



**Anekant Education Society's**  
**Tuljaram Chaturchand College, Baramati.**  
*(Autonomous)*

(Faculty of Science & Technology)

**F.Y.B.Sc. (Environmental Science) Semester-II**  
**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**  
**F.Y.B.Sc. Scheme of Course Structure (Faculty of Science)**  
**Department: Environmental Science (2022- 2023)**

Class	Semester	Paper Code	Title of Paper	No. of Credits
F.Y.B.Sc.	I	USES111	Fundamentals of Environmental Science – I	2
		USES112	Fundamentals of Environmental Biology – I	2
		USES113	Practical based on USES111 & USES112	2
	II	USES121	Fundamentals of Environmental Science-II	2
		USES122	Fundamentals of Environmental Biology – II	2
		USES123	Practical based on USES121 & USES122	2

Anekant Education Society's  
**TULJARAM CHATURCHAND COLLEGE OF ARTS, SCIENCE & COMMERCE,**  
**BARAMATI. (AUTONOMOUS)**  
**SYLLABUS**  
**FIRST YEAR B.Sc. ENVIRONMENTAL SCIENCE**  
**ACADEMIC YEAR (2022-2023)**  
**SEMESTER -II**

**PAPER CODE: USES121**

**PAPER - I: FUNDAMENTALS OF ENVIRONMENTAL SCIENCE-II**

**Credit -2: No. of Lectures -36.**

**A. Learning objectives:**

- To understand the basics of Environmental Sciences.
- To learn about interrelationship and various disciplines in environmental science
- To make the students aware about conservation and sustainable use of Biodiversity.
- To make student understood GIS and remote sensing application

**B. Course outcomes :**

**CO1.** Imparts conceptual knowledge of environment, and meteorology

**CO2.** Students will understand the distinguishing characters and the Energy and its resources.

**CO3.** Student will know the concept of meteorology and apply their knowledge in day to day life.

**CO4.** Students will acquire the knowledge about bio resources their conservation and sustainable use of Biodiversity.

**CO5.** Students will understand the knowledge about Environmental problems and their solutions.

**CO6.** Discover knowledge in ecological perspective and value of environment.

**CO7.** Demonstrate a comprehensive understanding of the world's biodiversity and the importance of its conservation.

**Unit I: Energy and Environment**

Sun as source of energy; solar radiation and its spectral characteristics. Fossil fuels: classification, composition, physico-chemical characteristics and energy content of coal, petroleum and natural gas. Gross-calorific value and net-calorific value. Principles of generation of hydro-power, tidal energy, ocean thermal energy conversion, wind power, geothermal energy, solar energy (solar collectors, photo-voltaic modules, solar ponds). Nuclear energy - fission and fusion, nuclear fuels, Nuclear reactor – principles and types. Bioenergy: Introduction and uses of bioenergy. (10L)

**Unit II: Meteorology**

Definition, Concept and importance, Meteorological parameters – Pressure, temperature, precipitation, humidity, mixing ratio, saturation mixing ratio, radiation and wind velocity, lapse rate, environmental lapse rate. Wind roses, Climograph. (08L)

### **Unit III: Introduction to GIS and Remote Sensing**

Introduction to GIS and Remote sensing, Components and Types of GIS Data, Digital image processing and ground truthing. Application of remote sensing and GIS in land cover/land use planning and management (urban sprawling, vegetation study, forestry, natural resource). (08L)

### **Unit IV: Social cultural and Ethical aspect of Environment**

Environmental Values, Cultural Value, Environmental Aesthetics, Recent Developments in Environmental Aesthetics, Environmental ethics: Issues and possible solutions. Impact of cultural change on environment, Case studies on environment conservation, role of tribal people in conservation of Environment. (10L)

### **References:**

1. Cunningham W.P. & Saigo S.W. (1997) '**Environmental Science: A Global Concern**' WCB, McGraw Hill
2. Tyler M.G. Jr. (1997) '**Environmental Science**' Wadsworth Publ. Co
3. Benny Joseph (2005) '**Environmental Studies**' Tata McGraw Hill Publ. Co. Ltd.
4. **Perspectives in Environmental Studies:** Anubha Kaushik, C.P.Kaushik (New Age International(P) Limited, Publishers)
5. **Environmental Science and Engineering:** Dr.N.Arumugam,Prof.V.Kumaresan( Saras Publication, Kottar, Dist. Kanyakumari )
6. Environmental Geography-Savindra Singh, Prayog pustak Bhavan
7. A manual on Conservation of soil & water-UNDA, Scientific Publisher Rs.- 450/-
8. Environmental Remote sensing - F. Mark Danson, Wiley Publisher
9. A text book of Environmental Science- Vidya Thakur, Scientific Publisher Rs- 250/
10. Environmental Law & Policy of India, Diwans. &Rosencranz, A, Oxford University Press, 2001
11. Sustainable Energy and Environment: An Earth System Approach- edited by Sandeep Narayan Kundu, Muhammad Nawaz, apple academic press.
12. Introduction to forestry & Agroforestry - K.T. Parthiban, N. Krishnakumar .M. Karthick
13. Environmental Policy in India-Surendra Kumar,Northen Book Centre,New Delhi

**Mapping of Program Outcomes with Course Outcomes**

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

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

CO2. Students will understand the distinguishing characters and the Energy and its resources and to know how to conserve energy and natural resources.

CO3. Student will know the concept of meteorology and apply their knowledge in day to day life.

CO5. Students will understand the knowledge about Environmental problems and be able to identify and analyze and to solve the environmental problems.

CO7. Students will demonstrate a comprehensive understanding of the world's biodiversity and enabling them to its conservation and management.

**PO2: Critical Thinking and Problem solving:**

CO5. Students will apply their knowledge of Environmental problems and to solve the environmental and social problems.

**PO8: Environment and Sustainability:**

CO1. Students will understand Imparts conceptual knowledge of environment, and meteorology concept to understand the impact of the scientific solutions in societal and environmental context.

CO2. Students will understand the distinguishing characters and the Energy and its resources.

CO4. Students will acquire the knowledge about bio resources their conservation and sustainable use of Biodiversity.

CO6. Discover knowledge in ecological perspective and value of environment.

CO7. Demonstrate a comprehensive understanding of the world's biodiversity and the importance of its conservation.

**PO9: Self-directed and Life-long learning:**

CO3. Student will know the concept of meteorology and apply their knowledge in day to day life and able to solve the climate change related problems.

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**PAPER CODE: USES122****PAPER - I: FUNDAMENTALS OF ENVIRONMENTAL BIOLOGY – II****Credit -2: No. of Lectures 36.****A. Learning objectives:**

- To understand the basics of Environmental Biology.
- To learn about interrelationship and various disciplines in ecosystem and its importance.
- To make the students aware about conservation and sustainable use of Biodiversity.

**B. Course outcomes:****By the end of the course, students will be able to:****CO1.** Students will acquire knowledge about bioresources.**CO2.** Study of biodiversity and apply that knowledge in day to day life.**CO3.** Imparts conceptual knowledge of environment, their adaptations and interrelationship.**CO4.** Use interdisciplinary approaches such as ecology, economics, ethics and policy to devise solutions to environmental problems.**CO5.** Be proficient in ecological field methods such as wildlife survey, biodiversity assessment, mathematical modeling and monitoring of ecological systems.**CO6.** Apply the scientific method and quantitative techniques to describe, monitor and understand environmental systems.**CO7.** Evaluate current environmental issues and problems including the solutions and management practices that have been used or offered to address these issues and problems.**Unit-I: Introduction of Ecology**

Ecology, Ecosystem, Biomes Concept: classification and distribution. Characteristics of different biomes: Tundra, Taiga, Grassland, Deciduous forest biome, Highland Icy Alpine Biome, Chaparral, Savanna, Tropical Rainforest. (06L)

**Unit-II: Man - Environment & Bioresources**

Introduction, Uses of Environment, threats to the Environment, Environmental Deterioration, Effects of habitat destruction and climate change on Earth; Conservation of Environment. Bioresources, Significances of the Bioresources; Extraction of Bioresources by traditional & modern methods; Threat to local bioresources - overexploitation, habitat loss, invasive species etc., Human dependence on Environment (12L)

**Unit III: Biodiversity and its conservation**

Biodiversity: Introduction, Concept and Importance of Biodiversity, classification and types of, Biodiversity Hotspot, threats to biodiversity, Endangered, Threatened and rare species and Endemic species of India, Conservation of Biodiversity: In-situ and Ex-Situ Conservation Methods. (12L)

**Unit IV: Introduction to Environmental Microbiology**

Introduction, Classification of microbes and their metabolism and ecology, Micro-organisms and their association with man, animals and plants, Role of microbes in bio-remedial processes, ecological restoration and other environmental applications, Useful and harmful microbes. (06L)

**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. Aroras ( Himalaya Publishing House, New Delhi )
- 07. Environmental Science:** Enger 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

**Books:**

1. Ambashta R.S. & Ambashta N.K (1999) 'A Textbook of Plant Ecology' CBS Publ. & Distributers, New Delhi
2. Chapman J.L. & Reiss M.J. (1995) 'Ecology: Principles and Applications' Cambridge University Press
3. Cunningham W.P. & Saigo S.W. (1997) 'Environmental Science: A Global Concern' WCB, McGraw Hill
4. Sharma P.D. 'Elements of Ecology'
5. Tyler M.G. Jr. (1997) 'Environmental Science' Wadsworth Publ. Co
6. Vashista P.C. 'Textbook of Plant Ecology'



7. Smith R.L. 'Ecology and Field Biology'
8. Benny Joseph (2005) 'Environmental Studies' Tata McGraw Hill Publ. Co. Ltd.
9. 'Patterns in the Living World' – Biology-an Environmental approach, John Murray, London
10. 'Diversity Among Living Things' Biology-an Environmental approach, John Murray, London
11. Bell P.R. & Woodcock Christopher (1973) 'The Diversity of Green Plants' Edward Arnold Ltd.
12. Wilson N. Stewart (1983) 'Paleobotany and the Evolution of Plants' Cambridge University Press

#### Mapping of Program Outcomes with Course Outcomes

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

#### Justification for the mapping

**PO1: Disciplinary Knowledge:**

CO1. Students will acquire knowledge about bioresources and able to conserve and management of bioresources.

CO2. Students will develop knowledge about biodiversity and apply that knowledge in day to day life and able to conserve our biodiversity.

CO3. Students will acquire knowledge of environment, their adaptations and interrelationship.

CO4. Students use interdisciplinary approaches such as ecology, economics, ethics and policy to devise solutions to environmental problems.

**PO2: Critical Thinking and Problem solving:**

CO4. Students will apply their knowledge interdisciplinary approaches such as ecology, economics, ethics and policy to devise solutions to environmental problems.

**PO5: Trans-disciplinary knowledge:**

CO5. Students will apply mathematical modelings in ecological field methods such as wildlife survey, biodiversity assessment, and monitoring of ecological systems to solve biodiversity related problems.

**PO8: Environment and Sustainability:**

CO3. Students will acquire knowledge of environment, their adaptations and interrelationship this knowledge will enable to continue learning and developing their skills throughout their careers.

CO4. Students use interdisciplinary approaches such as ecology, economics, ethics and policy this approach will able them to solve environmental and societal problems.

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**PAPER CODE: USES123****PAPER - III: PRACTICAL BASED ON USES121 and USES122****Semester –II****Course Outcomes:**

**CO1.** Imparts conceptual knowledge of environment, and meteorology

**CO2.** Students will understand the distinguishing characters and the Energy and its resources.

**CO3.** Student will know the concept of meteorology and apply their knowledge in day to day life.

**CO4.** Students will acquire the knowledge about bio resources their conservation and sustainable use of Biodiversity.

**CO5.** Students will understand the knowledge about Environmental problems and their solutions.

**CO6.** Discover knowledge in ecological perspective and value of environment.

**CO7.** Demonstrate a comprehensive understanding of the world's biodiversity and the importance of its conservation.

1. Measurement of Atmospheric Humidity by Hair-Hygrometer and light by Lux Meter.
2. Study of land use planning and management.
3. Study of economical and medical values of plant species in local area.
4. To Study the basics of Geographical Information System
5. Study of satellite image and interpret it.
6. Isolation and culture of microbes from soil / water samples by Gram staining.
7. Draw the simple wind rose from given data and interprets the graph using given information.
8. Draw the Climograph from given data and interpret it.
9. Preparation of Media (Broth, Agar and Slant).
10. Case study related to invasive species.
11. Study of Food Adulterant and their human health affect.
12. Visit of any community and submission of Excursion report is compulsory at the time of practical examination.

(Any other practical relevant to syllabus)

**Mapping of Program Outcomes with Course Outcomes**

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

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

CO1. Students will demonstrate a comprehensive understanding of the world biodiversity and to aware the importance of its conservation.

CO2. Students will understand the significance of various natural resources and able to its management.

CO3. Students will evaluate hazards and risks in order to carry out a risk assessment.

CO4. Students will use a variety of laboratory techniques and able to safely conduct chemical experiments and procedures.

CO5. Students will understand variety of ecosystem of their own locality and be able to conserve and management of local ecosystems

CO6. Students will able to understanding the ecological value and consumptive use of ecosystem in day to day life.

**PO2: Critical Thinking and Problem solving:**

CO5. Students will understand variety of ecosystem of their own locality and be able to solve the local ecosystems related problems.

**PO4: Research-related skills and Scientific temper:**

CO7. Students will have opportunity to work in research lab, enabling them to handling the instruments in laboratories and developing their skills throughout their careers entrepreneurs.

**PO8: Environment and Sustainability:**

CO1. Students will demonstrate a comprehensive understanding of the world biodiversity and to aware the importance of its conservation.

**PO9: Self-directed and Life-long learning:**

CO6. Students will able to understanding the ecological value and consumptive use of ecosystem in day to day life this knowledge will enable to continue learning and developing their skills throughout their careers

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