

**UNIVERSITY OF PUNE**  
**Revised Syllabus from 2008**  
**S.Y.B.Sc. (Environmental Science)**  
**ENV-201: Ecology and Ecosystem (Semester-I)**

<b>Unit</b>	<b>Contents</b>	<b>Lectures</b>
1	Introduction, Interdisciplinary nature, History and scope of Ecology. Ecological Principals & Concepts: - Levels of ecology (Gene to organism – Individual to Biome, Biosphere and Landscape). Autecology, Synecology, population, community, biome, and limiting factors: biotic and abiotic	6
2	Environmental heterogeneity and dynamism. Evolution of environment; Early atmosphere; Reducing and oxidizing atmosphere	4
3	Population Ecology: - Basic concepts of population ecology, size and distribution of population. (Random, Aggregate and uniform populations with examples). Population dynamics characteristic features: Natality Mortality, fecundity, density, fluctuation, age distribution, biotic potential, prey-predator relationship, Environmental resistance in relation to absolute maximum and realized minimum carrying capacity	10
4	Characteristics of community, composition and structure, origin and development, ecotone, edge effect, ecological niche, interspecific and intra specific competition, examples.	4
5	Ecological Succession: Mechanism of succession; trends of succession, types, climax and sub-climax concept, edaphic and climatic succession, models of succession, hydrosere and xerosere	5
6	Concept of food chain food web, ten percent law, net community' production, Energy flow, The ecosystem concept, abiotic and biotic components.	3
7	Energy input in ecosystem, standing crop, biomass, primary and secondary production, gross and net production, methods of measuring productivity, pattern of primary production and biomass in the major ecosystem of the world, Feedback and control.	9
8	Concept of Biogeochemical cycles, gaseous and sedimentary Hydrological cycle, Oxygen, carbon, nitrogen, sulphur, and phosphorus cycle, nutrient budget, human impact on nutrient cycles.	7

### ENV-201: Biological Diversity (Semester-II)

Unit	Contents	Lectures
1	Biodiversity concept, Definition and Scope. Organisms evolution and distribution in space and time Types of biodiversity – ecosystem, species and genetic, Biodiversity at local, national and international level,	6
2	History and origin of species diversity, Species variation, convergence and divergence in species, number of species of microbes, plants and animals,	5
3	Centres of diversity, concept of endemism, types and endemic species with examples	3
4	Origin and evolution of species diversity, Agro-ecosystem – factors responsible for variation	3
5	Ecosystem diversity- classification of ecosystem, major ecosystems of India and their characteristics, floral and faunal elements	5
6	Genetic diversity – Brief introduction to genetic variation in species, concept of genetic drift, gene pool. Measurement of genetic diversity using DNA, chromosomes, molecular markers	6
7	Concept of hotspots and the basis of hotspot identification, detailed account of Western Ghats as a hotspot, India as mega-biodiversity nation, Mayrs system and latest estimates	5
8	Value of biodiversity – Introduction, direct and indirect value as food, fodder, timber, forage, medicinal and ornamental, Other benefits of biodiversity	4
9	Loss of biodiversity- Factors responsible for degradation of ecosystem, fragmentation, pollution and overexploitation, change in habitat, effects of climate change, genetically modified organisms and their effects on ecosystem, human-wildlife conflict	6
10	Conservation of biodiversity –need and awareness, <i>In-Situ</i> and <i>Ex-Situ</i> conservation with examples, traditional methods of conservation, International and national efforts for biodiversity conservation.	5

### ENV-202: Hydrology (Semester-I)

Unit	Contents	Lectures
1	<p><b>Introduction to Hydrology:</b> Definition and Scope, Sources, Occurrence and distribution of surface and groundwater. Origin of water – meteoric, juvenile, magmatic and sea waters, chemical composition of groundwater, river water, sea water</p>	4
2	<p><b>Hydrological process:</b> Surface run off, interception, infiltration, evaporation, evapo-transpiration, groundwater flow, primary and secondary aquifers</p>	4
3	<p><b>Groundwater Chemistry:</b> Groundwater quality, physical, chemical and biological properties of water, quality criteria for different uses. Groundwater quality in different provinces of India, problems of Arsenic, nitrate and Fluoride with case studies, saline water intrusion in aquifer and its prevention.</p>	12
4	<p><b>Groundwater problems and Management:</b> Groundwater problems related to foundation work, mining, canals and tunnels, agriculture. Problems of over exploitation, remediation, groundwater balance and methods of estimation, legislation, sustainability criteria and managing renewable and non-renewable groundwater resources and groundwater development in urban area and artificial recharge methods</p>	13
5	<p><b>Water Harvesting:</b> Introduction to watershed, Definition, characters of materials for catchment apron. Rainwater harvesting: Techniques for preparation of water harvesting catchments, storage of harvested water, traditional methods of water harvesting, some issues related to rain water harvesting</p>	10
6	<p><b>Water Pollution:</b> Surface and groundwater Types, sources, consequences, groundwater contamination, effects on man and environment</p>	5

### ENV-202: Soil Science (Semester-II)

Unit	Contents	Lectures
1	Definition of soil, classification, types, soil formation. Physical, chemical and biological weathering. Main components of soil Soil profile – Introduction, horizons – A, B, C and D	8
2	Soil morphology – texture, structure, and other physical, chemical, and biological properties	5
3	Role of soil nutrients (major, minor and trace) in plant growth, various forms of nutrients in soil, soil moisture	4
4	Soil microbes and other organisms, types and their role in soil fertility, nitrate and phosphate solubilising microbes	4
5	Soil organic matter, its decomposition and effects on soil fertility. Soil chemistry – reactions in soil, Acidic and alkaline soils, organic manures and green manures, biofertilizers. Effects of fertilizers on soil properties	10
6	Soil erosion, types of agents, factors affecting erosion	3
7	Soil pollution, types, sources, and effects of soil pollution, bioremediation of soils with examples	5
8	Soil conservation: Methods, engineering practices and land treatment, land drainage. Need and practices for agricultural lands: physical, mechanical and biological practices.	6
9	Soils of India in general and soils of Maharashtra	3

## **PRACTICAL BASED ON 201 AND 202**

### **Soil Science**

1. Visit to Soil Survey Department of the State Government or Agriculture University.
2. Determination of water holding capacity of soil.
3. Determination of available nitrogen in the soil sample.
4. Determination of total calcium carbonate in soil by rapid methodl.
5. Determination of Fe (II) in soil.
6. Determination of Soluble Salts in Soils.
7. Determination of Soil Sediments.
8. Determination of Total Organic Carbon in Soil.
9. Determination of Gypsum requirement of alkaline soils
10. Determination of available potassium by Flame Photometer.

### **Hydrology**

1. Sampling of water and preservation
2. Analysis of specific conductance
3. Analysis of nitrate
4. Analysis of fluoride
5. Analysis of sulphide
6. Turbidity test
7. Analysis of Free Chlorine
8. Determination of oil and grease
9. Determination of silica
10. Determination of Phenols
11. Bacterial analysis of Water

### **Ecology and Ecosystem and Biological Diversity**

1. Study of vegetation by quadrat method – list count quadrat
2. Determination of minimum area and six by employing species area curve method
3. Study of vegetation by line transect method
4. Study of vegetation by Belt transect methods
5. Study visits to protected area / sacred grove / nature reserve to understand the biological diversity and interrelationship of biotic-abiotic factors
6. Identification of insects, birds, animals and plants in sanctuaries
7. Visit to the Interpretation Centre or Nature Information Centre

**Out of the above mentioned list any 24 practical are to be covered in both the semesters.**

**BOOKS:**

1. A Manual of Air Quality Monitoring: - NEERI Publication.
2. A Textbook of Soil Science – J.A. Daji – Media Promoters and Publ. Pvt. Ltd. Mumbai
3. Air Pollution: - MN Rao, Mcgraw Hill 1993.
4. Air Pollution: - V.P. Kudesia Pragati Prakashan Meerut.
5. Biodiversity and Environment:- S.K. Agarwal, S. Tiwari and P.s. Dubey, 1996.
6. Biodiversity Conservation: - Global agreements and nation at concerns. RAMSAR sites CBD, Quarantine, Regulation, National terety pdicy Biodiversity Act wild life Act.
7. Biodiversity Measurement and Estimation: - D.L. Hawks worth Director international Mycological Institute Surrey, UK, Published: - Chapman & Hall, Condou New York, Tokyo, Madras.
8. Climateology: Fundamentals and Applications: - Mater J.R.
9. Climatology; Selected Applications: - Henry D. Foth
10. Concept of Ecology: - E.J. Koromondy, 1996, Concept of modern Biology Series, Prentice Hall.
11. Ecology 2000:- Sir Edmand Hillary.
12. Ecology and Environment: - P.D. Sharma, 1994.
13. Ecology and Environment: - P.W. Sharma Rastogi Publications, Meerut.
14. Env. Priorities in India and Sustainable Development: - T.N. Khoshoo.
15. Environment, Energy, Health, Planning for conservation:- V.Vidyanath, Gyan Publishing house, New Delhi.
16. Environmental Chemistry – A.K. De
17. Environmental Chemistry – B.K. Sharma
18. Environmental Chemistry – H. Kaur
19. Environmental Chemistry – Thomas G. Spiro
20. Environmental Science: - A study of interaction ship E.D. Enger, B., E. Smoith, 5th ed; WCB Publication.
21. Environmental Science: - Daniel Botkin and Edward Kelter, John Wiley and Sons, NewYork.
22. Environmental Science: - Eldon d. Enger and Bradley F. Smith, WCB Publishers; Boston.
23. Environmental Science: - Enger, Smith, Smith W.M.C, Brown. Company Publication
24. Forests Types of India: - (1968) Champion and Seth.
25. Fundamentals of Air Pollution: - 2nd Ed. Arthur Co Stern Acad. Press 1984.
26. Fundamentals of Ecology: - Dash M.C. Tata McGraw Hill. Pub. Co- Ltd. New Delhi.
27. Fundamentals of Ecology: - E.P. Odum, Revised Edition 1995-96 Edition 2003.
28. General Climatology: - Critichfield H.J.
29. General Meterology: - Horace Robert Byers, Sc. D. 3rd Ed. Mcgraw Hill Book Company New York, Toronto, London.
30. Handbook of Industrial pollution and Control – S.C. Bhatia
31. Introduction to Climatologh for topics: - Ayoade J.O.
32. Introduction to Weather and Climate: - Trewartha
33. Manual for field scology: - R. Mishra.
34. Meteorology of Air Pollution: - R.S. Scores 1990 Ellis Hardood Pub.
35. Modern Concepts in Ecology: - H.D. Kumar
36. Perspectives in Environmental Studies – Kaushik and Kaushik
37. Principals of Environmental Biology: - P.K.G. Nair, Himalaya Pub. House, Delhi.
38. Productivity in Fresh Water Ecosystem: - Vollenveider.
39. Resources & Human Well-Being:- Archana Sharma.
40. Soil Pollution – Dinesh Mani
41. The Atmosphere: An Introduction to Meterology :- Frederic K. Lutgen E.J. tarbuck.
42. The Biological diversity Act 2002 and Biological diversity rules 2004:- National Biodiversity Authority INDIA. 475, 9th South cross street, Kalpalocwar Nagar, Neelangarai Chennai – 600041.
43. Vegetation of the Earth: - Heinovich Walter, the English University Press Ltd. London. Springer-Verlag, New York.
44. Water & Plant Productivity: - Toder G. Kurdess.
45. Water and Plant Productivity: - Todar G. Kudrev.