



Anekant Education Society's
Tuljaram Chaturchand College, Baramati.
(Autonomous)
(Faculty of Science & Technology)

S.Y.B.Sc. (Environmental Science) Semester-III
For Department of Environmental Science
Tuljaram Chaturchand College, Baramati.

Programme Specific Outcomes (PSOs)

PO1: Disciplinary Knowledge: Demonstrate comprehensive knowledge of the disciplines that form a part of a graduate programme. Execute strong theoretical and practical understanding generated from the specific graduate programme in the area of work.

PO2: Critical Thinking and Problem solving: Exhibit the skills of analysis, inference, interpretation and problem-solving by observing the situation closely and design the solutions.

PO3: Social competence: Display the understanding, behavioral skills needed for successful social adaptation, work in groups, exhibit thoughts and ideas effectively in writing and orally

PO4: Research-related skills and Scientific temper: Develop the working knowledge and applications of instrumentation and laboratory techniques. Able to apply skills to design and conduct independent experiments, interpret, establish hypothesis and inquisitiveness towards research.

PO5: Trans-disciplinary knowledge: Integrate different disciplines to uplift the domains of cognitive abilities and transcend beyond discipline-specific approaches to address a common problem

PO6: Personal and professional competence: Performing dependently and also collaboratively as a part of a team to meet defined objectives and carry out work across interdisciplinary fields. Execute interpersonal relationships, self- motivation and adaptability skills and commit to professional ethics.

PO7: Effective Citizenship and Ethics: Demonstrate empathetic social concern and equity centred national development, and ability to act with an informed awareness of moral and ethical issues and commit to professional ethics and responsibility.

PO8: Environment and Sustainability: Understand the impact of the scientific solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.

PO9: Self-directed and Life-long learning: Acquire the ability to engage in independent and life-long learning in the broadest context of socio-technological changes.

Anekant Education Society's
**TULJARAM CHATURCHAND COLLEGE OF ARTS, SCIENCE & COMMERCE,
BARAMATI.
(AUTONOMOUS)**

Department: Environmental Science (2023- 2024)
SYLLABUS (CBCS) FOR S. Y. B. Sc. Environmental Science (w.e.f. June, 2023)
Academic Year 2023-2024

Class	Semester	Paper Code	Title of Paper	No. of Credits
S.Y.B.Sc.	III	USES231	Natural Resources	3
		USES232	Environmental Pollution-I	3
		USES233	Practical based on USES231 & USES232	2
	IV	USES241	Solid and Hazardous Waste Management	3
		USES242	Environmental Pollution -II	3
		USES243	Practical based on USES241 & USES242	2

SYLLABUS
SECOND YEAR B.Sc. ENVIRONMENTAL SCIENCE
ACADEMIC YEAR 2023-2024
SEMESTER - III
DEPARTMENT OF ENVIRONMENTAL SCIENCE

A. Learning objectives:

- 1) Create a personal inventory of consumption of natural resources.
- 2) To make the students aware about resources and their uses.
- 3) To learn about interrelationship and discipline in environment science.
- 4) Students will learn how to assess pollution sources.
- 5) To improve the quality of the environment and to encourage the sustainable management of resources.

B. Learning outcomes :

On completion of this subject, students will able to:

- 1) Students will understand the basic principles of livestock production.
- 2) Students will understand the basic concepts of laws pertaining to agriculture and/or evaluation of land use for various agricultural practices.
- 3) Students will be able to apply knowledge to solve problems related to crop production and plant growth.
- 4) Students will have a greater knowledge of how natural resources relate to the economy and environment, both currently and in the future.
- 5) Students will be evaluating consequences of human exposure to pollution and its impacts to environmental quality.

Class : **S. Y. B. Sc. (Semester - III)**

Paper Code : **USES 231**

Paper : **I**

Credit : **3**

Title of Paper : **NATURAL RESOURCES**

No. of lectures: **48**

A. Learning objectives:

- 1) To learn basic natural, forest, Grasslands resources etc.
- 2) To make the students aware about resources.
- 3) To aware students about role of society in management of resources.
- 4) To better understand the role of natural resources in the economy in order to develop more sustainable methods of managing those resources to ensure their availability for future generations.

B. Course outcomes:

- 1) Student understands resources, vermiculture in day to day life, Sponge fishery.
- 2) Students will understand basics of natural resources and their significance.
- 3) Students will have the knowledge of forest management and related laws.
- 4) Students will be able to understand resource management techniques. (Insitu and exsitu methods.)
- 5) Students will be able to understand water and water shed management and water conflicts in India and world.
- 6) Students will get in depth knowledge of renewable energy resources.
- 7) Students will have understanding of biological energy and fuels.

UNIT I: Resource:

(10L)

Definition and introduction, Importance & Scope of Natural Resources, Classification of Resources: a) Natural Vs Artificial Resources. b) Material Vs Energy Resources. c) Biotic / Biological Vs Abiotic / Non-biological Resources. d) On the basis of its Renewability with-in the Human Time Scale as – Non-renewable, Potentially renewable & Perpetual Resources, Interaction between Earth, Man and Environment.

UNIT II: Forest, Grassland and Wildlife Resources

(10L)

- A) Forest Resource: Classification – Old & Second Growth Forests, Ecological Significance, forest products and productive benefits, medicinal plants, and forest-based industries and livelihoods. Grassland Resource: Classification, Significance – Productive benefits.
- B) Wildlife Resource: Meaning & Definition, Significance, Biogeographic provinces of the world and agro-climatic zones of India.

UNIT III: Land Resources and Water Resources:

(10L)

- A) Land Resources: Introduction, Land as resource: Minerals, soil, agricultural crops, natural, Land resources in India, Threats to land resources, land use change, land degradation, soil erosion, and desertification;
- B) Water Resource: Introduction, Sources, Uses of water, over exploitation of surface and ground water resources, Marine and Fresh Water, Water Scarcity.

UNIT IV: Conflicts Over Natural Resources**(08L)**

Growing energy needs; Agro-residues as a biomass energy source, Emissions of CO₂ in developed and developing countries including India, Impacts of large scale exploitation of solar, wind, hydro and nuclear energy sources.

Case studies: Contemporary Indian issues related to mining, dams, forests, energy, etc

UNIT V: Natural Resource Management and Society**(10L)**

Concept, Forest and Tribal, Forest management in India – Laws, Social forestry, Protected Areas, Protection and Conservation of Wildlife – Laws– In situ and Ex-situ methods, Conservation of land resources, Conservation & Management of water resources. Grassland management – prevention from overgrazing.

References:

- 1) P.D. Sharma (2006): Ecology and Environment – Rastogi Publications, Meerut
- 2) S.T. Ingle et al. (2005) Environment Studies – Prashant Publication House, Pune
- 3) P.S. Verma and V.K. Agrawal (1998) Environmental Biology (Principles of ecology), S. Chand and company ltd, New Delhi
- 4) H.V. Jadhav (1994): Principles of Environmental Sciences, Himalaya Publishing House
- 5) Dr. A. M. Deshmukh (1996): Outlines of Microbiology, Krishnai Publication, Karad
- 6) P.C. Dubey, D.K. Maheshwari (1993): A Textbook of biotechnology, S. Chand and Co. Ltd, New Delhi
- 7) S.C. Santra (2001): Environmental Sciences, New Central Book Agency (P) Ltd, Kolkata
- 8) Environmental Geography : Savindra Singh (Pravalika Publications, Prayagraj)
- 9) Physical Geography: Savindra Singh (Pravalika Publications, Prayagraj)
- 10) Disaster Management: Savindra Singh (Pravalika Publications, Prayagraj)
- 11) Ecology and Environment: P. D. sharma (Rastogi Publications, Meerut)
- 12) Principles of Environmental Biology: P. K. G. Nair (Himalaya Publishing House, New Delhi)
- 13) Environmental Biology: M. P. Arora (Himalaya Publishing House, New Delhi)
- 14) Environmental Science: Enger Smith, Smith, W. M. C. Brown (Company Publishing)
- 15) Principles of Soil Science: Watt K. E. F. (1973), (McGraw Hill Book Company, New Delhi)
- 16) Principles of Soil Science: Watt K. E. F. (1973), (McGraw Hill Book Company, New Delhi)

Mapping of Program Outcomes with Course Outcomes

Programme Outcomes (POs)									
Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9
CO 1	2		2		2	2			
CO 2	2	3			3			3	2
CO 3	2			3				3	
CO 4	2	3				2			
CO 5		3	2				3		
CO 6					3	2		3	3
CO 7				3			3		

Justification for the mapping**PO1: Disciplinary Knowledge**

CO1: Students will demonstrate comprehension of resources, vermiculture in day-to-day life, and Sponge fishery.

CO2: Attain a solid understanding of the basics of natural resources and their significance.

CO3: Acquire knowledge of forest management and related laws.

CO4: Develop the ability to understand resource management techniques, encompassing both insitu and exsitu methods.

PO2: Critical Thinking and Problem Solving

CO2: Cultivate critical thinking skills through understanding the basics of natural resources and their significance.

CO4: Enhance problem-solving abilities by understanding resource management techniques.

CO5: Foster critical analysis in comprehending water and watershed management, and water conflicts.

PO3: Social competence:

CO1: Develop social competence through comprehension of resources, vermiculture, and Sponge fishery.

CO5: Understand the social dimensions of water and watershed management, and water conflicts.

PO4: Research-related skills and Scientific temper:

CO3: Acquire knowledge of forest management and related laws, fostering research-related skills.

CO7: Develop scientific temper through understanding biological energy and fuels.

PO5: Trans-disciplinary Knowledge

CO1: Integrate trans-disciplinary knowledge through comprehension of resources, vermiculture, and Sponge fishery.

CO2: Cultivate a trans-disciplinary perspective by understanding the basics of natural resources and their significance.

CO6: Gain a holistic view through in-depth knowledge of renewable energy resources.

PO6: Personal and Professional Competence

CO1: Develop personal and professional competence through comprehension of resources, vermiculture, and Sponge fishery.

CO4: Enhance competence in resource management techniques.

CO6: Deepen personal and professional competence through in-depth knowledge of renewable energy resources.

PO7: Effective Citizenship and Ethics:

CO5: Understand water and watershed management, and water conflicts, fostering effective citizenship.

CO7: Attain understanding of biological energy and fuels, considering ethical implications.

PO8: Environment and Sustainability:

CO2: Understand the basics of natural resources and their significance for environmental sustainability.

CO3: Gain knowledge of forest management and related laws, contributing to environmental awareness.

CO6: Deepen understanding of renewable energy resources, fostering sustainability awareness.

PO9: Self-directed and Life-long Learning

CO2: Cultivate self-directed learning through understanding the basics of natural resources and their significance.

CO6: Encourage life-long learning through in-depth knowledge of renewable energy resources.

Class : **S. Y. B. Sc. (Semester - III)**

Paper Code : **USES 232**

Paper : **II** Title of Paper : **ENVIRONMENTAL POLLUTION - I**

Credit : 3 No. of lectures: 48

A) Learning objectives:

- 1) To know basic pollution types, components, phyto-remediation , etc
- 2) To make the students aware about pollution and control of pollution.
- 3) To aware students about effects of pollution in day to day life.
- 4) To know treatments for maintaining quality of water and soil.

B) Course outcomes:

- 1) Student understanding w.r.t. biofertilizers, biopesticides, cropping and pest management, innovative Ex-situ and In-situ methods of pollution remediation
- 2) Students will able to determine soil quality and effect of fertilizers and pesticides on the soil.
- 3) Students will learn about various important parameters for water analysis.
- 4) Students will learn the stepwise detailed process of water analysis.
- 5) Students will understand various aerobic and anaerobic water treatment techniques and various types of water treatment plants.
- 6) Students will know the IS standard procedures for analysis and standard pollution levels for industries.
- 7) Students will expertise in waste management techniques for different type of wastes and pollution.

UNIT I: Introduction to Environmental Pollution (12L)

Introduction, Concepts and Definition of Environmental Pollution, Pollutants: Definition, Sources, Nature and Types of Pollutants, Types of Environmental Pollution: Air pollution, Water pollution, Soil pollution, Noise pollution, Solid Waste pollution, Thermal Pollution, Plastic pollution, E-Waste and Radiation Pollution

UNIT II: Soil Pollution and Control (12L)

Introduction of soil pollution, Sources of soil pollution, Effects of soil pollution on plants, animals and humans, Soil salinity and issues. • Physical / Mechanical Methods: soil replacement, soil isolation • Chemical Methods- immobilization, soil washing • Biological Methods: Biofertilizers & Biopesticides, Conservational Tillage, Mixed Cropping, Crop rotation, Biological Pest Management., Organic Farming etc. • Phyto-remediation of contaminated sites.

UNIT III: Water Pollution (12L)

Introduction, Types of water pollution, Sources of ground water, surface water, sea water pollution. Impact on humans, plants and animals, Measurement of water quality parameters: Physical, Chemical and biological parameters, Indian standards for drinking water (IS: 10500, 2012) and Industrial Effluent.

UNIT IV: Control of Water Pollution (12L)

Introduction of ETP and STP, Drinking Water-Primary Treatment, Secondary Treatment and Tertiary Treatment.

References:

1. Environmental chemistry by B. K. Sharma, Goel publication house, Meerut, Sixth revised edition – 2001.
2. Environmental geography by Savindra Singh, Prayag Pustak Bhavan, Allahabad. Revised edition – 2002.
3. Ecology and environment by P. D. Sharma, Rastogi publications, Meerut. Seventh edition – 2004.
4. Environmental studies by S. T. Ingle and S. R. Thorat, Prashant publications, Pune, First edition – 2005.
5. Waste Water Engineering: Metcalf & Eddy, Tata Mc-Graw Hill Publishers, III Edition (1995).
6. Water Supply and Sanitary Engineering: S. C. Rangwala, Charotar publishing house, Anand (1992).
7. Water and Wastewater Technology: Mark J Hammer & Mark J Hammer Jr., Prentice Hall of India, IV Edition (2002)
8. Environmental Pollution Control Engineering: C.S.Rao, New Age International (P) Ltd. (1991)
9. Environmental Science and Engineering: Dr.N.Arumugam, Prof.V.Kumaresan(Saras Publication, Kottar, Dist. Kanyakumari)
10. Perspectives in Environmental Studies: Anubha Kaushik, C.P.Kaushik (New Age International(P) Limited, Publishers)
11. Principles of Soil Science: Watt K. E. F. (1973),(McGraw Hill Book Company, New Delhi)

Mapping of Program Outcomes with Course Outcomes

Programme Outcomes (POs)									
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3		3	2	3				
CO2	2	2							
CO3		3		2	3				
CO4				2					
CO5	2	3							
CO6	2	3							
CO7		2	3						

Justification for the mapping**PO1: Disciplinary Knowledge:**

CO1: Achieve understanding in the context of biofertilizers, biopesticides, cropping, and pest management.

CO2: Develop the ability to determine soil quality and comprehend the effects of fertilizers and pesticides on the soil.

CO5: Understand various aerobic and anaerobic water treatment techniques and different types of water treatment plants.

CO6: Gain knowledge about IS standard procedures for analysis and standard pollution levels for industries.

PO2: Critical Thinking and Problem solving:

CO2: Apply critical thinking skills to determine soil quality and assess the impact of fertilizers and pesticides on the soil.

CO3: Develop problem-solving skills by learning various important parameters for water analysis.

CO5: Apply critical thinking to understand and evaluate different aerobic and anaerobic water treatment techniques and plants.

CO6: Analyze and critically assess IS standard procedures for analysis and pollution levels for industries.

CO7: Apply critical thinking in the selection of waste management techniques for different types of wastes and pollution.

PO3: Social competence:

CO1: Develop social competence by understanding the social implications of biofertilizers, biopesticides, cropping, and pest management.

CO7: Foster social competence through waste management techniques that address different types of pollution.

PO4: Research-related skills and Scientific temper:

CO1: Foster research-related skills by understanding the intricate details of biofertilizers, biopesticides, cropping, and pest management.

CO3: Enhance scientific temper through the study of various important parameters for water analysis.

CO4: Develop research-related skills through the stepwise detailed process of water analysis.

PO5: Trans-disciplinary knowledge

CO1: Integrate trans-disciplinary knowledge in the context of biofertilizers, biopesticides, cropping, and pest management.

CO3: Cultivate trans-disciplinary knowledge by learning about various important parameters for water analysis.

CO5: Apply trans-disciplinary knowledge in understanding various aerobic and anaerobic water treatment techniques and plants.

PO6: Personal and professional competence

CO1: Develop personal and professional competence through an understanding of biofertilizers, biopesticides, cropping, and pest management.

CO7: Deepen competence in waste management techniques for different types of wastes and pollution.

PO7: Effective Citizenship and Ethics:

CO1: Foster effective citizenship by understanding the impact of biofertilizers, biopesticides, cropping, and pest management on the environment.

CO7: Address ethical considerations in waste management techniques for different types of wastes and pollution.

PO8: Environment and Sustainability:

CO1: Promote environmental awareness by understanding the environmental impact of biofertilizers, biopesticides, cropping, and pest management.

CO3: Foster environmental sustainability by studying various important parameters for water analysis.

PO9: Self-directed and Life-long learning:

CO6: Promote life-long learning by staying updated on IS standard procedures for analysis and pollution levels for industries.

CO7: Encourage self-directed learning by exploring waste management techniques for different types of wastes and pollution.

Class : **S. Y. B. Sc. (Semester - III)**

Paper Code : **USES 233**

Paper : **III** Title of Paper : Practical based on **USES 231 and USES 232**

Credit : 2 No. of Practicals: 13

A) Learning objectives:

- 1) To understand the basics of sample collection of water and soil.
- 2) To make the students aware about medicinal and economical plants around them.
- 3) To make student aware about renewable energy resources around them.
- 4) To field experience of water treatment plant.

B) Course outcomes:

- 1) Students will be aware about local ground water resources.
 - 2) Students will have practical knowledge of water conservation practices like rain water harvesting.
 - 3) Students will know marketed forest resources, medicinal and economical plants their significance.
 - 4) Students will be able to determine content of important elements like organic carbon, nitrogen in soil.
 - 5) Students will have practical knowledge of determining important properties of soil like EC, bulk density, salinity.
 - 6) Students will have practical knowledge of determining important properties of water like Carbonates, bicarbonates, hardness, turbidity, salinity, DO, etc.
 - 7) Students will be able to identify rock and mineral samples with their classification.
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1. Determination of Organic Carbon from soil.
 2. Study of Solar Energy equipments in day to day life.
 3. Determination of available Carbonate and Bicarbonate from water by titrimetric method.
 4. Study of Collection & Preservation of Water and Soil sample.
 5. Identification and Classification of the given Mineral/ Rock samples.
 6. Determine the Biological Oxygen Demand of given water sample.
 7. Study of Hardness of given water samples by EDTA-titrimetric method.
 8. Determination of the Bulk Density of given soil samples.
 9. Determine the Turbidity of given water sample.
 10. Case study of Rain Water Harvesting and Ground Water in local area.
 11. Study of any five Forest Resources available in local market (Gum, Bamboo, Spices, Timber, Resins, etc.)
 12. Visit of any natural community and submission of study visit report is compulsory at the time of practical examination.

13. Visit of water treatment plant/waste water treatment plant and submission of study visit report is compulsory at the time of practical examination.

Mapping of Program Outcomes with Course Outcomes

Programme Outcomes (POs)									
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1					2			3	
CO2					2		3	3	2
CO3			3			3			
CO4	2			3					2
CO5	2	2							
CO6	3	2		2					
CO7						2			

Justification for the mapping

PO1: Disciplinary Knowledge:

CO4: Develop the ability to determine the content of important elements like organic carbon and nitrogen in the soil.

CO5: Gain practical knowledge of determining important properties of soil, including EC, bulk density, and salinity.

CO6: Acquire practical knowledge of determining important properties of water, such as carbonates, bicarbonates, hardness, turbidity, salinity, and dissolved oxygen.

PO2: Critical Thinking and Problem solving:

CO5: Apply problem-solving skills in determining important properties of soil like EC, bulk density, and salinity.

CO6: Apply critical thinking in determining important properties of water, such as carbonates, bicarbonates, hardness, turbidity, salinity, and dissolved oxygen.

PO3: Social competence:

CO3: Understand and appreciate the social significance of marketed forest resources, medicinal, and economical plants.

PO4: Research-related skills and Scientific temper:

CO4: Develop research-related skills by determining the content of important elements like organic carbon and nitrogen in the soil.

CO6: Apply scientific temper in determining important properties of water, such as carbonates, bicarbonates, hardness, turbidity, salinity, and dissolved oxygen.

PO5: Trans-disciplinary knowledge

CO1: Gain awareness about local groundwater resources.

CO2: Acquire practical knowledge of water conservation practices like rainwater harvesting.

PO6: Personal and professional competence

CO3: Develop personal and professional competence through knowledge of marketed forest resources, medicinal, and economical plants.

CO7: Enhance competence by identifying rock and mineral samples with their classification.

PO7: Effective Citizenship and Ethics:

CO2: Contribute to effective citizenship by applying practical knowledge of water conservation practices like rainwater harvesting.

PO8: Environment and Sustainability:

CO1: Promote environmental awareness by gaining awareness about local groundwater resources.

CO2: Apply practical knowledge of water conservation practices like rainwater harvesting for sustainable water management.

PO9: Self-directed and Life-long learning:

CO2: Cultivate self-directed learning by gaining practical knowledge of water conservation practices like rainwater harvesting.

CO4: Foster life-long learning by continuously improving research-related skills in soil and water analysis.
