Shivaji University, Kolhapur
Syllabus for B.Sc. (Part-I)
(Environmental Science)

Paper I: Fundamentals of Environmental Science

Section-I

1. **Definition, Scope and Importance of Environmental Science**: Definition; Multidisciplinary nature of the environmental Science; Scope and importance; Introduction to global environmental problems. (6)
2. **Physical and Chemical Environment of Man**: Evolutionary history of the earth; Ecosphere and its components such as Atmosphere, Hydrosphere, Lithosphere and Biosphere; Structure of atmosphere; Physical parameters of the earth like solar radiation, pressure, humidity, visibility and climate etc.; Distribution of water on the earth; Hydrological cycle. (8)
3. **Ecological Concepts**: Definition and scope of ecology; Subdivisions of Ecology, Concept of Ecosystems, their structure and functioning; Energy flow; Food chains and food webs; Ecological pyramids; Biogeochemical cycles of nitrogen, oxygen and carbon, Types of Ecosystems, Aquatic, deserts, forests and grassland ecosystems. (9)
4. **Environment and the Human Population**: Population growth and its dynamics; Population growth patterns; Age pyramids; Malthus theory; Distribution of the world population; Problems of population explosion; Family welfare programmes. (7)
5. **Biodiversity**: Definition, Types of biodiversity such as genetic, species and ecosystem biodiversity; Importance and value of biodiversity; Hot spots of biodiversity; Biodiversity in India; Threats to biodiversity; Endangered and endemic species; Biodiversity conservation. (7)

Section-II

1. **Natural Catastrophes and Disaster Management:** Definition and types of natural catastrophes such as earthquakes, floods, cyclones and storms, landslides, drought and famines, tsunami, and disease epidemics etc. with examples; Predisaster and postdisaster management; Risk assessment; Role of administrators, scientists, planners, volunteers and community in disaster mitigation; Public awareness, drills and training; Forecasting; Warning systems including Tsunami warning system; Disaster management in relation to earthquakes and floods. (10)
2. **Remote Sensing and GIS:** Principles of Remote Sensing, Electromagnetic spectrum, Aerial photographs and their interpretation; Satellite imageries; Platform and airborne sensors; Types of sensors; Applications of Remote sensing and GIS in Environmental Studies. (6)

3. **Environmental Pollution:** Definition, sources, effects and control; Air, water, marine, noise and thermal pollution; Nuclear hazards; Pollution from solid wastes and its management; Drinking water treatment. ` (6)
4. **Socio-Environmental Issues and Environmental Ethics**: Sustainable development; Energy related problems; Nuclear accidents; Problems of resettlement and rehabilitation of people with examples; Environmental effects of urbanization, industrialization and consumerism; Stockholm Conference on Human Environment; Environmental ethics. (6)
5. **Environmental Priorities in India**: Brief knowledge of Environmental Acts in India, Salient features of environment, energy, forest and water policies in India; River & Lake conservation plans in India, Rural & Urban water supply programmes in India; Role of Central and State Pollution Control Boards, Ministry of Environment and Forests. (8)

Paper II: Natural Resources and Conservation

Section-I

1. Natural Resources: Definition; Classification; Concept of renewable and nonrenewable resources; their conservation and importance. (4)
2. Role of Individuals and NGOs in Resource Conservation: Environmental movements such as 'Chipko', Western Ghat, and Silent valley, Narmada Project agitation etc.; Role of individuals and NGO's. (6)
3. Energy Resources: Non renewable and conventional energy resources like coal, petroleum, fuel gases; Renewable and non-conventional energy resources like solar, wind, geothermal, tidal and wave energy, biomass, biogas and bio-diesel, hydroelectric energy; Atomic energy, Energy crisis; Environmental impacts of energy exploitation, Energy conservation. (12)
4. Forest and Wildlife Resources: Importance of forests and wildlife; Types of forest resources; Overexploitation of forests; Deforestation; Forest management and conservation; Wildlife conservation; National parks and sanctuaries; Biosphere reserves. (7)
5. Water Resources: Water resources on the earth; Consumption and uses of water; Management and conservation of water resources; Rain water harvesting. (8)

Section-II

1. Mineral Resources: Types and Importance of minerals; Important minerals of India; Mineral extraction and environmental problems; Conservation of mineral resources; Reclamation of mining areas. (8)
2. Soil Resources: Importance; Classification of soils; Soil formation; Soil profile; Structure and properties of soil; Soil fertility; Major types of soil in India. (8)
3. Land Degradation and Management: Desertification; Soil Salinization and reclaimation; Shifting cultivation; Soil erosion; Loss of soil fertility and formation of wastelands, Soil conservation. (10)
4. Grasslands and Grazing Lands: Definition and importance; Factors causing loss of grazing lands; Conservation. (5)
5. Food resources: World food problems; Malnutrition and undernutrition; Role of agriculture; Green revolution; Hazards of advanced agriculture. (6)

Practical Course

Sr. No.	Number of Practical days	Title
1.	1	Study of vegetation of local area/college campus
2.	1	Study of fauna of local area/college campus
3.	1	To find out minimum size of the quadrat for vegetation study
4.	1	Study of vegetation density by quadrat method
5.	1	Study of vegetation frequency by quadrat method.
6.	1	Study of Phytoplankton.
7.	1	Estimation of biomass.
8.	1	Study of Zooplankton
9.	1	Study of soil texture by sieve method
10.	1	Determination of water holding capacity of soil
11.	1	Determination of pH of soil.
12.	1	Determination of conductivity of soil.
13.	1	Determination of water transparency by Secchi disc method.
14.	1	Measurement of atmospheric humidity.
15.	1	Determination of total alkalinity of water.
16.	1	Determination of acidity of water
17.	1	Determination of pH and temperature of water.
18.	1	Determination of hardness of water.
19.	1	Determination of residual chlorine in water.
20.	1	Determination of chloride in water.
21.	1	Determination of carbon dioxide in water.
22.	1	Study of aerial photographs.
23.	1	Study of solar energy devices.
24.	1	Field visit to terrestrial/aquatic environments.
25.	1	Study tour (one day)
26.	**Total days = 25**	**Total Practicals = 25**

Instructions for Practicals

Students should complete the 'Practical Course' in a satisfactory manner on the lines laid down by the Board of Studies from time to time. The students should record the observations directly in the laboratory journal and write a report of each exercise giving the Theory, Requirements, Methods, Observations, Calculations and Results etc. Observations should be recorded preferably in tabular form.

Suitable labeled diagrams should be made wherever necessary. Each journal shall be checked and signed regularly by the teacher concerned and certified by Head/In-charge of the Department at the end of the academic year after satisfactorily completion of the 'Practical Course'. The report of the field visit should be written in the journal while the report of the study tour should be prepared separately and be submitted along with the journal.

The journal and the study tour report, duly certified by the Head/In-charge of the Department, have to be submitted by each candidate at the time of University Practical Examination. The same will be assessed by the examiners and signed by them.

In the University Examination, the students are required to write only Requirements, Observations, Calculations and Results etc. along with figures, if any. The Theory/Introduction and detailed methodology may be avoided.

Distribution of Practical Marks

Vegetation Study/Phytoplankton/Zooplankton	10
Soil Study	10
Water Analysis	10
Study of Aerial Photographs/Energy devices/humidity	05
Study tour report	05
Viva-Voce	05
Journal	05
Total =	**50 Marks**

Recommended Books

1. *A Text Book of Environmental Sciences*, S. S. Purohit, Q. J. Shammi and A. K. Agarwal, Student Edition (Agrobios), Jodhpur.
2. *A Text Book of Environmental Studies*, D. K. Asthana and Meera Asthana, S. Chand & Co., New Delhi.
3. *Air Pollution*, M.N. Rao and H.V.N. Rao, Tata McGraw Hill, New Delhi.
4. *An Introduction to Air Pollution*, R. K. Trivedy and P. K. Goel, B. S. Publications, Hyderabad.
5. *Aerial Photography and Image Interpretation for Resource Management,* Paine, D.P., John Wiley and Sons.
6. *Chemical & Biological Methods for Water Pollution Studies*, R.K. Trivedy and P. K. Goel, Environmental Publications, Karad.
7. *Disaster Management in Hills*, Dr. Satendra, Concept Publishing Co., New Delhi.
8. *Ecology and Environment,* P.D. Sharma, Rastogi Pub., New Delhi.
9. *Environmental Science,* S.C. Santara, New Central Book Agency (P) Ltd., Kolkota.

10. *Ecology: Principles and Applications*, J. L. Chapman and M.J. Reiss, Cambridge University Press, U.K.
11. *Environment: Problems and Solutions*, D.K. Asthana and Meera Asthana, S. Chand & Co., New Delhi
12. *Environmental Biotechnology*, M. H. Fulekar, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
13. *Environmental Chemistry*, A.K. Dey, New Age International Publishers, New Delhi.
14. *Environmental Concerns and Strategies*, T. N. Khoshoo, Ashish Publishing House, New Delhi
15. *Environmental Geography*, Savindra Singh, Prayag Pustak Bhavan, Allahabad.
16. *Fundamentals of Ecology*, E.P. Odum, W.B. Saunders Co., Philadelphia.
17. *Handbook of Environmental Laws, Acts, Rules, Guidelines, Compliances and Standards,* Vol. I and II, BS Publications, Hyderabad.
18. *Handbook of Methods in Environmental Studies*, Vol. 1 & 2, S. K. Maiti, ABD Publishers, Jaipur.
19. *Law on Protection of Environment and Prevention of Pollution (Central and States)*, R. G. Chaturvedy and M.M. Chaturvedy, The Law Book Co. (Pvt.) Ltd., Allahabad.
20. *Natural Disasters*, Lee Davis, Checkmark Books, New York.
21. *Practical Methods in Ecology and Environmental Science*, R. K. Trivedy and P.K. Goel, EnviroMedia, Karad.
22. *Remote Sensing and Image Interpretation,* Lilleand, T.M. and Kieffer, R.W., John Wiley and Sons.
23. *Remote Sensing: Principles and Applications,* Sabbins, F.E., Freeman.
24. *Standard Methods for the Examination of Water and Wastewaters*, American Public Health Association, Washington, DC.
25. *State of India's Environment: A Citizen's Report,* Arvind Agarwal, Centre for Science and Environment, New Delhi.
26. *Water Pollution: Causes, Effects and Control*, P. K. Goel, New Age International Publishers, New Delhi.
27. *Environmental Biology,* P.S. Verma and V.K. Agarwal, S.Chand & Co., New Delhi.
28. *Environmental Chemistry,* A.K.Department of Environmental Science, New Age International Publishers, New Delhi.
29. *Essentials of Ecology & Environmental Science,* S.V.S. Rana, Prentice Hall of India Pvt. Ltd., New Delhi.
30. Introduction to Environmental Legislation, B.L.Chavan, A.R.Shahane and C.S. Rawandale, Asian Inst. Env. Law., Karmala.
31. Environmental Chemistry, B.K. Sherma, Goel Publishing Housing, Meerut.