Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science &Commerce, Baramati.

(Empowered Autonomous)

Three/Four Year Honours / Honours with Research B.Sc. Degree Program

in Environmental Science

(Faculty of Science)

CBCS Syllabus

S.Y.B.Sc. (Environmental Science) Semester-III

For Department of Environmental Science

NEP 2.0

Choice Based Credit System Syllabus (2024 Pattern)

(As Per NEP 2020)

To be implemented from Academic Year 2025-2026

Title of the Programme: B.Sc. (Environmental Science)

Preamble

AES's Tuljaram Chaturchand College has made the decision to change the syllabus of across various faculties from June, 2023 by incorporating the guidelines and provisions outlined in the National Education Policy (NEP), 2020. The NEP envisions making education more holistic and effective and to lay emphasis on the integration of general (academic) education, vocational education and experiential learning. The NEP introduces holistic and multidisciplinary education that would help to develop intellectual, scientific, social, physical, emotional, and ethical and moral capacities of the students. The NEP 2020 envisages flexible curricular structures and learning based outcome approach for the development of the students. By establishing a nationally accepted and internationally comparable credit structure and courses framework, the NEP 2020 aims to promote educational excellence, facilitate seamless academic mobility, and enhance the global competitiveness of Indian students. It fosters a system where educational achievements can be recognized and valued not only within the country but also in the international arena, expanding opportunities and opening doors for students to pursue their aspirations on a global scale.

In response to the rapid advancements in science and technology and the evolving approaches in various domains of Environmental Science and related subjects, the Board of Studies in Environmental Science at TuljaramChaturchand College, Baramati - Pune, has developed the curriculum for the first semester of F.Y.B.Sc. Environmental Sciencewhich goes beyond traditional academic boundaries. The syllabus is aligned with the NEP 2020 guidelines to ensure that students receive an education that prepares them for the challenges and opportunities of the 21st century. This syllabus has been designed under the framework of the Choice Based Credit System (CBCS), taking into consideration the guidelines set forth by the National Education Policy (NEP) 2020, UGC (UGC), NCrF, NHEQF, Prof. R.D. Kulkarni's Report, Government of Maharashtra's General Resolution dated 20th April and 16th May 2023, and the Circular issued by SPPU, Pune on 31st May 2023.

In todays rapidly changing world, a Bachelor's degree in Environmental Science offers ample opportunities for individuals passionate about making a positive impact on the environment and understanding the interrelated systems governing the planet. As the global population surges and natural resources dwindle, the need for professionals skilled in environmental management, conservation, and sustainable development has never been more critical. With a strong foundation in critical thinking, problem-solving, and interdisciplinary understanding, Environmental Science graduates can pursue a wide range of rewarding careers in various sectors.

One of the most prominent careers in this field is that of an Environmental Scientist. This role entails conducting research and analysis to identify, monitor, and mitigate environmental hazards, develop sustainable land, water, and waste management practices, and inform public policy on environmental conservation. Industries such as mining, oil and gas, chemical production, and urban development actively seek Environmental Scientists to ensure compliance with environmental regulations and reduce their ecological footprint.

Environmental Consulting is another avenue that combines scientific knowledge and problem-solving abilities to help businesses, nonprofits, and governments develop eco-conscious strategies and innovative solutions to mitigate environmental risks. These consultants play a crucial role in developing and implementing sustainable practices that meet legislative and social expectations.Environmental education and awareness are now more significant than ever. Environmental Science graduates can contribute as educators in schools, colleges, and community organizations, creating environmentally literate citizens that can make informed decisions about the planet's future.

Overall, revising the Environmental Science syllabus in accordance with the NEP 2020 ensures that students receive an education that is relevant, comprehensive, and prepares them to navigate the dynamic and interconnected world of today. It equips them with the knowledge, skills, and competencies needed to contribute meaningfully to society and pursue their academic and professional goals in a rapidly changing global landscape.

Programme Specific Outcomes (PSOs)

PSO1. Critical Thinking- Students will demonstrate an understand major concepts of Environment in association with multidisciplinary subjects such as physics, chemistry and mathematics etc. Understood the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevance in the day-to-day life.

PSO2. Effective Communication- Development of various communication skills such as reading, listening, speaking, etc., which we will help in expressing ideas and views clearly and effectively.

PSO3. Social Interaction- Development of scientific outlook not only with respect to science subjects but also in all aspects related to life.

PSO4. Effective Citizenship- Imbibe moral and social values in personal and social life leading to highly cultured and civilized personality.

PSO5. Ethics- Follow the ethical principles and responsibilities to serve the society.

PSO6. Environment and Sustainability- Understand the issues of environmental contexts and sustainable development.

PSO7. Self-directed and Lifelong learning- Students will be capable of self- paced and self-directed learning aimed at personal development and for improving knowledge/skill development.

Anekant Education Society's

Tuljaram Chaturchand College, Baramati

(Empowered Autonomous)

Board of Studies (BOS) in Environmental Science

From 2025-26 to 2027-28

Sr.No.	Name	Designation
1.	Ms. Surashri Sonawane	Chairman
2.	Ms. Aruna Kadam	Member
3.	Prof. Dr.Ajit Telave	Member
4.	Dr. Deepali Nimbalkar	Expert from SPPU
5.	Dr. Asawari Jadhav	Expert from other University
6.	Dr. Rachana Ingavale	Expert from other University
7.	Dr. Ganesh Kadam	Industry Expert
8.	Ms. Bhavana Upadhyay	Alumni
9.	Ms. Vaishnavi Lonkar	Student Representative

Course and Credit Distribution Structure for B.Sc. (Environmental Science)-2024-2025

Credit Distribution Structure for Three/Four Year Honours/Honours with Research Degree Programme With Multiple Entry and Exit options as per National Education Policy (2024 Pattern as per NEP-2020)

Level/ Difficulty	Sem	Subject DSC-1	Subject DSC-2	Subject DSC-3	GE/OE	SEC	IKS	AEC	VEC	CC	Total
4.5/100	I	2(T)+2(P)	2(T)+2(P)	2(T)+ 2(P)	2(T)	2 (T/P)	2(T) (Generic)	2(T)	2(T)	--	22
	II	2(T)+2(P)	2(T)+2(P)	2(T)+2(P)	2(P)	2 (T/P)	--	2(T)	2(T)	2(T	22

Exit option: Award of UG Certificate in Major with 44 credits and an additional 4 credits core NSQF course/Internship OR Continue with Major and Minor
Continue option: Student will select one subject among the (subject 1, subject 2 and subject 3) as major and other as minor and third subject will be dropped.

Level/ Difficulty	Sem	Credits Related to Major				Minor	--	GE/OE	SEC	IKS	AEC	VEC	CC	Total
		Major Core	Major Elective	VSC	FP/OJT/CEP/RP									
5.0/200	III	4(T)+2(P)	--	2 (T/P)	2(FP)	2(T)+2(P)	--	2(T)	--	2(T)	2(T)	--	2(T)	22
	IV	4(T)+2(P)	--	2 (T/P)	2(CEP)	2(T)+2(P)	--	2(P)	2 (T/P)	--	2(T)	--	2(T)	22
Exit option: Award of UG Diploma in Major and Minor with 88 credits and an additional 4credits core NSQF course/Internship OR Continue with Major and Minor														
5.5/300	V	8(T)+4(P)	2(T)+2(P)	2 (T/P)	2(FP/CEP)	2(T)	--	--	--	--	--	--	--	22
	VI	8(T)+4(P)	2(T)+2(P)	2 (T/P)	4 (OJT)	--	--	--	--	--	--	--	--	22
Total 3Years		**44**	**8**	**8**	**10**	**18**	**8**	**8**	**6**	**4**	**8**	**4**	**6**	**132**
Exit option: Award of **UG Degree in Major** with 132 credits OR Continue with Major and Minor														
6.0/400	VII	6(T)+4(P)	2(T)+2 (T/P)	--	4(RP)	4(RM)(T)	--	--	--	--	--	--	--	22
	VIII	6(T)+4(P)	2(T)+2 (T/P)	--	6(RP)	--	--	--	--	--	--	--	--	22
Total 4Years		**64**	**16**	**8**	**22**	**22**	**8**	8	**6**	**4**	**8**	**4**	**6**	**176**
Four Year UG Honours with Research Degree in Major and Minor with 176 credits														
6.0/400	VII	10(T)+4(P)	2(T)+2 (T/P)	--	--	4(RM) (T)	--	--	--	--	--	--	--	22
	VIII	10(T)+4(P)	2(T)+2 (T/P)	--	4 (OJT)	--	--	--	--	--	--	--	--	22
Total 4Years		**72**	**16**	**8**	**14**	**22**	**8**	8	**6**	**4**	**8**	**4**	**6**	**176**
Four Year UG Honours Degree in Major and Minor with176 credits														

T = Theory **P** = Practical **DSC** = Discipline Specific Course **OE** = Open Elective **SEC** = Skill Enhancement Course **IKS** = Indian Knowledge System **AEC** = Ability Enhancement Course **VEC** = Value Education Course **CC** = Co-curricular Course

VSC= Vocational Skill Course **OJT**= On Job Training **CEP**= Community Engagement Project **FP**= Field Project **RP**= Research Project

Course Structure for F.Y.B.Sc. Environmental Science (2024 Pattern)

Sem	Course Type	Course Code	Course Title	Theory / Practical	Credits
I	DSC-I (Gencral)	-101-GEN	-------	Theory	04
	DSC-II (General)	-101-GEN	-------	Theory	04
	DSC-III(General)	ENV-101-GEN	Basics of Environmental Science	Theory	02
		ENV-102-GEN	Environment Science Practical-I	Practical	02
	Open Elective (OE)	ENV-103-OE	Disasters and their Management	Theory	02
	Skill Enhancement Course (SEC)	ENV-104-SEC	Introduction to lab instruments	Practical	02
	Ability Enhancement Course (AEC)	ENG-104-AEC	-----	Theory	02
	Value Education Course (VEC)	ENV-105-VEC	Environmental Education	Theory	02
	Generic Indian Knowledge System (GIKS)	GEN-106-IKS	------	Theory	02
				Total Credits	**22**
	DSC-I (General)	-151-GEN	-----	Theory	04
	DSC-II (General)	-151-GEN	-----	Theory	04
	DSC-III (General)	ENV-151-GEN	Fundamentals of Environmental Biology	Theory	02
		ENV-152-GEN	Environment Science Practical-II	Practical	02
	Open Elective (OE)	ENV-153-OE	Environmental Management and Safety	Practical	02
	Skill Enhancement Course (SEC)	ENV-154-SEC	Sustainable Agricultural Practices	Practical	02
	Ability Enhancement Course (AEC)	ENG-154-AEC	----	Theory	02
	Value Education Course (VEC)	COS-155-VEC	Digital and technological solutions	Theory	02
	CC	YOG/PES/CUL/NSS/NCC-156-CC	To be selected from the CC Basket	Theory	02
				Total Credits	**22**
				Grand Total Sem I + Sem II	**44**

Course Structure for S. Y. B. Sc. Environmental Science (2024 Pattern)as per NEP 2020

Sem	Course Type	Course Code	Course Title	Theory/ Practical	Credits
III (5.0)	Major Mandatory	ENV-201-MRM	Natural Resources And Management	Theory	02
	Major Mandatory	ENV-202-MRM	Environmental Pollution-I	Theory	02
	Major Mandatory	ENV-203-MRM	Practicals based on ENV-201-MRM and ENV-202-MRM	Practical	02
	Vocational Skill Course (VSC)	ENV-204-VSC	Practical based on Organic farming	Practical	02
	Field Project(FP)	ENV-205-FP	Field Project	Practical	02
	Minor	ENV-206-MN	Man and Environment	Theory	02
	Minor	ENV-207-MN	Basic Practicals in Environmental science	Practical	02
	Open Elective (OE)	ENV-208-OE	Initiatives for Environmental Management	Theory	02
	Subject Specific Indian Knowledge System (IKS)	ENV-209-IKS	Environment, cultural values and Society	Theory	02
	Ability Enhancement Course (AEC)	MAR-210-AEC/ HIN-210-AEC/ SAN-210-AEC		Theory (Any One)	02
	Co-curricular Course (CC)	YOG/PES/CUL/NSS/NCC-211-CC	To be continued from the Semester - II		02
				Total Credits Semester - III	22
IV (5.0)	Major Mandatory	ENV-251-MRM	Solid and Hazardous Waste Management	Theory	02
	Major Mandatory	ENV-252-MRM	Environmental Pollution-II	Theory	02
	Major Mandatory	ENV-253-MRM	Practicals based on ENV-251-MRM and ENV-252-MRM	Practical	02
	Vocational Skill Course (VSC)	ENV-254-VSC	Organic farming	Theory	02
	Community Engagement Project(CEP)	ENV-255-CEP	Community Engagement Project (CEP)	Practical	02
	Minor	ENV-256-MN	Basics of Environmental Geoscience and Biology	Theory	02
	Minor	ENV-257-MN	Practical course on Environmental Geoscience and Biology	Practical	02
	Open Elective (OE)	ENV-258-OE	Eco-Friendly Practices	Practical	02
	Skill Enhancement Course (SEC)	ENV-259-SEC	Practicals on Waste Management	Practical	02
	Ability Enhancement Course (AEC)	MAR-260-AEC/ HIN-260-AEC SAN-260-AEC		Theory (Any One)	02

	Co-curricular Course (CC)	YOG/PES/CUL/NSS/NCC-261-CC	To be continued from the Semester - III		02
				Total Credits Semester - IV	22
				Total Credits Semester – III + IV	44

CBCS Syllabus as per NEP 2020 forS.Y. B.Sc. (2023 Pattern)

Name of the Programme: B.Sc. Environmental Science
Program Code :USENV
Class : S.Y.B.Sc.
Semester : III
Course Type : Major Mandatory (Theory)
Course Code : ENV-201-MRM
Course Name : **Natural Resources and Management**
No. of Credits : 2
No. of Teaching Hours : 30

Course Objectives:

1. To learn basic characteristics of environment.
2. To learn basic natural, forest, Grasslands resources etc.
3. To make the students aware about resources.
4. To aware students about role of society in management of resources.
5. 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.
6. To maintain ecological diversity.
7. To provide resources for future generations

Course Outcomes:

By the end of the course, students will be able to:

CO1. Student understands resources, vermiculture in day-to-day life, Sponge fishery.
CO2. Students will understand basics of natural resources and their significance.
CO3. Students will have the knowledge of forest management and related laws.
CO4. Students will be able to understand resource management techniques. (Insitu and exsitu methods.)
CO5. Students will be able to understand water and water shed management and water conflicts in India and world.
CO6. Students will get in depth knowledge of renewable energy resources.
CO7. Students will have understanding of biological energy and fuels.

Topics and Learning Points

Teaching Hours

UNIT 1: Resource **06**

1.1 Definition and introduction, Importance & Scope of Natural Resources, Classification of Resources
1.2 On the basis of its Renewability with-in the Human Time Scale as – Non-renewable, potentially renewable & Perpetual Resources, Interaction between resources and man.

UNIT 2: Forest, Grassland, Land and Water Resources 14

2.1 Forest and Grassland Resource: Classification, Ecological Significance, forest products and productive benefits, medicinal plants, and forest-based industries and livelihoods. Forest and Tribal, Forest management in India – Laws, Social forestry, Protected Areas, Grassland management – prevention from overgrazing.

2.2 Land Resources: 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; Conservation of land resources.

2.3 Water Resource: Sources, Uses of water, over exploitation of surface and ground water resources, Marine and Fresh Water, Water Scarcity. Conservation & Management of water resources.

UNIT – 3: Food and Energy Resources 10

3.1 Food Resources, Significances, Threats, Management of food resources.

3.2 Energy resources, Importances, Management and conservation of energy resources.

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. Vermaand V.K.Agrawal (1998) Environmental Biology (Principles of ecology), S. Chandand 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. Chandand 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),(Mc Graw 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**	**PO10**	**PO11**	**PO12**	**PO13**
CO1	3	2											
CO2	3										1		
CO3	3		2								1		
CO4	1		2	2									

CO5				2							1	1
CO6	3								2		1	
CO7											2	

Justification for the mapping

PO1: Comprehensive Knowledge and Understanding:
CO1: covers understanding various resources, vermiculture, and sponge fishery.
CO2: addresses understanding the basics of natural resources.
CO3: involves knowledge of forest management and related laws.
CO6 and CO7:delve into renewable energy resources and biological energy, respectively

PO2: Practical, Professional and Procedural Knowledge:
CO1: involves practical understanding of resources, vermiculture, and sponge fishery, contributing to practical knowledge.

PO3: Specialized Skills and Competencies:
CO3 and CO4: focus on specific areas such as forest management, resource management techniques, renewable energy, and biological energy, respectively, contributing to specialized skills and competencies.

PO4: Capacity for Application, Problem-Solving, and Analytical Reasoning:
CO4 and CO5: directly involve understanding and applying resource management techniques and water management concepts, contributing to problem-solving and analytical reasoning skills.

PO9: Digital and Technological Skills:
CO6: Although not explicitly stated, understanding renewable energy resources might involve learning about digital and technological aspects of energy production and utilization.

PO11: Value Inculcation and Environmental Awareness:
CO2, CO3, CO5, CO6, and CO7 all contribute to environmental awareness by addressing topics such as natural resources, forest management, water management, renewable energy, and biological energy.

PO12: Autonomy, Responsibility, and Accountability:
CO4: involving understanding resource management techniques, contributes to autonomy and responsibility in managing resources effectively and being accountable for their use.

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CBCS SYLLABUS as per NEP 2020for S. Y. B.Sc. (2024 Pattern)

Name of the Programme: B.Sc. Environmental Science
Program Code :USENV
Class : S.Y. B.Sc.
Semester : III
Course Type : Major Mandatory (Theory)
Course Code : ENV-202-MRM
Course Name : **Environmental Pollution -I**
No. of Credits : 02
No. of Teaching Hours : 30

Course 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.
5) Environmental pollution aims at changing climate and weather conditions.
6) To control the pollution and protect the environment and ensure the sustainable growth of the society.
7) It also increases productivity, creates employment and initiates innovation

Course Outcomes:

By the end of the course, students will be able to:

CO1. Student understanding w.r.t. Biofertilizers, biopesticides, cropping and pest management, innovative Ex-situ and In-situ methods of pollution remediation.
CO2. Students will able to determine soil quality and effect of fertilizers and pesticides on the soil.
CO3. Students will learn about various important parameters for water analysis.
CO4. Students will learn the step wise detailed process of water analysis.
CO5. Students will understand various aerobic and anaerobic water treatment techniques and various types of water treatment plants.
CO6. Students will know the IS standard procedures for analysis and standard pollution levels for industries.
CO7. Students will expertise in waste management techniques for different type of wastes and pollution.

Topics and Learning Points

Teaching Hours

UNIT 1: Introduction to Environmental Pollution **10**

1.1 Introduction, Concepts and Definition of Environmental Pollution, Pollutants: Definition, Sources, Nature and Types of Pollutants.

1.2 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 2: Soil Pollution and Control **10**

2.1 Introduction of soil pollution, Sources of soil pollution, Effects of soil pollution on plants,animals and humans, Soil salinity and issues.

2.2 Physical / Mechanical Methods:soilreplacement, soil isolation

2.3 Chemical Methods- immobilization, soil washing

2.4 Biological Methods: Biofertilizers & Biopesticides, Conservational Tillage, Mixed Cropping, Crop rotation, Biological Pest Management., Organic Farming etc.

2.5 Phyto-remediation and Bioremediation of contaminated sites.

UNIT 3: Water Pollution and Control **10**

3.1 Introduction, Types of water pollution, Sources of ground water, surface water, sea waterpollution.

3.2 Impact on humans, plants and animals,

3.3 Measurement of water quality parameters: Physical, Chemical and biological parameters,

3.4 Water quality standard.

3.5 Introduction of Effluent Treatment Plant and Sewage Treatment Plant, Drinking Water-Primary Treatment, Secondary Treatment and Tertiary Treatment.

References:

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3. Cunningham W.P. &Saigo S.W. (1997) 'Environmental Science: A Global Concern' WCB, McGraw Hill
4. Sharma P.D. 'Elements of Ecology'
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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

13. Perspectives in Environmental Studies: Anubha Kaushik, C.P.Kaushik (New Age International(P) Limited, Publishers)
14. Environmental Science and Engineering: Dr. N. Arumugam, Prof.V. Kumaresan (Saras Publication, Kottar, Dist. Kanyakumari)
15. Environmental Biology: P. D. Sharma (Rastogi Publications, Meerut)
16. Ecology and Environment: P. D. Sharma (Rastogi Publications, Meerut)

Mapping of Program Outcomes with Course Outcomes

	Programme Outcomes (POs)												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3	2		1							1	1	
CO2	3	2		1							1	1	
CO3	3	2		1							1	1	
CO4		3			1							1	
CO5		3		2	1						1	1	
CO6		3		2	1						1	1	
CO7		3		2	1						1	1	

Justification for the mapping

PO1: Comprehensive Knowledge and Understanding:
CO1: Ensuring students gain comprehensive knowledge and understanding in various aspects of environmental science and pollution management,
CO2: Gain comprehensive knowledge and understanding in various aspects including biofertilizers, biopesticides, soil quality, water analysis, water treatment techniques,
CO3: Understanding in Pollution remediation methods, waste management, and pollution standards.

PO2: Practical, Professional, and Procedural Knowledge:
CO1, CO2, CO3, CO4, CO5, CO6, and CO7: All contribute to practical knowledge and procedures involved in environmental science and pollution management. They involve understanding practical aspects of soil quality determination, water analysis, water treatment techniques, waste management, and pollution standards.

PO4: Specialized Skills and Competencies:
CO1, CO2, CO3, CO5, CO6, and CO7: focus on specialized skills and competencies related to environmental science and pollution management, including knowledge of biofertilizers, biopesticides, soil quality determination, water analysis, water treatment techniques, pollution standards, and waste management techniques.

PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning:CO4, CO5, CO6, and CO7: all involve applying knowledge and problem-solving skills in environmental science and pollution management. They require students to analyze soil and water quality, apply appropriate treatment techniques, and solve pollution-related problems.

PO11: Value Inculcation and Environmental Awareness:
CO1, CO2, CO3, CO5, CO6, and CO7: Contribute to developing awareness of environmental issues,

pollution management techniques, and adherence to pollution standards, thereby promoting environmental consciousness and responsibility.

PO12: Autonomy, Responsibility, and Accountability:

CO1, CO2, CO3, CO4, CO5, CO6, and CO7: Emphasize autonomy, responsibility, and accountability in environmental science and pollution management practices. Students learn to take responsibility for analyzing environmental parameters, implementing appropriate treatment methods, and ensuring compliance with pollution standards.

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CBCS Syllabus as per NEP 2020 for S.Y. B.Sc. (2024 Pattern)

Name of the Programme: B.Sc. Environmental Science

Program Code	:USENV
Class	: S.Y.B.Sc.
Semester	: III
Course Type	: Major Mandatory (Practical)
Course Code	: ENV-203-MRM
Course Name	: **Practical's based on ENV-201-MRM and ENV-202-MRM**
No. of Credits	: 02
No. of Teaching Hours	: 60

Course 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.
5) To develop an awareness about environmental problems.
6) Analyze and evaluate the most important environmental problems facing the world.
7) Apply an understanding of environmental concept from ecology, chemistry,geology and physics to real world problems.

Course Outcomes:

By the end of the course, students will be able to:

CO1. Students will be aware about local ground water resources.
CO2. Students will have practical knowledge of water conservation practices like rain water harvesting.
CO3. Students will know marketed forest resources, medicinal and economical plants their significance.
CO4. Students will be able to determine content of important elements like organic carbon, nitrogen in soil.
CO5. Students will have practical knowledge of determining important properties of soil like EC, bulk density, salinity.
CO6. Students will have practical knowledge of determining important properties of water like Carbonates, bicarbonates ,hardness, turbidity, salinity, DO, etc.
CO7. Students will be able to identify rock and mineral samples with their classification.

Topics and Learning Points

1. Determination of Organic Carbon and organic matter 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 Biochemical 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. Study of Rain Water Harvesting in institutional complex.
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.

*Any other relevant practical related to syllabus

References:

1. Environmental Science: A Practical Manual Book by G Lakshmi Swarajya and P Prabhu Prasadini (2018)
2. Environmental Chemical Analysis Laboratory Manual, Prepared by Dr. Erik Krogh, Dr. Chris Gill, Shelley Gellein, and Peter Diamente Department of Chemistry, 2018
3. Environmental Chemistry: S. e. Manahan
4. The Chemistry of Our Environment: R. A.

Mapping of Program Outcomes with Course Outcomes

	Programme Outcomes (POs)												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3						1				1		
CO2		3			1	1					1		
CO3	3						1				1		
CO4	3	2		1	1	1	1						
CO5	3	2		1	1	1	1						
CO6	3	2		1	1	1	1						
CO7	3	2		1	1	1	1				1		

Justification for the mapping

PO1: Comprehensive Knowledge and Understanding:
CO1, CO3, CO4, CO5, CO6, and CO7: contribute to developing comprehensive knowledge and understanding in various domains such as groundwater resources, forest resources, soil content, soil properties, water properties, and rock/mineral classification.

PO2: Practical, Professional, and Procedural Knowledge:
CO2, CO4, CO5, CO6, and CO7: involve practical knowledge acquisition regarding water conservation practices, soil and water properties determination, and rock/mineral identification, aligning with the development of practical, professional, and procedural knowledge.

PO4: Specialized Skills and Competencies:
CO4, CO5, CO6, and CO7: focus on specific skills and competencies related to soil analysis, water analysis, and rock/mineral identification, aligning well with the development of specialized skills and competencies.

PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning:
CO2, CO4, CO5, CO6, and CO7: involve practical applications, problem-solving, and analytical reasoning in the context of water conservation, soil analysis, water analysis, and rock/mineral identification, thereby enhancing the capacity for application, problem-solving, and analytical reasoning.

PO6: Communication Skills and Collaboration:
While not explicitly stated, effective communication and collaboration are likely involved in activities related to practical knowledge acquisition, analysis, and presentation of findings associated with CO2, CO4, CO5, CO6, and CO7.

PO7: Research-related Skills:
CO1, CO3, CO4, CO5, CO6, and CO7: entail elements of research-related skills such as data collection, analysis, and interpretation, contributing to the development of research-related skills.

PO11: Value Inculcation and Environmental Awareness:
CO1, CO2, CO3, and CO7 involve understanding and awareness of environmental resources, conservation practices, and ecological systems, thereby contributing to the development of environmental awareness and values.

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CBCS Syllabus as per NEP 2020 for S.Y. B.Sc. (2024 Pattern)

Name of the Programme	: B.Sc. Environmental Science
Program Code	:USENV
Class	: S.Y. B.Sc.
Semester	: III
Course Type	: Vocational Skill Course (Practical)
Course Code	: ENV-204-VSC
Course Name	: **Practicals based on Organic Farming**
No. of Credits	: 02
No. of Teaching Hours	: 60

Course Objectives:

1) To create awareness about Organic farming.
2) It reduces the cost of agricultural production and also improves the soil health.
3) To equip learners with the knowledge and skills necessary to practice sustainable agriculture and the production of healthy, organic food.
4) To introduce the concept of organic ecosystem and learn about biological magnification & its significance in present day scenario.
5) To increase soil fertility by promoting the growth of beneficial soil microorganisms.
6) To inoculate the importance of doing organic farming as the responsibility of every human being to ensure food safety, nutritional security and food security for the present as well as future generation, to achieve sustainable development for every nation.
7) To teach cultivation practices for various crops cultivated using organic farming methods.

Course Outcomes:

By the end of the course, students will be able to:

CO1. Understand various principles, need and prospect of organic farming including the importance of sustainability, biodiversity and ecological balance.

CO2. Gain hands on experience through field work, farm visits or practical exercises to apply their knowledge in a real world setting.

CO3. Explore the significance of soil health in organic farming and various methods to enhance soil fertility through composting and crop rotation.

CO4. Learn about marketing organic products, understanding consumer demand and the economic aspect of Organic farming.

CO5. Culture microbes used as biofertilizers and biopesticides.

CO6. Estimate the application dosage of biofertilizers and biopesticides for a crop.

CO7. Handle the equipment and tools to produce biofertilizers and to apply biopesticides.

Topics and Learning Points

1. Study of Organic Farming Principles – Understanding IFOAM principles (Health, Fairness, Ecology, and Care).
2. Comparative Study of Organic and Conventional Farming – Analysis of methods, advantages, and limitations.
3. Soil Quality Testing – Testing pH, moisture, and nutrient content.
4. Preparation and Use of Biofertilizers –Rhizobium.
5. Study and preparation of Azotobacter Biofertilizers.
6. Preparation of Azospirillum Biofertilizers.
7. Pest Control in Organic Farming – Cultural, biological, and mechanical methods.
8. Testing Water Quality for Organic Farming – Analyzing pH, dissolved oxygen, and contaminants in irrigation water.
9. Preparation of Panchagavya and Jeevamrut – Making organic liquid fertilizers from cow-based products.
10. Effect of Organic Farming on Soil Microbial Activity – Analyzing microbial diversity in organic vs. conventional soil.
11. Weed Management in Organic Farming – Studying manual, mechanical, and biological weed control methods.
12. Study of Integrated Pest Management (IPM).
13. Role of Earthworms in Soil Health – Studying earthworm activity and its effect on soil fertility.

*Any other relevant practical related to syllabus

References:

1. Sharma, Arun K. 2002. A Handbook of Organic farming. Agrobios, India.
2. Sathe, T.V. 2004, Vermiculture and Organic Farming. Daya Publishers.
3. Alvares, C. 1996. The Organic Farming Source Book. The Other India Press, Mapusa, Goa.
4. Gupta, M., 2004. Organic Agriculture Development in India. ABD publishers, Jaipur, India.
5. S.P. Palaniappan, K. Annadurai, 1999. Organic Farming- Theory and Practice, Scientific Publishers, Jodhpur, India.
6. Dr. PratikshaRaghuvanoki. Handbook of Organic Farming.
7. Organic Farming: The Ecological System- Agronomy Monograph 54, ASA, USA.
8. Subha Rao, N.S. 200, Soil Microbiology, Oxford & IBH Publishers, New Delhi
9. Dongarjal R. P. and Zade S.B. 2019. Insect Ecology and Integrated Pest Management, Akinik Publications, New Delhi.
10. Guideline of National Project on Organic Farming, Department of Agriculture and Cooperation, INM Division, Ministry of Agriculture, Govt. of India
11. Dushyent Gehlot. 2005. Organic Farming- standards, accreditation, certification and inspection. Agribios, India.

Mapping of Program Outcomes with Course Outcomes

Course Outcomes	Programme Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3						2				1		
CO2		3					2	1			1	2	2
CO3					3		2				1		
CO4			3								1	2	
CO5				3							1		
CO6				3							1		
CO7											1		

Justification for the mapping

PO1: Comprehensive Knowledge and Understanding:
CO1: Introduces students to various principles, needs, and prospects of organic farming, emphasizing sustainability, biodiversity, and ecological balance, thereby providing a comprehensive understanding of organic farming practices and their importance.

PO2: Practical, Professional, and Procedural Knowledge:
CO2: Involves gaining hands-on experience through fieldwork, farm visits, or practical exercises, allowing students to apply their theoretical knowledge in real-world settings, thus developing practical and procedural knowledge essential for professional practice in organic farming.

PO3: Entrepreneurial Mindset and Knowledge:
CO4: focuses on marketing organic products, understanding consumer demand, and the economic aspect of organic farming, which fosters an entrepreneurial mindset by providing insights into business aspects and opportunities in organic agriculture.

PO4: Specialized Skills and Competencies:
CO5: Involves learning about culture microbes used as biofertilizers and biopesticides, developing specialized skills necessary for organic farming practitioners.
CO6: Further enhances skills by estimating application dosages of these bio-agents for crop production.

PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning:
CO3: explores the significance of soil health in organic farming and various methods to enhance soil fertility, requiring analytical reasoning and problem-solving skills to assess and address soil health issues effectively.

PO7: Research-related Skills:
CO1 to CO3: Collectively contribute to developing research-related skills by introducing students to principles, needs, and methods of organic farming, as well as the significance of soil health, fostering an understanding of research methodologies and practices in organic agriculture.

PO8: Learning How to Learn Skills:
CO2: Involves gaining hands-on experience and practical knowledge through fieldwork and farm visits, promoting experiential learning and the development of learning-how-to-learn skills essential for continuous improvement and adaptation in organic farming practices.

PO11: Value Inculcation and Environmental Awareness:

All COs collectively contribute to promoting environmental awareness and values by emphasizing sustainability, biodiversity, and ecological balance in organic farming practices, instilling a sense of responsibility towards environmental stewardship.

PO12: Autonomy, Responsibility, and Accountability:

CO2: Involves gaining hands-on experience and practical knowledge, promoting autonomy in decision-making and responsibility towards implementing organic farming practices effectively. CO4: further emphasizes understanding the economic aspect of organic farming, fostering accountability in business decisions.

PO13: Community Engagement and Service:

CO2: may involve fieldwork and farm visits, providing opportunities for students to engage with local communities and stakeholders in organic farming initiatives, thereby promoting community engagement and service in sustainable agriculture.

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CBCS Syllabus as per NEP 2020 for S.Y. B.Sc. (2024 Pattern)

Name of the Programme	: B.Sc. Environmental Science
Program Code	: USENV
Class	: S.Y. B.Sc.
Semester	: III
Course Type	: Field Project (FP)
Course Code	: ENV-205-FP
Course Name	: **Field Project (FP)**
No. of Credits	: 02
No. of Teaching Hours	: -

Course Objectives:

1) Describe selected field-based methodologies and techniques used in collecting, analyzing, presenting and application of environmental information
2) Apply Environmental science concepts in different situations
3) Work in teams to solve cross-disciplinary problems in environmental hazards
4) To create awareness about innovative method.
5) To find out new conclusions through field project.
6) To impart basic knowledge about the environment and its allied problems.
7) Develop an attitude of concern for the environment.

Course Outcomes:

By the end of the course, students will be able to:

CO1. Getting of awareness of innovative methodology.
CO2. Students will experience about innovative methodology to solve environmental problems.
CO3. In a specialization domain of his / her choice, student manager will be able to choose an appropriate topic for study and will be able to clearly formulate& state a research problem.
CO4. For a selected research topic, student manager will be able to compile the relevant literature and frame hypotheses for research as applicable.
CO5. For a selected research topic, student manager will be able to plan a research design including the sampling, observational, statistical and operational designs if any.
CO6. For a selected research topic, student manager will be able to compile relevant data, interpret & analyze it and test the hypotheses wherever applicable.
CO7. Based on the analysis and interpretation of the data collected, student manager will be able to arrive at logical conclusions and propose suitable recommendations on the research problem.
CO8. Student manager will be able to create a logically coherent project report and will be able to defend his / her work in front of a panel of examiners.

Field Project Work

1) Identification of environmental issues related to society,
2) Compilation of data, typing, binding and submission of dissertation.
3) Writing of research paper.
4) Power point presentation based on project work.

Typical Time and marks allocation for the different stages of the field project is:

Step of Project	Individual students work in hours	Marks
Topic Selection / Study Design	05	05
Survey preparation / Fieldwork	25	20
Analysis	10	05
Report writing	20	10
Oral Presentation		10
Total	60	50

Mapping of Program Outcomes with Course Outcomes

Course Outcomes	Programme Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3		2					1			1		
CO2	3		2					1			1		
CO3		3		2	2	2	2	1				1	
CO4		3		2	2	2	2	1				1	
CO5		3		2	2	2	2	1				1	
CO6		3		2	2	2	2	1				1	
CO7		3		2	2	2	2	1				1	

Justification for the mapping

PO1: Comprehensive Knowledge and Understanding:
CO1 and CO2: Introduce students to innovative methodologies for solving environmental problems, broadening their understanding of different approaches to addressing environmental challenges.

PO2: Practical, Professional, and Procedural Knowledge:
CO3 to CO7: Collectively contribute to developing practical, professional, and procedural knowledge. They guide students through the process of conducting research in environmental management, from formulating research problems (CO3) to proposing recommendations based on data analysis (CO7).

PO3: Entrepreneurial Mindset and Knowledge:
CO1 and CO2: Exposure to innovative methodologies (CO1 and CO2) can foster an entrepreneurial mindset by encouraging students to think creatively and adaptively in addressing environmental challenges.

PO4: Specialized Skills and Competencies:
CO3 to CO7: Focus on developing specialized skills and competencies related to research in environmental management. This includes formulating research problems, compiling relevant literature, planning research designs, analyzing data, and proposing recommendations.

PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning:
CO3 to CO7: Enhance students' capacity for application, problem-solving, and analytical reasoning by guiding them through the process of conducting research. This involves identifying research problems, designing studies, collecting and analyzing data, and drawing conclusions.

PO6: Communication Skills and Collaboration:
CO3 to CO7: require students to communicate their research findings effectively and collaborate with peers, instructors, and potentially external stakeholders. This includes articulating research problems,

presenting findings, and proposing recommendations.

PO7: Research-related Skills:
CO3 to CO7: Directly contribute to developing research-related skills such as formulating research problems, compiling literature reviews, designing research studies, collecting and analyzing data, and drawing conclusions based on empirical evidence.

PO8: Learning How to Learn Skills:
CO1 and CO2: Introduce students to innovative methodologies, which require them to learn new concepts and techniques.
CO3 to CO7: guide students through the research process, helping them develop the skills necessary for continuous learning and improvement.

PO11: Value Inculcation and Environmental Awareness:
CO1 and CO2: emphasize the importance of innovative methodologies for addressing environmental problems, which helps instill values of creativity, adaptability, and innovation in environmental management practices.

PO12: Autonomy, Responsibility, and Accountability:
CO3 to CO7: require students to take ownership of their research projects, demonstrating autonomy in formulating research problems, conducting studies, and proposing recommendations. This fosters a sense of responsibility and accountability in their research endeavors.

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CBCS Syllabus as per NEP 2020 for S.Y. B.Sc. (2024 Pattern)

Name of the Programme: B.Sc. Environmental Science

Program Code	:USENV
Class	: S.Y. B.Sc.
Semester	: III
Course Type	: Minor (Theory)
Course Code	: ENV-206-MN
Course Name	: **Man and Environment**
No. of Credits	: 2
No. of Teaching Hours	: 30

Course Objectives:

1) Creating awareness among the mass population about the harmful effects of the environmental pollution.
2) Imparting basic knowledge about the environment and its allied problems.
3) Developing an attitude of concern for the environment.
4) Creating the awareness about environmental problems among peoples.
5) To create new patterns of behavior of individuals, groups and society as a whole towards the environment.
6) Develop scientific, interpretive and creative thinking skills
7) Investigate the complexities of the natural environment and our relationship with it.

Course Outcomes:

By the end of the course, students will be able to:

CO1. Interpret the Knowledge about the environment and the role of human beings in shaping the environment.

CO2. Understand various components of the environment and interfaces.

CO3. Categorize the various environmental issues. Critically appreciate the environmental management practices and better solutions.

CO4. Examine a method that practically implements various sustainable development goals and its importance.

CO5. Identify the possible ways of environmental protection and conservation.

CO6. Recognize and integrate the international, cross-cultural, and transdisciplinary nature of environmental problems in analyses and solutions.

CO7. Identify environmental hazards affecting air, water and soil quality.

Topics and Learning Points

Teaching Hours

UNIT 1: Introduction to Environment **(10)**

1.1 Fundamentals of Environment and its components, Functions of Environment, Scope and Importance of Environment.
1.2 Multidisciplinary and dynamic nature of Environmental Science.
1.3 Natural Resources
1.4 Human Interaction with Environment
1.5 Environmental Conservation and protection

UNIT 2: Technologies and Approaches in Environmental Science **(10)**

2.1 Industrial Environment Management, Introduction to Green Technologies.
2.2 Environment, Social and Governance (ESG).
2.3 Industrial Sustainability Practices, Environmental Management System, Certifications under ISO, Circular Economy.
2.4 Concept and components of green building, Carbon Credits.
2.5 Environmental applications of GIS and RS.
2.6 Green and Clean Energy Generation Technologies.

UNIT – 3: Entrepreneurship Opportunities in Environmental Science **(10)**

3.1 Innovation & Entrepreneurship Green Business Ideas,
3.2 Environmental Management by NGO's,
3.3 Governmental Polices and Job Opportunities,
3.4 Success Stories in Environmental Entrepreneurship,
3.5 Role & Functions of MoEFCC.

References:

1) Industrial Environmental Management: Engineering, Science, and Policy, 9 April 2020 by Tapas K. Das (Author), Publisher: Wiley; 1st edition.
2) Environmental Technology and Sustainability: Physical, Chemical and Biological Technologies for Clean Environmental Management 1st Edition, Kindle Edition by Basanta Kumara Behera, Ram Prasad, Publisher: Elsevier; 1st edition.

3) Environment for Entrepreneurship, 1 January 1993, by M Soundarapandian, Publisher: Dominant Publishers and Distributors (1 January 1993).
4) Environment and Sustainable Development by M.H. Fulekar, Bhawana Pathak, R K Kale, Springer Nature (2013).
5) Sustainable Development in the Digital Era by Dr. Aparna Mishra, Dr. Vikas Dahiya, Dr.Kamini Tandon, JSR Publishing House LLP; (2019).
6) Mays, L.W. 2006. Water Resources Sustainability. The McGraw-Hill Publications. Schward & Zhang, 2003. Fundamentals of Groundwater. John Willey and Sons.
7) Bansil, P.C. 2004. Water Management in India. Concept Publishing Company, India.
8) Mays, L.W. 2006. Water Resources Sustainability. The McGraw-Hill Publications. Schward& Zhang, 2003. Fundamentals of Groundwater. John Willey and Sons.

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Mapping of Program Outcomes with Course Outcomes

	Programme Outcomes (POs)												
Course utcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3							1			1		
CO2	3							1			1		
CO3	3				2		2	1			1		
CO4	3	2			2			1			1		
CO5	3	2						1			1	2	2
CO6	3			2		2		1		2	1		2
CO7	3						2	1			1		2

Justification for the mapping

PO1: Comprehensive Knowledge and Understanding:
CO1, CO2, CO3, CO4, CO5, CO6, and CO7: Collectively provide a comprehensive understanding of environmental issues, including their causes, components, management practices, sustainable development goals, international dimensions, and hazards affecting air, water, and soil quality.

PO2: Practical, Professional, and Procedural Knowledge:
CO4: Requires practical implementation of sustainable development goals.
CO5: emphasizes identifying practical ways of environmental protection and conservation. These COs contribute to practical knowledge and skills necessary for addressing environmental challenges professionally.

PO4: Specialized Skills and Competencies:
CO6: Requires recognizing and integrating international, cross-cultural, and transdisciplinary aspects of environmental problems, which develops specialized skills in analyzing and addressing complex

environmental issues.

PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning:
CO3: Involves critical appreciation of environmental management practices and identifying better solutions, requiring analytical reasoning and problem-solving skills.
CO4: Involves examining methods for implementing sustainable development goals, further enhancing problem-solving capacity.

PO6: Communication Skills and Collaboration:
CO6: Emphasizes integrating international, cross-cultural, and transdisciplinary perspectives in environmental problem analyses and solutions, promoting communication and collaboration across diverse stakeholders.

PO7: Research-related Skills:
CO3: involves critical appreciation of environmental management practices, which often requires research to understand various approaches and their effectiveness.
CO7: involves identifying environmental hazards, which may involve research to assess their impacts and mitigation strategies.

PO8: Learning How to Learn Skills:
Engaging with environmental issues and management practices (as in COs 1-7) inherently involves learning how to learn, as students must continually update their knowledge and skills to address evolving environmental challenges.

PO10: Multicultural Competence, Inclusive Spirit, and Empathy:
CO6: emphasizes the integration of international, cross-cultural, and transdisciplinary perspectives, fostering multicultural competence and empathy towards diverse cultural and environmental contexts.

PO11: Value Inculcation and Environmental Awareness:
All COs collectively contribute to raising awareness about environmental issues, their importance, and the value of sustainable practices through understanding, critical appreciation, and practical implementation.

PO12: Autonomy, Responsibility, and Accountability:
CO5: involves identifying possible ways of environmental protection and conservation, fostering autonomy in decision-making and responsibility towards environmental stewardship.

PO13: Community Engagement and Service:
CO5, CO6, and CO7: collectively encourage engagement with communities and service towards environmental protection and conservation efforts, fostering a sense of responsibility and accountability towards the broader community and environment.

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CBCS Syllabus as per NEP 2020 for S.Y. B.Sc. (2024 Pattern)

Name of the Programme: B.Sc. Environmental Science

Program Code	:USENV
Class	: S.Y. B.Sc.
Semester	: III
Course Type	: Major Mandatory (Practical)
Course Code	: ENV-207-MN
Course Name	: **Basic Practical's in Environmental Science**
No. of Credits	: 02
No. of Teaching Hours	: 60

Course Objectives:

1) To learn that adaptation allows organisms to survive and reproduce in their natural environment.
2) Understand the importance of environment by accessing its impacts on the human world.
3) To understand basic nature of soil.
4) To understand the environmental significance of water quality.
5) To understand the different types of ecosystems.
6) Develop an ability to handle the apparatus carefully and the resources wisely.
7) Develop scientific understanding of physical world.

Course Outcomes:

By the end of the course, students will be able to:

CO1. Demonstrate a compressive understanding of the world biodiversity and the importance of its conservation.
CO2. Understand the significance of various natural resources and its management.
CO3. Evaluate hazards and risks in order to carry out a risk assessment.
CO4. Students will use a verity of laboratory techniques to safely conduct chemical experiments and procedures.
CO5. To understand verity of ecosystem of their own locality.
CO6. Describe the ecological value and consumptive use of ecosystem.
CO7. Students will have opportunity to work in research lab, bio fertilizer industry and can also be bio-entrepreneurs.

Topics and Learning Points

1) Collection and preservation of water samples and Introduction to water sampling methods (Field Practical).
2) Collection and preservation of soil samples (Field Practical).

3) Determination of pH & Electrical Conductivity from soil sample.
4) Calculation of Life Cycle Assessment.
5) Study on Requirements for Smart Cities
6) Calculation of Greenhouse Gas Emissions.
7) Estimation of dissolved oxygen level.
8) Determination of pH & Electrical Conductivity of water/waste water sample.
9) Study on Requirements for ISO EMS.
10) Use of social media for e- networking and dissemination of ideas on environmental issues
11) Calculation of Carbon Footprint.
12) Study on Formats Required for ESG Reporting.
13) Calculation of Water Footprint.
14) Visit to local polluted site: Aquatic, terrestrial etc. .

*Any other relevant practical related to syllabus

References:

1. Environmental Science: A Practical Manual Book by G Lakshmi Swarajya and P Prabhu Prasadini (2018)
2. Environmental Chemical Analysis Laboratory Manual, Prepared by Dr. Erik Krogh, Dr. Chris Gill, Shelley Gellein, and Peter Diamente Department of Chemistry, 2018
3. Environmental Chemistry: S. e. Manahan
4. The Chemistry of Our Environment: R. A. Hom

Mapping of Program Outcomes with Course Outcomes

	Programme Outcomes (POs)												
Cou) utcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3										1		
CO2	3										1		
CO3	3				2						1		
CO4		3		2	2						1	2	
CO5	3										1		
CO6	3										1		
CO7			3	2			2				1	2	

Justification for the mapping

PO1: Comprehensive Knowledge and Understanding:

CO1, CO2, CO3, CO5, and CO6: Collectively provide a comprehensive understanding of biodiversity, natural resources, hazards and risks, ecosystems, and their ecological value and consumptive use, thus contributing to comprehensive knowledge and understanding in environmental studies.

PO2: Practical, Professional, and Procedural Knowledge:
CO4: Involves students using laboratory techniques for chemical experiments and procedures, which contributes to practical knowledge and skills necessary for professional work in environmental science and related fields.

PO3: Entrepreneurial Mindset and Knowledge:
CO7: Provides students with opportunities to work in research labs, biofertilizer industries, and potentially become bio-entrepreneurs, fostering an entrepreneurial mindset and knowledge in environmental contexts.

PO4: Specialized Skills and Competencies:
CO4: Involves the use of specialized laboratory techniques.
CO7: Provides opportunities for specialized work in research labs and biofertilizer industries, contributing to the development of specialized skills and competencies.

PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning:
CO3: Involves evaluating hazards and risks, which requires analytical reasoning and problem-solving skills. Additionally,
CO4: Requires students to safely conduct chemical experiments, demonstrating their capacity for application and problem-solving.

PO7: Research-related Skills:
CO7: Explicitly involves students working in research labs, where they can develop research-related skills such as experimental design, data analysis, and scientific inquiry.

PO11: Value Inculcation and Environmental Awareness:
All COs(1-7) collectively contribute to raising awareness about the importance of biodiversity conservation, sustainable resource management, risk assessment, ecosystem values, and the significance of environmental research and entrepreneurship, thus inculcating values and awareness in environmental studies.

PO12: Autonomy, Responsibility, and Accountability:
CO4: Requires students to safely conduct chemical experiments, demonstrating autonomy and responsibility. Additionally, opportunities provided.
CO7: For working in research labs and biofertilizer industries entail accountability for one's work and contributions.

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CBCS Syllabus as per NEP 2020 for S.Y. B.Sc. (2024 Pattern)

Name of the Programme	: B.Sc. Environmental Science
Program Code	:USENV
Class	: S.Y.B.Sc.
Semester	: III
Course Type	: Open Elective (Theory)
Course Code	: ENV-208-OE
Course Name	: **Initiatives For Environmental Management**
No. of Credits	: 02
No. of Teaching Hours	: 30

Course Objectives:

1) Mitigate adverse impacts on various environmental components.
2) Protect environmental resources where possible.
3) Enhance the value of environmental components where possible.
4) Creating the awareness about environmental problems among people.
5) Imparting basic knowledge about the environment and its allied problems.
6) Developing an attitude of concern for the environment.
7) To maintain a balance between economic development and environmental quality.

Course Outcomes:

By the end of the course, students will be able to:

CO1. Provide definitions of environment, management, systems and organizations in relation to environmental management.

CO2. Describe organizations as systems and their role in environmental management.

CO3. Understand the usefulness of systems thinking in relation to environmental management in organizations.

CO4. Explain how environmental management can be used as environmental protection and how organizations can define and manage risk.

CO5. Demonstrate mastery of core ecological and physical science concepts and methods as they pertain to environmental problem-solving.

CO6. To articulate the basic structure, function and processes of key social system affecting the environment.

CO7. To identifies, interpret, and apply basic measures (metrics and formulae) of social system variables to assess socio-environmental conditions.

Topics and Learning Points

Teaching Hours

UNIT 1: Introduction **10**

1.1 Definition and components of the environment – Atmosphere, hydrosphere, lithosphere and biosphere – Definitions and influences on human beings.
1.2 Environmental issues
1.3 Water and wastewater management
1.4 Energy conservation
1.5 Municipal solid waste management

UNIT 2 Sustainable Strategies in Agriculture **10**

2.1 Implications on soil water management – Fertilizer pollution – Soil salinity, Eutrophication and Bio-magnification.
2.2 Pesticide pollution -Integrated Pest Management (IPM), Bio- pesticides, Genetic Modified Crops (GMCs).
2.3 Natural farming methods.
2.4 Irrigation and drainage systems (Israel Model), Hydroponics and Aeroponics.
2.5 Alternative cultivation methods.

UNIT 3: Environmental Management **10**

3.1 Definition, need, significance and applications.
3.2 Management of Bioresources, Land and water resources
3.3 Technological solutions for environmental degradation: Concept, advantages and limitations.
3.4 Role of individuals in Environmental management
3.5 Participation in ecofriendly and sustainable endeavors.

References:

1) Baird, Ian G. Peoples Livelihoods and Developments in the Xekong River Basin Laos, whitelotous Bangkok 2009.
2) DzodziTsikata and Pamela Golah (Ed) Land Tanure Gender And Globalization: Research And Analysis From Africa Asia And Latin America Zubaan New Delhi 2010
3) Agrawal, Bina. Gender and Green Revolution, OUP New Delhi 2010

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Mapping of Program Outcomes with Course Outcomes

Course Outcomes	Programme Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3							2			1		
CO2	3										1		
CO3					2						1		
CO4		3		2							1	1	
CO5	3			2	2		2				1		
CO6						3				2	1		
CO7		3	2			2	2	1			1	1	2

Justification for the mapping

PO1: Comprehensive Knowledge and Understanding:
CO1: introduces foundational concepts related to environmental management, providing a comprehensive understanding of key terms and their relevance.
CO2: expands this understanding by relating organizations to environmental management, enhancing knowledge about the systems involved.
CO5: deepens understanding by applying core ecological and physical science concepts to environmental problem-solving.

PO2: Practical, Professional, and Procedural Knowledge:
CO4: involves explaining how environmental management translates to environmental protection and risk management within organizations, providing practical knowledge applicable in professional settings.
CO7: by identifying and applying measures of social system variables, enhances procedural knowledge essential for environmental management practices.

PO3: Entrepreneurial Mindset and Knowledge:
CO7: provides opportunities for students to work in research labs, bio-fertilizer industries, and potentially become bio-entrepreneurs, fostering an entrepreneurial mindset and providing knowledge about entrepreneurial opportunities in environmental management.

PO4: Specialized Skills and Competencies:

CO4: emphasizes the use of laboratory techniques for chemical experiments, developing specialized skills necessary for environmental management professionals.
CO5: ensures mastery of core ecological and physical science concepts, providing competencies essential for addressing environmental challenges.

PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning:
CO3: introduces systems thinking in environmental management, enhancing problem-solving capacity by providing a holistic approach to analyzing and addressing environmental issues.
CO5: further develops problem-solving skills by applying core science concepts to environmental problem-solving.

PO6: Communication Skills and Collaboration:
CO6: involves articulating the structure, function, and processes of social systems affecting the environment, requiring effective communication skills to convey complex ideas. Additionally, CO7: involves interpreting and applying social system variables, which may necessitate collaboration in data interpretation and analysis.

PO7: Research-related Skills:
CO7: provides opportunities for students to work in research labs, requiring research-related skills such as data collection, analysis, and interpretation.
CO5: also involves applying scientific methods to environmental problem-solving, further enhancing research skills.

PO8: Learning How to Learn Skills:
CO1 to CO7: Collectively contribute to learning how to learn by introducing foundational concepts, practical knowledge, and specialized skills essential for environmental management, providing a basis for continuous learning and skill development.

PO10: Multicultural Competence, Inclusive Spirit, and Empathy:
CO6: Involves understanding the structure and processes of social systems affecting the environment, fostering awareness of cultural and social dynamics, which contributes to developing multicultural competence and empathy towards diverse stakeholders.

PO11: Value Inculcation and Environmental Awareness:
All Cos (1-7) collectively contribute to raising awareness about environmental issues, management practices, and the importance of integrating environmental considerations into organizational operations, thus promoting environmental awareness and values.

PO12: Autonomy, Responsibility, and Accountability:
CO4: Involves explaining how organizations define and manage environmental risks, fostering a sense of responsibility and accountability in environmental management.
CO7: by providing opportunities for students to work in various settings, promotes autonomy and accountability in applying environmental management principles.

PO13: Community Engagement and Service:

CO7: provides opportunities for students to engage in research labs and bio-fertilizer industries, potentially contributing to community service through environmental research and sustainable practices.

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CBCS Syllabus as per NEP 2020 S.Y.B.Sc. (2024Pattern)

Name of the Programme	: B.Sc. Environmental Science
Program Code	: USENV
Class	: S.Y.B.Sc.
Semester	: III
Course Type	: Indian Knowledge System
Course Code	: ENV-209-IKS
Course Name	: Environment, Cultural Values and Society (Theory)
No. of Credits	: 02
No. of Teaching Hours	: 30

CourseObjectives:

1. To know in depth that our existence is impossible if the nature does not exist.
2. Encouraging environmentally responsible behavior, and developing an environmental ethic that promotes an understanding of the ecological interdependence of the social, political, and economic spheres.
3. Individuals develop a deeper understanding of environmental issues and have the skills to make informed and responsible decisions.
4. Understanding the extent of our responsibility towards the environment and also identifies our obligation towards it.
5. To promote personal development through spiritual, moral, social and cultural development through a rich range of curricular opportunities.
6. Students will learn why it's important to learn about the cultures of the communities.
7. Increase awareness, appreciation, and inclusion of diverse beliefs and cultural value

CourseOutcomes:

By the end of the course, students will be able to:

CO1. Know the values of natural resources.

CO2. Participate in conservation and preservation of environment discussion and contributing tothecountry by protecting.

CO3. Underst and the gender equality and concepts of women status in India.

CO4. To provide student with a theoretical understanding of the challenge of sustainability,

with an emphass on cultural perspectives and environmental values.

CO5. Learn about the ethical responsibilities of the communities about environmental values.

CO6. To develops student's skill in and knowledge of philosophical argumentation, historical processes and cultural understanding of environmental problems.

CO7. To introduces students to the complexities of interdisciplinary research.

TopicsandLearningPoints

TeachingHours

UNIT1 Unique Traditional Practices 10

Agriculture, animal husbandry, Forest, Sacred Groves, Sacred Water Bodies, Water Mills. Water and Soil Conservation and management Practices, Utilization Practices and Food Preservation Methods. Handicrafts, Wood Processing and Carving, -Fiber Extraction and Costumes. Role of tribal people in environmental conservation.

UNIT 2 Applied Traditional Knowledge 10

Community participation in Environmental conservation – Role of communities, Individual- level initiatives to ensure sustainable development, case studies of environmental movements (Chipko Movement, Narmada Bachao Andolan). Role of NGOs and youth, Environmental education and awareness.

UNIT3: Women and environment 10

Women response to environmental degradation, Women and environmental conservation, Prominent women environmentalist, Role of rural women in agricultural and social forestry sector, etc., Role of urban women in climate management, life style choices and resource conservation,etc.

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Mapping of Program Outcomes with Course Outcomes

	Programme Outcomes (POs)												
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PO13**
CO1	3										2		
CO2		3				2					1		1
CO3													
CO4	2									1			
CO5					3						2	1	
CO6			3	2									
CO7					2		1	1					

Justification for the mapping

PO1: Comprehensive Knowledge and Understanding
CO1: Know the values of natural resources.
CO4: Provide students with a theoretical understanding of the challenge of sustainability, with an emphasis on cultural perspectives and environmental values.

PO2: Practical, Professional, and Procedural Knowledge

CO2: Participate in conservation and preservation of environment discussion and contribute to the country by protecting.

PO3: Entrepreneurial Mindset and Knowledge
CO6: Develop students' skills in and knowledge of philosophical argumentation, historical processes, and cultural understanding of environmental problems.

PO4: Specialized Skills and Competencies
CO6: Develop students' skills in philosophical argumentation and historical processes related to environmental problems.

PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning
CO5: Learn about the ethical responsibilities of communities regarding environmental values.
CO7: Introduce students to the complexities of interdisciplinary research.

PO6: Communication Skills and Collaboration
CO2: Participate in conservation and preservation of environment discussion and contribute to the country by protecting.

PO7: Research-related Skills
CO7: Introduce students to the complexities of interdisciplinary research.

PO8: Learning How to Learn Skills
CO7: Introduce students to the complexities of interdisciplinary research.

PO10: Multicultural Competence, Inclusive Spirit, and Empathy
CO4: Provide students with an understanding of sustainability with emphasis on cultural perspectives.

PO11: Value Inculcation and Environmental Awareness
CO1: Know the values of natural resources.
CO2: Participate in conservation and preservation of the environment.
CO5: Learn about ethical responsibilities of communities related to environmental values.

PO12: Autonomy, Responsibility, and Accountability
CO5: Learn about ethical responsibilities of communities regarding environmental values.

PO13: Community Engagement and Service
CO2: Participate in conservation and preservation of environment discussion and contribute to the country by protecting.

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