and Sec. 12 of Mining Act, 1952.

b) National Legislation on Forest, Wildlife etc.

The Forest (conservation) Act, 1980, The Wildlife (Protection) Act, 1972, The Biodiversity (Protection) Act, 2002, their aims, objectives and major contents.

Unit – 4 a) Environmental Legislation related to CRZ, PIL & PIL

(15)

Concept and need of public interest litigation, jurisdiction of High Courts and Supreme Court. Need of CRZ rules for regulation the activities in coastal zone, Statutory provisions in IPC and CRPC, common law remedies for environmental safeguard, Environment related provisions in Public Liability Insurance Act.

References:

1.Environmental Law and Policy of India ,Diwan,S. and Rosencranz, A,2001,oxford University Press.

2. Environmental Policy in India, Shekhar Singh, IIPA, New Delhi

3.Declaration of :The Stockholm Conference, Rio, Rio+5 and Rio+10

4. Our Common Future, WECD, 1991

5. Universal Environment and Pollution Law Manual, S.K. Mohanty, 1998

6.Legal Aspects of Environmental Pollution and Management, S.M.Ali, 1992

7. Environmental Protection and Laws, Jadhav and Bhosale, V.M. Himalaya publishing

House.

EVS Optional Paper 03

Unit – 1 a) Introduction to Environmental Toxicology

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Definition, classification, Basic Concepts, origin of toxicants , general nature of toxicants in environment, Evaluation of toxicity, Bioassay, factors affecting toxicity, mutagenesis, spermatogenesis, carcinogens, hallucinogens, phytotoxins and animal toxins.

b) Ecotoxicology

Routs of entry of toxicants, Toxic response of different body systems likes respiratory, gastro-intestinal tract, liver, kidney, immune system, reproductive system. Problems and approach, effects of toxicants on ecosystem, detoxification of toxicants in resistant biota.

Unit - 2 a) Biotransformation, Bioaccumulation & Biomagnification of toxicants

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Toxicants, absorption, distribution and excretion of toxicants in animal body, Bio-transformation of toxicants, antidotes treatment and their detoxification of toxicants, Bio-accumulation, Bio-magnification.

b) Environment and health and environmental stress

Basic principles of environmental health, community health, impact of changing environment on biota, effect of stress on environment, adaptations and tolerance level of various organisms and stress factors, micro-organisms of extreme environment.

Unit – 3 a) Occupational health hazards

(15)

Stress, man, machine and environment, ergonomics and occupational physiology and hazards of working environment safety management of occupational hazards.

b) Epidemiology

Definitions, types, bacterial, viral, protozoan, zoonotic diseases, endemic and epidemic diseases, causes, effects and control, case studies.

Unit- 4 Sanitation and public health, bio-medical waste and its disposal (15)

Sanitation, hygiene and human health, concept of social and public health, sanitation practices and related problems, case studies., definition of hazardous waste and biomedical waste, comparative study of existing disposal methods and environment friendly disposal methods of biomedical waste.

References:

1. Environmental Sanitation, Ehlers, V.M., add Steel, E.W., McGraw-Hill Book Co., Inc.

2 Toxic Chemicals, health and the Environment, Lave, L.B and Upton, A.C. 1987. The HopkinsPress Ltd., London.

- 3 Basic Environmental Toxicology, Lorris G. Cockerham & Barbara S. Shane, CRC Press.
- 4. Introduction to Environmental Toxicology Wayne G.Landi Ming-Ho Yu.
- 5. Patty's Industrial Hygiene and Toxicology, Ed.by Lewis J.Cralley, Lester V. Cralley, James S. Bus.
- 6. Hazardous waste management Charles A. Wentz, 2nd Edition, 1995, Mc Graw Hill International
- 7. Integrated Solid waste management George Tchobanoglous, Hilary & Samuel A. Vigil
- 8. Standard handbook of hazardous waste Harry M. Freeman, Mc Graw Hill 1997. treatment and disposal
- 9. Environmental Sanitation, Ehlers, V.M., add Steel, E.W., McGraw-Hill Book Co., Inc.
- 10. Toxicology- The Basic Science of Poisons, Louis J Casarette, John Doull. Mc Millan Publishing Co. Inc. New York.
- 11. Modern Toxicology, Gupta, Salunkhe, Metropolitian Book Co. Pvt. Ltd.

SEM IV EVS10 Socio- Economic Aspects of Environment (Lectures 60)

Unit 1 a). Recent advances in human ecology

(15)

History and human ecology, strategy for human survival and environmental change, Human development and modern day ecological crises- depletion of natural resources, resource crunch, destruction of flora and fauna, problems of waste generation and their disposal, pollution, Urbanisation, urban sprawl., slums .Industrialization, Unplanned urban growth, ; social conscience and humanism..

a) Environmental and developmental priorities in India, past and future

Developmental priorities in India, pre independence and post independence period, industrialization, green revolution, urbanization, developmental priorities vs. environmental priorities, resource depletion and degradation due to improper priorities such as water, soil, forest etc. in India.

Unit2a)Global and national environmental movements

Global environmental movements and initiatives - Green Peace, IUCN, WWF, World Watch Institute, Wetland International etc. Indian environmental movements and initiatives Chipko, Narmada Bachao Andolan, Save Western Ghats, Silent Valley, Bhopal Gas Tragedy. Rehabilitation and resettlement issues, Government policies and social awareness for the protection of environment

b) People's participation and role of NGOs in environmental protection

People's participation in environmental protection, history of role of women in environmental protection in India, need for the involvement of women, youth, NGOs in environmental protection, Individual efforts for environmental protection.

Unit 3 a) Philosophy of nature conservation and co-existence

(15)

Man nature relationship, cultural heritage and man's place in Nature, philosophy of nature conservation and co-existence, human responsibility in maintaining nature's equilibrium and harmony, concept of trusteeship

b) Cost- benefit analysis of developmental projects

Concept of cost benefit analysis, applications, costs of developmental projects, tangible costs and benefits, invisible environmental costs, differed costs, incremental costs, case studies.

Unit 4 a) Environmental Audit, Social Audit (15)

Definition of environmental audit, social audit and socio-economic surveys, Social Impact Assessment (SIA) methods and steps in SIA.

b) Environmental economics, eco-politics and accounting

Ecology and economy, economic principles, role of environmental economics at local, regional, nation and global level, polluter pays principle, natural resource accounting, trade and environment ,eco-politics - have's and have nots, north south divide, restructuring of global politics on environmental justice.

Reference:

1. Environmental Economics in theory and practice - Hanley, Shogren and White.

- 2. Cost benefit analysis and the environment Hanley, Splash.
- 3. Environmental Economics- Karpagam.
- 4. Environmental Economics- G.N. Singh.
- 5. Environmental Economics- R.N. Bhattachary

Unit	_	1	a)Introduction	to	Hazards	and	Disasters
(15)							

(15)

Definition of hazards and disasters, differences between disaster and hazards, types of hazards and disasters, natural disasters and man made hazards.

b) Man made hazards

Industrial accidents, causes and effects of hazardous waste, toxic waste, chemical waste and their disposal and control, industrial pollution - acid rain and its control, ozone depletion causes and control, green house effect and control measures, possibility of radiation hazards and its control, Oil spills, causes and control, Land slides - causes, changed land use practices, prevention measures, man made hazards fire, forest and industrial fires and control, environmental degradation due to wars.

Unit – 2 a) Natural disasters

(15)

Earthquake - causes of occurrences, consequences, measurement, distribution of earthquake in world and India ,

Volcanoes - types, causes of occurrences, consequences, distribution in world and Indian, Tsunami - causes of occurrences, consequences, distribution in world.

Cyclones – types of tropical and temperate, distribution in world and India, role in Indian subcontinent, storms - causes of occurrences, distribution in world,

Floods - occurrences role of man and nature,

Draught - reasons of occurrences, draught prone areas in India and world, consequences, Epidemics - types and causes and major epidemic's in India.

Unit – 3 a)Prediction of disasters

(15)

Indicators of disasters, planning and control of natural disasters, earthquake, cyclones, floods, storms, tsunami, draught, volcanoes and epidemics,

National and state level planning for hazards mitigation, use of remote sensing in disaster management, disaster management plan, Social and economic impact of natural disasters and man made hazards.

Unit – 4 Restoration management

(15)

Environmental disasters, hazards and restoration management, environmental risk assessment, anthropogenic activity resulting environmental degradation, public perception of risk.

References:

1. Environmental Hazards: Assessing Risk and Reducing Disaster Smith, Keith, Routledge Publication

2. Environmental Geology, K. Valdia, Tata McGraw Hill Publishing House

3.Lal D.S. ,Climatology, Parag Pustak Bhavan,Allahabad

4.Hillary, Sir Edmand, Ecology,2000, The changing face of Earth, Multimedia Publication,1984

EVS12 Environmental Planning and Management (Lectures 60)

Unit – 1 a) Environmental Management Plan (EMP) ISO 14000 Series (15) Scope of environmental management, importance, Principle functions environment and enterprise, objectives and need for training for staff, criteria for EM instrument, project management, production management,. Background and Development of ISO 14000, EMS, Principles and elements

b) Environmental planning, micro and macro planning, rural and urban planning Concept of and need for environmental planning, levels of planning - micro planning, macro planning, National and regional Planning basic difference in rural and urban planning, Planning Parameters for urban and rural areas, Demographic considerations dynamics, requirements, available resources, Gandhian concept of self reliant villages.

Unit – 2 a) Fair environmental practices in trade, commerce and industry (15)

Total Quality Management (TQM) and business ecosystems, business ethics and environmental principals, traditional trade and commerce practices and fair environmental practices, Quality management and its impact of human society in India.

b) Global environmental initiatives, National Environmental Policy (NEP)

Environmental initiatives at the national and global level, case studies, National Environmental Policy - basis, regulatory structure for policy implementation, role bureaucrats, problems in formulation of policy, policy implementation and analysis, strategies for policy implementation.

Unit – 3 a) Environmental Impact Assessment

(15)

Need of EIA, Scope, objectives, types of environmental impacts, steps involved in conducting the EIA Studies, Environmental Impact Assessment techniques-Ad-hoc method, checklist method, overlay mapping method, network method, simulation and modeling technique, matrix method, system diagram technique., Merits and

Demerits

of EIA studies.

b) Environmental Audit

Preamble, scope and objectives of environmental auditing, applicability of satutary environmental statement audit, contents of EA report,

Consumption Audit, Pollution Audit, Hazardous waste audit ,Disposal Audit ,Cost audit investment audit ,Voluntary audit

Unit – 4 a) Concept of eco-development Vs growth (15)

Concept of eco-development, Integrating economic and ecological principles, definition of physical and economic growth, cost benefit ratios, development processes and growth, Integrated approach to environment and development, Western Ghats eco- development plan, developmental models for hilly area, river basins lands, growth centers.

b)Concept of sustainable Development

Concept of sustainable development, Definition of sustainable economy, society, over exploitation, Concept of wise use and sustainable development, Planning Vs perspective planning.

References:

- 1. Environmental Impact Assessment, Canter, L.W., 1977, McGraw Hills New York.
- 2. Environmental Impact Assessment, Peter Wathern , Unwin Hywin, London
- 3. Environmental Impact Assessment, P.R. Triwedi, APH Publishing Corporation, New Delhi
- 4. A Handbook ofn EIA, V.S..Kulkarni,S.N. Kaul & R.K.Trivedi Scientific Publication (India)

EVS Optional Paper 04 Environmental Monitoring and Energy Studies

(Lectures 60)

(15)

Unit 1. a) Principles of Remote Sensing, its Applications in Environmental Monitoring

Principles of remote sensing, EMR and its interaction with matter, types of sensors

and

data.

platforms, IRS satellites and their sensors, aerial photography, satellite imagery, elements of aerial / satellite image interpretation, application of remote sensing in environmental studies.

b) Geographical Information System (GIS)

Concept of GIS, Maps and GIS, cartography, digital representation of geographic

types of geographical data, raster and vector based GIS data processing, their disadvantages and disadvantages, GIS implementation and project management, Importance of GIS in environmental studies.

Unit 2.a) Present status of energy use patterns in India

Population and energy demand, energy use pattern in rural and urban area, impact of growing population on energy use, changing life style and energy use. Energy profile of oil and natural gas, Indian production and reserves, nuclear option, role of IREDA & MEDA in energy generation.

b) Conventional and non-conventional energy Sources

Concept and classification of energy resources, renewable and nonrenewable energy resources, coal, oil and natural gas, hydropower as conventional energy resources, environmental imparts of conventional energy resources, need of non conventional energy resources, geothermal energy, oceanic energy, wind energy, biomass energy, nuclear energy, merits, demerits and environmental issues of these energy resources.

Unit 3 a)Solar Energy

Measurement of solar radiation, collection, conversion and storage, solar pond, solar energy collectors, solar heaters, concentrating collectors, solar water heating systems, solar cookers, solar agricultural product dryers and other applications of solar energy.

b) Biomass Energy

Concept of biomass energy, biomass energy conversion technologies wet and dry processes, concept of energy plantation, thermal gasification of biomass, types of gasifiers, biogas generation, factors affecting biogas production, types of biogas plants, their merits and demerits

Unit 4 a) Wind Energy

Introduction to wind energy, basic principles of wind energy conversion, wind survey for electrical energy generation, criteria for site selection, major components of Wind Energy Conversion System., types of Wind Energy Conversion Systems ,applications of wind energy, merits and limitations of Wind Energy Conversion System.

b) Innovative energy technologies for the future

Limitations of traditional energy technologies, criteria for the selection of new energy sources, alternative liquid fuels (Alcohol fuel), magneto hydro dynamic (MHD) power generation, fuel cells, hydrogen as on alternative fuel, its production, conversion and use as energy sources. Future prospects for innovative energy technologies.

References : 1.Remote Sensing and GIS - M. Anji Reddy

2. Environmental Remote Sensing - F. Mark Danson

3. Principles of GIS for Land - Burrough P.A. Resources Assessment

4. Renewable Energy Environment and Development, Maheswar Dayal Konark Publishers Pvt.Ltd.

5. Reneweable Energy Programmes in India : some recent developments , Sinha P.C., Natural Resource Forum, 18(3), 1994

6. Renewable Energy Resources: Basic Principles And Applications Tiwari, G.N., Narosa Publishing House .

7. Conventional and Non conventional Energy sources G. D Rai