



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

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

*w.e.f. : June, 2009*

## ***Introduction***

Environmental Science is an interdisciplinary area of study that includes both applied and theoretical aspects of human impact on the world. It also includes many areas that are not usually considered to be scientific. Environmental Science is a field of study that is still in the process of evolving, but its beginnings are rooted in the early of civilization.

The Environment essentially comprises our living ambience, which gives us the zest and verve in all our activities. The turn of the twentieth century saw the gradual onset of its degradation by often callous deeds without any concern for the well being of our surroundings. This sustainable development goals. Such actions are pronouncedly necessitated, particularly in developing countries like India, in view of the rapid developmental activities that are taking place in the last two decades after liberal opening up of the economy on a global scale.

The environmental movements reached enormous proportions and environment became a house hold word following Earth Day, April 22<sup>nd</sup>, 1970. Courses in the high school and colleges with the title "Environmental science" were began around Earth Day. Most of the concepts become covered by Environmental Science courses had been taught previously in Ecology classes or Conservation classes. There was also some input from the social science such as Economics, Sociology, and Political Science. So Environmental Science has evolved as an interdisciplinary field that draws information related to environmental concern from the social sciences as well as the biological and physical sciences.

Environmental Science from a verity of subject areas, which also influence decisions, related to the environment. The areas are Biology, Laws, Sociology, Economics, Physics, Chemistry, Agriculture, Philosophy, Earth Science, Computers and Engineering.

Man is a part of this earth than careless exploiter of it. If we exploit the nature in unwise it will be difficult to support even a small population. But if we protect the nature it will continue to meet the needs of all living things not only for man.

The consideration of Environment as natural heritage may be the integral part of Environmental Education. Only when our life is guided by respect for the earth and all living things, we will be able to live In harmony with our Environment.

## ***Scope***

The students passing B. Sc. Degree in the subject Environmental science have the opportunity of job in the field of Effluent treatment plant of various industries, Maharashtra Pollution Control Board, NGO's, Forest department, Water purification plants, and various sectors of Environmental field.

## **Semester program for B. Sc. I Year Environmental Science**

Semester First				Semester Second				Annual Practical		Total marks of the Year
Paper Code	Total Marks for Theory Papers	External Theory Examination	Internal Assessment	Paper Code	Total Marks for Theory Papers	External Theory Examination	Internal Assessment	Paper No.	Total Marks	
Env. 101	60	50	10	Env. 103	60	50	10	Env. 105	60	300
Env. 102	60	50	10	Env. 104	60	50	10	----	----	

- External 50 marks are splitted in to 10 marks Objective questions and 40 marks Subjective questions.
- Internal 10 marks are splitted in to 05 marks for home assignment and 05 marks for the mid term examination
- Work load for theory papers Env. 101, Env. 102, Env. 103, & Env. 104 is 03 periods per week.
- Paper Env. 105 ( Laboratory course ) is annual and having work load 03 periods per week.

## **Course Structure & Marking System B. Sc. I year ( Semester I ) Environmental Science**

Sr. No.	Course Code	Title of the Paper	No. Of Periods Per Week	Total No. of Periods In the Semester	Internal Assessment		External Theory Examination	Total marks
					Home Assignment	Mid Term Exam		
01	Env. 101	Fundamentals of Environmental Science	03	45	05	05	50	60
02	Env. 102	Fresh Water : Sources & Uses	03	45	05	05	50	60

## **Env. 101 : Fundamentals of Environmental Science**

### **Unit I : Introduction :**

Need of Environmental awareness, Scope of Environmental Biology, Interrelationship of ecology with other disciplines. Ecology and its types: Behavioral ecology, Population ecology, Community ecology, Landscape ecology; Ecological principles; Structural, Functional and Evolutionary concepts of ecology. 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; 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

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### **References**

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|--|---|
| <b>01. Fundamentals of Ecology</b>               | : Eugene P. Odum, ( Natraj Publishers, Dehradun.)                               |
| <b>02. Principles of Ecology</b>                 | : P. S. Verma, V. K. Agarwal ( S. Chand and Co. New Delhi )                     |
| <b>03. Environmental Biology</b>                 | : P. D. sharma ( Rastogi Publications, Meerut )                                 |
| <b>04. Ecology and Environment</b>               | : P. D. sharma ( Rastogi Publications, Meerut )                                 |
| <b>05. Principles of Environmental Biology</b>   | : P. K. G. Nair ( Himalaya Publishing House, New Delhi )                        |
| <b>06. Environmental Biology</b>                 | : M. P. Arora ( Himalaya Publishing House, New Delhi )                          |
| <b>07. Environmental Science</b>                 | : Enger Smith, Smith, W. M. C. Brown ( Company Publishing )                     |
| <b>08. Principles of Soil Science</b>            | : Watt K. E. F. ( 1973 ), ( McGraw Hill Book Company, New Delhi )               |
| <b>09. Introduction to Environmental Studies</b> | : Turk & Turk   |
| <b>10. Ecology and Field Biology</b>             | : Robert Leo Smith ( Harper Collins college publication )                       |
| <b>11. General Ecology</b>                       | : H. D. Kumar ( Vikas Publishing house, New Delhi )                             |
| <b>12. Elements of Ecology</b>                   | : Brijgopal, N. Bharadwaj ( Vikas Publishing house, New Delhi )                 |
| <b>13. Fundamentals of Environmental Science</b> | : G. S. Dahliwal, G. S. Sangha, P. K. ralthan ( Kalyani Publishers, New Delhi ) |
| <b>14. Environmental Ecology</b>                 | : Bill Freedman ( Academic Press, New York )                                    |
| <b>15. Concepts of Ecology</b>                   | : N. Arumugam ( Saras Publication, Kottar, Dist. Kanyakumari )                  |
| <b>16. Plant Ecology</b>                         | : 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: Sources of getting Oxygen, Actions involved in self purification; Eutrophication: Effects of Eutrophication, Prevention of Eutrophication, Remedial measures. 15

### **Unit II : Sources of Water :**

Natural Water Resources types: Precipitation: Types of precipitation, Rainfall measurement (Rain gauge): Recording type, Non Recording type, Surface sources: Rivers, Lakes, Streams, Ponds, Storage reservoir. 07

Under ground water Resources: 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

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## **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



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

**Model Question Paper ( Theory )**

**Class : B. Sc. First Year ( Semester I )**

**Subject : Environmental Science**

**Paper : Env. 101 : Fundamentals of Environmental Science**

**Paper : Env. 102 : Fresh Water : Sources and Uses**

**Time : Two Hours**

**Maximum Marks : 050**

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Q. 1: Objectives (Compulsory)	10 marks
Q. 2: Essay Type Question	10 marks
OR	
a) Short Question	05 marks
b) Short Question	05 marks
Q. 3: Essay Type Question	10 marks
OR	
a) Short Question	05 marks
b) Short Question	05 marks
Q. 4: Essay Type Question	10 marks
OR	
Essay Type Question	10 marks
Q. 5: Short Notes ( Any Two )	10 marks
i)	
ii)	
iii)	
iv)	



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

*w.e.f. : June, 2009*

**Course Structure & Marking System**  
**B. Sc. I year ( Semester II ) Environmental Science**

Sr. No.	Course Code	Title of the Paper	No. Of Periods Per Week	Total No. of Periods In the Semester	Internal Assessment		External Theory Examination	Total marks
					Home Assignment	Mid Term Exam		
01	Env. 103	Concepts in Ecosystem	03	45	05	05	50	60
02	Env. 104	Fresh Water Treatment	03	45	05	05	50	60

**Course Structure & Marking System For**  
**Paper Env. 105 : Laboratory Course (Annual)**

Sr. No.	Course Code	Title of the Paper	No. Of Periods Per Week	Total marks
01	Env. 105	Laboratory Course	03	60

## **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: Species diversity, Species dominance; Intraspecific interactions; Interspecific interactions: Neutralism, Commensalism, Mutualism, Parasitism, Predation. 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, Pyramid of energy; Food web; Ecological indicators. 10

### **Unit II : Types 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, Grass land biome, Desert biome. 10

Deforestation; Desertification; Afforestation; Social forestry; Industrial forestry; Agro forestry; Conservation of forest; Forest management. 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

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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 )
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04. **Ecology and Environment** : P. D. sharma ( Rastogi Publications, Meerut )
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07. **Environmental Science** : Enger Smith, Smith, W. M. C. Brown ( Company Publishing )
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11. **General Ecology** : H. D. Kumar ( Vikas Publishing house, New Delhi )
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13. **Fundamentals of Environ. Science** : G. S. Dahliwal, G. S. Sangha, ( 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. 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, B-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; Water Act 1974; Water conservation; Watershed management, Watershed development in India. 15

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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 )
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11. **Water** : M. N. sastri ( Himalaya Publishing House, New Delhi).
12. **Water and Waste Water Technology** : Mark J. Hammer, ( Prentice Hall of India Pvt, Ltd., New Delhi).
13. **A textbook of Environmental Studies** : G. R. Chatwal, Harish Sharma ( Himalaya Publishing House, New Delhi)

## ***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 Excursion report is compulsory at the time of practical examination.

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

**Model Question Paper ( Theory )**

**Class : B. Sc. First Year ( Semester II )**

**Subject : Environmental Science**

**Paper : Env. 103 : Concepts in Ecosystems**

**Paper : Env. 104 : Fresh Water Treatment**

**Time : Two Hours**

**Maximum Marks : 050**

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|-------------------------------|----------|
| Q. 1: Objectives (Compulsory) | 10 marks |
| Q. 2: Essay Type Question     | 10 marks |
| OR                            |          |
| a) Short Question             | 05 marks |
| b) Short Question             | 05 marks |
| Q. 3: Essay Type Question     | 10 marks |
| OR                            |          |
| a) Short Question             | 05 marks |
| b) Short Question             | 05 marks |
| Q. 4: Essay Type Question     | 10 marks |
| OR                            |          |
| Essay Type Question           | 10 marks |
| Q. 5: Short Notes ( Any Two ) | 10 marks |
| i)                            |          |
| ii)                           |          |
| iii)                          |          |
| iv)                           |          |



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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 : 60**

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- Q. 1: Estimate Dissolved Oxygen / Total Hardness / Permanent Hardness from provided water sample 20
- 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/ Determine NPK from soil / Bulk density of soil. 15
- OR
- Identify and comment on Phytoplankton's / Zooplankton's. (Any Three)
- Q. 3: Determine leaf area index of provided leaf / Determine plant population density. 10
- 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.
- Q. 4: a) Record Book submission 05  
b) Excursion Report 05  
c) Viva – Voce 05
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