Anekant Education Society's

Tuljaram Chaturchand College, Baramati.

(Autonomous)

(Faculty of Science & Technology)

S.Y.B.Sc. (Environmental Science) Semester-III &IV
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
S.Y.B.Sc. Scheme of Course Structure (Faculty of Science)
Department: Environmental Science

Class	Semester	Paper Code	Title of Paper	No. of Credits
S.Y.B.Sc	III	EVS 2301	Natural Resources	3
		EVS2302	Environmental Pollution and Control-I	3
		EVS 2303	Practical based on EVS2301 & EVS2302	2
	IV	EVS 2401	Solid and Hazardous Waste Management	3
		EVS 2402	Environmental Pollution and Control- II	3
		EVS 2403	Practical based on EVS2401 & EVS2402	2

SEMESTER - IV
PAPER CODE: EVS 2401

PAPER – I: SOLID AND HAZARDOUS WASTE MANAGEMENT

Credit -3: No. of Lectures - 48.

 Learning objectives:
- To understand basic solid wastes.
- To make the students aware about solid waste processing, recovery and energy generation.

Course Outcomes:
1. Student understanding w.r.t. solid waste generation issue will be enhanced.

2. Students will be doing systematic study of solid waste issue and ways to tackle the issue.

3. Students will learn important details about collection and transport of solid waste.

4. Students will be able to identify different types of solid waste and their characteristics and classify them according to their properties.

5. Students will be able to understand economic and environmental benefits of recycling and resource recovery.

6. Students will be able to understand hazardous waste classification, types and sources.

7. Students will explore various methods of hazardous waste management including treatment storage and disposal.

Credit -1:
UNIT 1 - Solid Waste   16 L

- Solid Waste – types and sources. Solid waste characteristics, generation rates, solid waste components, proximate and ultimate analyses of solid wastes.

- Solid waste collection and transportation: container systems – hauled and stationary, layout of collection routes, transfer stations and transportation.

UNIT 2 - Solid waste processing and recovery: 16 L

- Solid waste processing and recovery – Recycling, recovery of materials for recycling and direct   manufacture of solid waste products.

- Electrical energy generation from solid waste (Fuel pellets, Refuse derived fuels), composting and Vermicomposting, biomethanation of solid waste.

- Disposal of solid wastes – sanitary land filling and its management, incineration of solid waste.

Credit -2:

UNIT 3 - Hazardous waste :   10L

- Hazardous waste – Types, characteristics and health impacts.

- Hazardous waste management: Treatment Methods – neutralization, oxidation reduction, precipitation, solidification, stabilization, incineration and final disposal.

UNIT 4: Plastic waste and e-waste   06 L

- Plastic waste: sources, consequences and management
- E-waste: classification, methods of handling and disposal.

References:

1. Environmental chemistry by B. K. Sharma, Goel publication house, Meerut, Sixth revised edition – 2001.
2. Ecology and environment by P. D. Sharma, Rastogi publications, Meerut. Seventh edition – 2004.
3. Environmental Pollution Control Engineering: C.S.Rao,New Age International (P) Ltd.
   (1991)
4. Environmental Science and Engineering: Dr.N.Arumugam,Prof.V.Kumaresan(Saras Publication, Kottar, Dist. Kanyakumari)
5. Perspectives in Environmental Studies: Anubha Kaushik, C.P.Kaushik (New Age International(P) Limited, Publishers)
6. Cheremisinoff, N. P., Bio-Technology for Waste and Wastewater Treatment William Andrew Publishing, 1996.
7. Fellenberg, G., Chemistry of Pollution, John Wiley and Sons, 1999.
8. El-Halwagi M.M., Pollution Prevention through Process Integration, AP. 1997

Mapping of Program Outcomes with Course Outcomes

Programme Outcomes (POs)								
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1			3		2		3		

CO2		2		3		2			3
CO3	2						3	
CO4	2	2						
CO5		2					3	
CO6	2							
CO7						3		3

Justification for the mapping

PO1: Disciplinary Knowledge:

CO3: Gain important details about the collection and transport of solid waste.

CO4: Identify different types of solid waste, understand their characteristics, and classify them based on their properties.

CO6: Understand hazardous waste classification, types, and sources.

PO2: Critical Thinking and Problem solving:

CO2: Apply critical thinking skills in the systematic study of solid waste issues and devising effective solutions.

CO4: Utilize problem-solving skills to identify and classify different types of solid waste based on their properties.

CO5: Evaluate economic and environmental benefits associated with recycling and resource recovery.

PO3: Social competence:

CO1: Enhance social competence by understanding the impact of solid waste generation issues on the community.

PO4: Research-related skills and Scientific temper:

CO2: Develop research-related skills through a systematic study of solid waste issues.

CO7: Apply scientific temper in exploring various methods of hazardous waste management, including treatment, storage, and disposal.

PO5: Trans-disciplinary knowledge

CO1: Integrate trans-disciplinary knowledge in understanding and addressing solid waste generation issues.

PO6: Personal and professional competence

CO2: Deepen personal and professional competence by actively participating in the systematic study of solid waste issues.

PO7: Effective Citizenship and Ethics:

CO1: Promote effective citizenship by understanding and addressing the social and environmental impacts of solid waste generation issues.

CO7: Consider ethical considerations in exploring various methods of hazardous waste management.

PO8: Environment and Sustainability:

CO3: Promote environmental sustainability by learning important details about the collection and transport of solid waste.

CO5: Advocate for the economic and environmental benefits of recycling and resource recovery.

PO9: Self-directed and Life-long learning:

CO2: Cultivate self-directed learning by actively engaging in a systematic study of solid waste issues.

CO7: Foster life-long learning by exploring various methods of hazardous waste management and staying updated on advancements.

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SEMESTER - IV

PAPER CODE: EVS 2402
PAPER - II: ENVIRONMENTAL POLLUTION AND CONTROL-II
Credit -3: No. of Lectures - 48.

Learning objectives:
- To learn about air   pollution.
- To make the students aware of noise pollution.

Course Outcomes:
1. Students will understand various forms of environmental pollution its sources and causes.

2. Students will understand long term and short term effects of pollution on human health and ecosystem.

3. Students will learn methods for monitoring and measuring pollution levels and interpret data related to pollution.

4. Students will explore strategies and technologies for controlling air pollution.

5. Students will understand the role of air quality management in urban and industrial settings.

6. Students will understand the sources and effects of noise pollution.

7. Students will explore measures and regulations for controlling and mitigating noise pollution.

Credit -1:
UNIT 1 - Air Pollution   16L

Sources and types of Pollutants – Natural and anthropogenic sources, primary and secondary pollutants. Criteria air pollutants. Sampling and monitoring of air pollutants (gaseous and particulates); period, frequency and duration of sampling. Principles and instruments for measurements of (i) ambient air pollutants concentration and (ii) stack emissions. Indian National Ambient Air Quality Standards. Impact of air pollutants on human health, plants and materials. Acid rain. Dispersion of air pollutants. Mixing height/depth, lapse rates, Gaussian plume model, line source model and area source model. Control devices for particulate matter: Principle and working of: settling chamber.

Credit -2:

UNIT 2 - Control of Air Pollution   12L

• At source reduction: a) Raw material changes. b) Process / Operational changes. c) Equipment modification / replacement. • Air Pollution control technology: Principle - a) Condensation. b) Absorption. c) Adsorption. d) Filtration. e) Electrostatic Precipitation. f) Gravity Settling. g) Wet scrubbing. • Control of emissions from automobiles. a) Redesigned engines. b) Catalytic converters …etc.

Credit -3:
UNIT 3 - Noise Pollution   12L

Sources, weighting networks, measurement of noise indices (Leq, L10, L90, L50, LDN, TNI). Noise dose and Noise Pollution standards. Noise control and abatement measures: Active and Passive methods. Vibrations and their measurements. Impact of noise and vibrations on human health.

UNIT 4 - Control of Noise Pollution   06L

Noise Control Techniques - a) Sound Insulation. b) Sound Absorption. c) Vibration Damping. d) Vibration Isolation. e) Active Noise Control/ Noise Cancellation. • Control at Source - a) Selection & Maintenance of machines. b) Control over vibrations. • Control in Transmission Path - Installation of barriers / enclosures …etc. • Control at Receiver - a) Using protective equipments. b) Job rotation to reduce exposure …etc.

References:

1. Environmental chemistry by B. K. Sharma, Goel publication house, Meerut, Sixth revised edition – 2001.
2. Ecology and environment by P. D. Sharma, Rastogi publications, Meerut. Seventh edition – 2004.
3. Environmental Pollution Control Engineering: C.S.Rao,New Age International (P) Ltd.
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5. Perspectives in Environmental Studies: Anubha Kaushik, C.P.Kaushik (New Age International(P) Limited, Publishers)
6. Cheremisinoff, N. P., Bio-Technology for Waste and Wastewater Treatment William Andrew Publishing, 1996.
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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
CO1	3		3		2		3		
CO2		3				2			
CO3		2		3					2
CO4				3				3	3
CO5								3	
CO6				2					
CO7				2			3		

Justification for the mapping

PO1: Disciplinary Knowledge:
CO1: Attain comprehensive knowledge about various forms of environmental pollution, their sources, and causes.

PO2: Critical Thinking and Problem solving:
CO2: Develop critical thinking skills to understand the long-term and short-term effects of pollution on human health and ecosystems.
CO3: Apply problem-solving skills in learning methods for monitoring and measuring pollution levels and interpreting related data.

PO3: Social competence:
CO1: Foster social competence by understanding the societal implications of various forms of environmental pollution.

PO4: Research-related skills and Scientific temper:
CO3: Develop research-related skills in methods for monitoring and measuring pollution levels and interpreting related data.
CO4: Apply scientific temper in exploring strategies and technologies for controlling air pollution.
CO6: Apply scientific temper to understand the sources and effects of noise pollution.
CO7: Explore measures and regulations for controlling and mitigating noise pollution with a scientific mindset.

PO5: Trans-disciplinary knowledge
CO1: Integrate trans-disciplinary knowledge by understanding various forms of environmental pollution and their interconnectedness.

PO6: Personal and professional competence
CO2: Deepen personal and professional competence by understanding the health and ecological effects of pollution.

PO7: Effective Citizenship and Ethics:

CO1: Promote effective citizenship by understanding the environmental impact and societal causes of pollution.

CO7: Explore measures and regulations for controlling and mitigating noise pollution with ethical considerations.

PO8: Environment and Sustainability:

CO4: Advocate for strategies and technologies that contribute to the control of air pollution.

CO5: Understand the role of air quality management in urban and industrial settings, advocating for environmental sustainability.

PO9: Self-directed and Life-long learning:

CO3: Cultivate self-directed learning by actively engaging in methods for monitoring and measuring pollution levels and interpreting related data.

CO4: Foster life-long learning by staying updated on advancements in strategies and technologies for controlling air pollution.

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SEMESTER - IV, PAPER – III

PAPER CODE: EVS 2403
Practicals based on EVS - 2401 and EVS- 2402.   **No. of Practicals - 13**

Course Outcomes:

1. Students will be reinforcing theoretical concepts and developing hands-on skills.
2. Students will be able to collect and analyze environmental samples to measure pollutant concentrations.
3. Students will learn to interpret monitoring results and draw conclusions about the extent of pollution.
4. Students will be able to conduct air quality measurements using air samplers and analyzers with different analyzing methods.
5. Students will learn to use sound level meters to measure noise levels in different environments.
6. Students will identify and quantify pollutants in water samples by performing water analysis tests.
7. Students will analyze effect of pollution on plants and their chlorophyll levels.

1. Study of principal and function of air volume sample and settling chamber.
2. Determination of Sox from given sample.
3. Estimation of residual chlorine from the given water sample.
4. Study of BOD of given water sample by Iodometric method.
5. Determination of Total Dissolved solids from waste water sample.
6. Analysis of organic carbon of wastes.
7. Determination of the total chlorophyll content from the plant in clean and polluted environment.
8. Study of air pollution by spectro-photometric method.
9. Study of air pollution by chromatographic method.
10. Qualitative and quantitative observation and study of noise pollution.
11. Study of noise pollution control devices in any five locations.
12. Demonstration of air pollution control technology (any four).
13. Visit to any three – Vermicomposting plant / Water filtration unit/ Sewage treatment plant/ Biogas unit and submission of GEOTAG photo print at the practical examination.

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

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

Justification for the mapping

PO1: Disciplinary Knowledge:
CO1: Reinforce theoretical concepts and cultivate hands-on skills in environmental studies.

PO2: Critical Thinking and Problem solving:
CO2: Develop critical thinking skills by collecting and analyzing environmental samples to measure pollutant concentrations.
CO3: Apply problem-solving skills in interpreting monitoring results and drawing conclusions about the extent of pollution.

PO3: Social competence:
CO7: Analyze the effects of pollution on plants and their chlorophyll levels, contributing to an understanding of the ecological and social impact of pollution.

PO4: Research-related skills and Scientific temper:
CO2: Enhance research-related skills by collecting and analyzing environmental samples to measure pollutant concentrations.
CO4: Develop scientific temper through conducting air quality measurements using air samplers and analyzers with different analyzing methods.
CO6: Apply scientific methods in identifying and quantifying pollutants in water samples through water analysis tests.

CO7: Conduct scientific analysis of the effect of pollution on plants and their chlorophyll levels.

PO5: Trans-disciplinary knowledge
CO2: Integrate trans-disciplinary knowledge by collecting and analyzing environmental samples, recognizing the interconnectedness of various environmental factors.

PO6: Personal and professional competence
CO1: Deepen personal and professional competence by reinforcing theoretical concepts and developing hands-on skills in environmental monitoring.

PO7: Effective Citizenship and Ethics:
CO7: Analyze the effect of pollution on plants and their chlorophyll levels with ethical considerations for environmental impact and conservation.

PO8: Environment and Sustainability:
CO2: Advocate for environmental sustainability by collecting and analyzing environmental samples to measure pollutant concentrations.
CO4: Apply knowledge of air quality measurements to contribute to strategies for environmental sustainability.

PO9: Self-directed and Life-long learning:
CO1: Cultivate self-directed learning by reinforcing theoretical concepts and developing hands-on skills independently.
CO2: Foster life-long learning by staying updated on advancements in environmental monitoring techniques.

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