Anekant Education of Society's
Tuljaram Chaturchand College of Arts, Science and Commerce,
Baramati
(Autonomous)

SYLLABUS (CBCS) FOR S. Y. B. Sc. Environmental Science (w.e.f. June, 2023)

Academic Year 2023-2024

Semester	Paper Code	Paper Title	Credit
III	USES231	Natural Resources	03
	USES232	Environmental Pollution -I	03
	USES233	Practical based on USES231 & USES232	02
IV	USES241	Solid and Hazardous Waste Management	03
	USES242	Environmental Pollution -II	03
	USES243	Practical based on USES241 & USES242	02

SYLLABUS

SECOND YEAR B.Sc. ENVIRONMENTAL SCIENCE

ACADEMIC YEAR 2023-2024

SEMESTER - IV

DEPARTMENT OF ENVIRONMENTAL SCIENCE

A. Learning objectives:

1) Create a personal inventory of consumption of natural resources.
2) To make the students aware about resources and their uses.
3) To learn about interrelationship and discipline in environment science.
4) Students will learn how to assess pollution sources.
5) To improve the quality of the environment and to encourage the sustainable management of resources.
6) To provide general understanding of quality of air and impact on local and global effects of air pollution on human, materials, properties and vegetation.
7) Environmental pollution aims at changing climate and weather conditions.

B. **Learning outcomes** :

On completion of this subject, students will able to:

1) Students will understand the basic principles of livestock production.
2) Students will understand the basic concepts of laws pertaining to agriculture and/or evaluation of land use for various agricultural practices.
3) Students will be able to apply knowledge to solve problems related to crop production and plant growth.
4) Students will have a greater knowledge of how natural resources relate to the economy and environment, both currently and in the future.
5) Students will be evaluating consequences of human exposure to pollution and its impacts to environmental quality.
6) Ability to demonstrate sound understanding of the waste generation process and characteristics of different types of solid wastes.
7) Ability to assess the underlying science behind the waste driven pollution.

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

Paper Code : **USES 241**

Paper : **I** Title of Paper : Solid and Hazardous Waste Management

Credit : 3 No. of lecture : 48

A. Learning objectives:

1) To understand basics of solid wastes.
2) To make the students aware about solid waste processing, recovery and energy generation.
3) Minimize the Production of Waste.
4) Proper management practices help minimize the garbage and scraps that need handling.
5) Reduce Pollution Effects. Secondly, it's vital to lower the impact garbage has on pollution.
6) Protect Groundwater Sources.
7) To characterize the waste and apply the knowledge of laws for municipal solid waste management, for handling of biomedical wastes and for handling of plastic wastes.

B. **Learning outcomes**:

1) Student understands resources in day to day life.
2) Students will be able to understand future sustainability of natural resources.
3) Students understand conservation of natural resources.
4) Students understand conflict and management of natural resources.
5) Plan a solid waste management system for decision makers.
6) To minimize the amount of waste generated and to promote the reuse and recycling of materials.
7) This can be achieved through waste reduction strategies, such as reducing packaging and promoting sustainable lifestyles.

UNIT I: Solid Waste **(12L)**

- Solid Waste – types (Domestic, Biomedical, industrial waste etc.) 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 II: Solid waste processing and recovery: **(12L)**

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

UNIT III: Hazardous waste (**12L)**

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

UNIT IV: Plastic waste and e-waste **(12L)**

- Plastic waste: sources, consequences
- Management methods of plastic waste
- E-waste: Sources, classification & effects of e-waste
- Methods of handling and disposal

References:

1) White P.R. et al, Integrated Solid Waste Management, Lewis Publisher, 1989.
2) Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Govt. of India, New Delhi, 2000.
3) David L.H.F. and Liptak D. G., Hazardous waste and solid waste, Lewis Publisher, 2000.
4) Oberoi N.K, Environmental Management, (2nd Edition) Excel Books, New Delhi, 2003.
5) Ashok K. Rathoure ,Zero Waste: Management Practices for Environmental Sustainability, 2019.
6) O. P. Gupta, Elements of Solid Hazardous Waste and Management,2018.
7) Handbook of Industrial and Hazardous Waste Treatment by Lawrence K. Wang, 2004.
8) Solid and Hazardous Waste Management: Science and Engineering, M.N. Rao, Razia Sultana, Sri Harsha Kota 2016.

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

Paper Code : **USES 242**

Paper : **II** Title of Paper : Environmental Pollution -II

Credit : 3 No. of lecture: 48

A. Learning objectives:

1) To learn about air pollution, noise pollution.
2) To make the students aware of noise pollution.
3) To know basic pollution types, components, phyto-remediation , etc
4) To make the students aware about pollution and control of pollution.
5) To aware students about effects of pollution in day to day life.
6) To know treatments for maintaining quality of water and soil.
7) To provide general understanding of quality of air and impact on local and global effects of air pollution on human, materials, properties and vegetation.

B. **Learning outcomes**:

1) Students will be able to understand future sustainability of natural resources.
2) Ability to suggest the environmental control /management plan for environmental pollution problems.
3) Students understand conflict and management of natural resources.
4) To make the surroundings cleaner and greener for the current as well as future generations.
5) To aware the surrounding people of the rapidly depleting natural resources and make them contribute to the conservation of the same.
6) Ability to identify and quantify the magnitude and intensity of Environmental pollution problems.
7) Ability to undertake environmental sampling and analysis with respect to air, water and noise pollution.

UNIT I: Air Pollution (12L)

- 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).
- 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. Dispersion of air pollutants. Mixing height/depth, Gaussian plume model, line source model and area source model.

UNIT II: 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, settling chamber.
- Control of emissions from automobiles. a) Redesigned engines. b) Catalytic converters etc.

UNIT III: Noise Pollution (12L)

- Sources, weighting networks, measurement of noise indices (Leq, L10, L90, L50, LDN, TNI).
- Noise dose and Noise Pollution standards.
- Vibrations and their measurements.
- Impact of noise and vibrations on human health.

UNIT IV - Control of Noise Pollution (12 L)

- 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
- 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. (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

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

Paper Code : **USES** 243

Paper : **III** Title of Paper : Practical based on **USES** 241 **and USES** 242

Credit : 2 No. of Practicals: 13

A) Learning objectives:

1) To understand the basics of sample collection of water and soil.
2) To make the students aware about medicinal and economical plants around them.
3) To make student aware about renewable energy resources around them.
4) To field experience of water treatment plant.
5) To understand sampling and analysis of air pollutants.
6) To understand standards and measurement of noise
7) To understand air pollution impacts on chlorophyll contents.

B) **Learning outcomes**:

1) Imparts conceptual knowledge of natural resources, and pollution.
2) Students will understand the basics knowledge of soil and water quality parameters in day to day life.
3) Students will acquire the knowledge about sustainable use of renewable energy resources.
4) Students will be able to understand easy way to save water and prevent soil erosion and flood hazard.
5) Students will understand handling of air pollutant sampling instrument
6) Students will acquire the knowledge about air pollution control technologies.
7) Students will understand solid waste management techniques.

1. Study of principal and function of air volume sample.
2. Determination of SO_x from given sample.
3. Estimation of residual chlorine from the given water sample.
4. Determination of total dissolved solids from waste water sample.
5. Determination of the total chlorophyll content from the plant in clean and polluted environment.
6. Study of principal and function of settling chamber
7. Determination of noise pollution by dB meter
8. Study of treatment for decomposable solid waste-vermi-composting.
9. Demonstration noise pollution control devices.
10. Visit to air pollution control technology- Noise cancellation and sound proofing.
11. Documentary on sanitary land filling of solid waste.
12. Visit to any – Vermi-composting plant / Water filtration unit/ Sewage treatment plant/ Biogas unit and submission of GEOTAG photo print at the practical examination.

*Any other practical's 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

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