

**Swami Ramanand Teerth
Marathwada University, Nanded.**

**Revised Curriculum
B. Sc. First year
(Semester I & II)
Environmental Science**

W.e.f. : June, 2013.

Env. 101 : Fundamentals of Environmental Science

Unit I : Introduction : concepts of environment , Global environmental problems. Need of Environmental awareness, Scope of Environmental Biology, Interrelationship of ecology with other disciplines. Ecology and its types: Behavioral, Population and Community ecology, Landscape ecology; Ecological principles. 10

Unit II : Biosphere and its components :

Definition of Biosphere; Components of biosphere

Atmosphere: Definition, Composition of air; Physico-chemical structure of atmosphere: Troposphere, Stratosphere, Mesosphere, Ionosphere, Exosphere. 05

Lithosphere: Definition; Types of rocks; Process of soil formation: Physical weathering, Chemical weathering; Climate and soil types, color and Morphology of soil, Soil profile; Physical properties of soil : Density, Porosity, Permeability, Temperature, Soil water, Soil atmosphere; Chemical properties of soil : Hydrogen ion concentration, Organic matter, Inorganic elements; Soil fauna and Soil flora; Soil erosion: Agents of soil erosion: Running water, Glaciers, Wind, Sea water, Deforestation and Overgrazing; Types of erosion: Sheet erosion, Rill erosion, Gully erosion, Slip erosion (land slide), Wind erosion; Soil conservation. 10

Hydrosphere: Definition, Physical properties of water : Temperature, Specific gravity, Viscosity, Thermal conductivity, Expansion before freezing, Surface tension, Solvency, Buoyancy, Transparency, Pressure; Chemical properties of water : Salinity, Solubility of gases, Oxygen, Carbon dioxide, Nitrogen, Hydrogen ion concentration, Hydrogen Sulphide; Hydrological cycle. 10

Unit III : Biogeochemical cycles

Biogeochemical cycles : a) Gaseous cycles: Oxygen cycle, Carbon cycle and Nitrogen cycle. b) Sedimentary cycles: Phosphorus cycle, Sulphur cycle. 10

References

01. **Fundamentals of Ecology** : Eugene P. Odum, (Natraj Publishers, Dehradun.)
02. **Principles of Ecology** : P. S. Verma, V. K. Agarwal (S. Chand and Co. New Delhi)
03. **Environmental Biology** : P. D. sharma (Rastogi Publications, Meerut)
04. **Ecology and Environment** : P. D. sharma (Rastogi Publications, Meerut)
05. **Principles of Environmental Biology** : P. K. G. Nair (Himalaya Publishing House, New Delhi)
06. **Environmental Biology** : M. P. Arora (Himalaya Publishing House, New Delhi)
07. **Environmental Science** : Eger Smith, Smith, W. M. C. Brown (Company Publishing)
08. **Principles of Soil Science** : Watt K. E. F. (1973), (McGraw Hill Book Company, New Delhi)
09. **Introduction to Environmental Studies** : Turk & Turk
10. **Ecology and Field Biology** : Robert Leo Smith (Harper Collins college publication)
11. **General Ecology** : H. D. Kumar (Vikas Publishing house, New Delhi)
12. **Elements of Ecology** : Brijgopal, N. Bharadwaj (Vikas Publishing house, New Delhi)
13. **Fundamentals of Environmental Science** : G. S. Dahliwal, G. S. Sangha, P. K. ralhan (Kalyani Publishers, New Delhi)
14. **Environmental Ecology** : Bill Freedman (Academic Press, New York)
15. **Concepts of Ecology** : N. Arumugam (Saras Publication, Kottar, Dist. Kanyakumari)
16. **Plant Ecology** : P. L. Kochhar

Env. 102 : Fresh Water : Sources and Uses

Unit I : Introduction :

Freshwater, Definition, Scope, Importance and need for Freshwater management, Global Distribution of fresh water, The limits of global fresh water resources, Freshwater resources of India, Quality of surface water, Water quality in flowing waters; Rainwater harvesting; Self purification of rivers; Eutrophication and its Remedial measures. 15

Unit II : Sources of Water :

Natural Water Resources types: Rainfall and runoff : precipitation, rain and snow fall water, measurement of rainfall, Surface sources: Streams, lakes, Rivers, Ponds, impounded Reservoirs, Stored rainwater, Suitability of Surface water with regard to quantity and Quality. 07

Under ground water Resources: Infiltration, porosity, water bearing stratum, Ground water flow, ground water yield, permeability. Ground water quality, Natural contaminants, Contamination from domestic wastewaters, Industrial and commercial sources, Agricultural sources, Aquifers, Infiltration galleries, Infiltration wells, Shallow wells, Deep wells, Tube wells, Artesian wells; Springs: Artesian, Gravity, Surface. 10

Need to protect water supplies, Water Supply Systems : Gravity system, Pumping system, Gravity and Pumping system. 03

Unit III : Uses of Fresh Water:

Domestic Uses, Civic or Public purpose, Industrial purpose, Business or Trade Purpose, Agriculture Purpose, Navigation, Hydroelectric Power Generation Purpose, Recreation Purpose, Factors affecting Water use Loss and waste. 10

References

01. **Water Supply and Sanitary Engineering** : S. C. Rangwala, R. C. Rangwala (Charotar Publishing House Anand)
02. **Environmental Science** : Nabel and Wright (Prentice Hall, New Jersey)
03. **Environmental Chemistry** : B. K. Sharma (Goel Publishing House, Meerut)
04. **Water and Hydrology** : Peter B. black
05. **Environmental Science** : Enger Smith, Smith, W. M. C. Brown (Company Publishing)
06. **A Treatise on Limnology** : Evelyn Hutchinson
07. **Principles of Soil Science** : Watt K. E. F. (1973), (McGraw Hill Book Company, New Delhi)
08. **Water Supply** : Alan C. Twort, Don D. Ratnayaka, (IWA Publishing, New Delhi)
09. **Water Pollution** : B. K. sharma, Dr. H. Kaur (Krishna Prakashan Mandir, Meerut)
10. **Water Supply and Pollution Control** : Warren Wiessman, Jr. Mark J. Hammer (AWL Publishers, California)
11. **Water** : M. N. sastri (Himalaya Publishing House, New Delhi).
12. **Water and Waste Water Technology** : Mark J. Hammer, Mark J. hammer Jr. (Prentice Hall of India Pvt,Ltd., New Delhi).
13. **A textbook of Environmental Studies** : G. R. Chatwal, Harish Sharma (Himalaya Publishing House, New Delhi).
14. **Environment Problems & Solutions** : D. K. Asthana, Meera Asthana, S. Chand & Co., New Delhi,1998
15. **Water Supply and Pollution Control** : Warren Viessman, Jr. Mark J. Hammer, Addison – Wesley California, 1999

Env. 103 : Concepts in Ecosystem

Unit I : Basic concepts in an Ecosystem :

Definition; Components of ecosystem; Abiotic components: Light, Temperature, Pressure, Water, Wind, Soil; Biotic components: Population ecology –Population characteristics Population growth curve, Natalty, mortality,. Species diversity, Species dominance; Intraspecific interactions; Interspecific interactions: Neutralism, Commensalism, Mutualism, Parasitism, Predation. 10

Unit II : Types of Ecosystem : Introduction, Structure and function of ecosystem

Aquatic ecosystem: Pond ecosystem, Lake ecosystem, River ecosystem, Marine ecosystem; Estuarine ecosystem; Terrestrial ecosystem: Forest ecosystem : Temperate forest, Deciduous forest, Tropical rain forest, Sub tropical rain forest, Trophical savanna biome, Grass land biome, Desert biome. 10

Energy flow in an ecosystem: Primary production, Secondary production; Food chain: Grazing food chain, Detritus food chain; Ecological pyramids: Pyramid of number, Pyramid of biomass and Pyramid of energy; Food web; Ecological indicators. 10

Deforestation; Desertification; Afforestation and types of forestry, Conservation of forest. 07

Unit III : Wild life :

Definition; Wild life in India; Necessity for wild life conservation; Modes of wild life conservation; National parks: Tadoba, Corbett, Borivli, Kanha, Ranthambor; Sanctuaries: Kaziranga, Bharatpur, Gir, Periyar. 08

References

01. **Fundamentals of Ecology** : Eugene P. Odum, (Natraj Publishers, Dehradun.)
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16. **Plant Ecology** : P. L. Kochhar

Env. 104 : Fresh Water Treatment

Unit I :

Water Analysis: meaning of Pure water, Reasons of water analysis. 03

Physical water analysis: Colour, Odour, Taste, Temperature, Turbidity; Chemical water analysis: Chlorides, Dissolved gases, Hardness, pH, Alkalinity, Acidity, Metals, Nitrogen and its compounds, Total solids, Total suspended solids, Total dissolved solids; Biological water analysis: Planktons: Phyto, Zoo, Nektons; Bacteriological water analysis: Coli forms, Qualitative and Quantitative, MPN, Presumptive, Confirmatory, Completed, E-coli index, Water quality standards, Purity maintenance of water. 12

Unit II:

Water Treatment Methods: Necessity of treatment, Sedimentation Tanks: Fill and draw, Continuous type; Coagulation: any six methods; Filtration: Slow sand filters, Rapid sand filters; Disinfection: any six methods; Chlorination: Properties of chlorine, Action of chlorine, Application of chlorine, Free chlorine gas, Plain chlorination, Pre-chlorination, Post chlorination, Dechlorination, Ortho-tolidin test, Starch iodide test. 15

Unit III:

Water Softening Methods: Purpose, Temporary hardness removal, Permanent hardness removal, Lime soda process, Zeolite process, Demineralization process; Colour, odour and taste removal; Iron and manganese removal; Fluoridation; Defluoridation, Watersheds 15

References

01. **Water Supply and Sanitary Engineering** : S. C. Rangwala, R. C. Rangwala (Charotar Publishing House Anand)
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Env. 105 : Laboratory Course

01. Measurement of Atmospheric Humidity by Psychrometer.
02. Measurement of Light intensity by Lux meter.
03. Determination of Total organic matter by ignition method
04. Determination of Soil pH
05. Determination of water holding capacity of soil.
06. Determination of N. P. K. from soil.
07. Determination of bulk density of soil.
08. Identification and description of Phytoplankton's (Any Five)
09. Identification and description of Zooplankton's (Any Five)
10. Plankton counting by Sedgwick cell
11. Determination of plant population density.
12. Estimation of Dissolved oxygen from water by Winkler's method.
13. Estimation of Alkalinity of provided water sample.
14. Estimation of Acidity from provided water sample.
15. Determination of Residual chlorine from provided water sample.
16. Estimation of total hardness from water sample by E. D. T. A. method.
17. Estimation of Permanent hardness from water sample by E.D.T.A. method.
18. Estimation of chlorides from water sample by Argentometric method.
19. Determination of leaf area index
20. Visit to Forest Reserve, National Park, Sanctuaries, Water reservoirs, and submission of

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Model Question Paper (Practical) Annual

Class : B. Sc. First Year

Subject : Environmental Science

Paper : Env. 105 : Laboratory Course

Time : Three Hours

Maximum Marks : 100

- Q. 1: Estimate Dissolved Oxygen / Total Hardness / Permanent Hardness from provided water sample 25
OR
Determine Total organic matter from soil / Water holding capacity of soil / Soil pH by pH meter.
- Q. 2: Determine Acidity / Alkalinity / Residual chlorine from provided water sample/ 25
Determine NPK from soil / Bulk density of soil.
OR
Identify and comment on Phytoplankton's / Zooplankton's. (Any Three)
- Q. 3: Determine leaf area index of provided leaf / Determine plant population density.
OR
Determine Atmospheric moisture from the air by Psychrometer. /
Determine Chlorides from provided water sample / Measure the light intensity by Lux meter / Count the Planktons from provided sample by Sedgwick rafter cell. 20
- Q. 4: a) Record Book submission 10
b) Excursion Report 10
c) Viva – Voce 10