

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

Scheme of Course Structure (Faculty of Science)

Department: Environmental Science

Class	Semester	Paper Code	Title of Paper	No. of Credits
F.Y.B.Sc.	I	EVS1101	Fundamentals of Environmental Science - I	2
		EVS1101	Fundamentals of Environmental Biology - I	2
		EVS 1103	Practical based on EVS1101 & EVS1102	2
	II	EVS 1201	Fundamentals of Environmental Science - II	2
		EVS 1202	Fundamentals of Environmental Biology - II	2
		EVS 1203	Practical based on EVS1201 & EVS1202	2
S.Y.B.Sc	III	EVS 2301	Natural Resources	3
		EVS2302	Environmental Pollution and Control-I	3
		EVS 2303	Practical based on EVS2301 & EVS2302	3
	IV	EVS 2401	Solid and Hazardous Waste Management	3
		EVS 2402	Environmental Pollution and Control- II	3
		EVS 2403	Practical based on EVS2401 & EVS2402	3
T.Y.B.Sc	V	EVS3501		
		EVS3502		
		EVS3503		
		EVS3504		
		EVS3505		
		EVS3506		
		EVS3507		
		EVS3508		
		EVS3509		
	VI	EVS3601		
		EVS3602		
		EVS3603		
		EVS3604		
		EVS3605		
		EVS3606		
EVS3607				
EVS3608				
EVS3609				

SEMESTER - III

PAPER CODE: EVS 2301

PAPER - I: NATURAL RESOURCES

Credit -3 : No. of Lectures – 48.

Learning objectives :

- To learn basic resources natural, forest, Grasslands etc
- To make the students aware about resources.

Learning outcomes :

1. Student understand resources, vermiculture in day to day life, Sponge fishery.

Credit 1

UNIT 1- Resources :

10L

Definition, Classification of Resources: a) Natural Vs Artificial Resources. b) Material Vs Energy Resources. c) Biotic / Biological Vs Abiotic / Non-biological Resources. d) On the basis of its Renewability with-in the Human Time Scale as – Non-renewable, Potentially renewable & Perpetual Resources. Man's interaction with Natural Resources – a) As Resource Base. b) As Waste Sink. c) Cultural Significance of Natural Resources. Importance & Scope of Natural Resources.

UNIT 2 - Forest, Grassland and Wildlife Resources

10L

- A) Forest Resource: • Classification – Old & Second Growth Forests ...etc. • Ecological Significance. • Forest Mgmt. in India – Laws, JFM, EDP, Protected Areas.
- B) Grassland Resource: • Classification. • Significance - Ecological & Non-ecological. • Grassland Mgmt. – Prevention from Overgrazing ...etc. C) Wildlife Resource: • Meaning & Definition. • Significance - Ecological and Non-ecological. • Protection and Conservation of Wildlife – Laws, Protected Areas - Insitu and Ex-situ methods.

Credit 2 :

Unit -3 : Land & Water Resources :

14L

- A) Land Resource: • Significance of the top-most layer. • Soil Erosion – Causes – Water & Wind. Erosion of Soil. Control of Erosion & Soil Conservation Methods.
- B) Water Resource: Sources and Distribution. Water Scarcity – the reasons. Conflicts over water in World and India. Conservation & Mgmt. – a) Traditional Methods. b) Rain-water Harvesting and Ground Water Recharge. c) Water-shed management- concept.

Credit 3 :**UNIT 4 : Energy Resources :****14L**

- Classification of energy resources: a) Exhaustible Vs Inexhaustible. b) Polluting Vs Non-polluting. c) Conventional Vs Non-conventional. • Energy Crisis. Energy Scenario in World & in India. • Conventional Energy Resource – a) Coal. b) Oil. c) Natural Gas. d) Nuclear Energy. • Solar Energy – Solar Cells, Solar Heating (Active & Passive), Solar Collectors. • Wind Energy – Location of Wind Generator Site, Wind Energy Converters. Hydro-electric Energy – Impulse & Reaction Turbines. Tidal Energy – Wells Turbine. Wave Energy. • Geothermal Energy. Bioenergy – a) Biomass &, Biomass Programme – Energy Plantation, Wastes. b) Biogas. c) Ethanol. d) Biodiesel. • Energy Management – Energy Audit .

SEMESTER - III**PAPER CODE: EVS 2302****PAPER - II: ENVIRONMENTAL POLLUTION AND CONTROL- I****Credit -3: No. of Lectures - 48.****Learning objectives :**

- To know basic pollution types, components, phytoremediation , etc
- To make the students aware about resources.

Learning outcomes :

2. Student understanding w.r.t. biofertilizers, biopesticides, cropping and pest management, innovative Ex-situ and In-situ methods of pollution remediation

Credit -1:**UNIT 1 - Soil Pollution****06 L**

Analysis of soil quality. Soil Pollution control. Industrial effluents and their interactions with soil components. Soil microorganisms and their functions – degradation of pesticides and synthetic fertilizers.

UNIT 2 - Soil Pollution Control**10L**

Biological Methods: a) To reduce dependency on chemicals – Use of Biofertilizers & Biopesticides, Conservational Tillage, Mixed Cropping, Crop rotation, Biological Pest Mgmt., Organic Farming ...etc. b) Bio / Phyto-remediation of contaminated sites. • Chemical Methods: a) Ex-situ - Acid Leaching. b) In-situ - pH correction using Lime or Gypsum. • Physical / Mechanical Methods: a) Ex-situ - Heavy metal immobilization through Vitrification. b) In-situ – Soil Vapour Extraction.

Credit -2 :

UNIT 3 – Water Pollution

16L

Types and sources of water pollution. Impact on humans, plants and animals. Measurement of water quality parameters: sampling and analysis for pH, EC, turbidity, TDS, hardness, chlorides, salinity, DO, BOD, COD, nitrates, phosphates, sulphates, heavy metals and organic contaminants. Microbiological analysis – MPN. Indian standards for drinking water (IS:10500, 2012). Drinking water treatment: Coagulation and flocculation, Sedimentation and Filtration, Disinfection and Softening. Wastewater

Credit -3 :

UNIT 4- Control of Water Pollution

16L

• Segregation & Re-utilisation of Domestic Waste Water – Gray & Black Water. • Waste Water Treatment: a) Primary Treatment – Screening, Grit removal, Sedimentation etc. b) Secondary Treatment - • Aerobic Method- i) Activated Sludge Process. ii) Trickling Filter. • Anaerobic Method. c) Tertiary Treatment – Disinfection (Chlorination). d) Advanced Treatments – Carbon Adsorption, Reverse Osmosis, Ion exchange. Bioremediation.

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.

Learning outcomes :

3. Student understanding w.r.t.

Credit -1 :

UNIT 1 - Solid Waste
L

16

- 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.

- **Credit -1 :**

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.

SEMESTER - IV

PAPER CODE: EVS 2402

PAPER - II: ENVIRONMENTAL POLLUTION AND CONTROL-II

Credit -3: No. of Lectures - 48.

A. Learning objectives :

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

B. Learning outcomes :

- Contribution of knowledge to control 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.

SEMESTER - III, PAPER – III**PAPER CODE : EVS 2303****Practicals based on EVS - 2301 and EVS- 2302.****No. of Practicals - 13**

- 1 . Determination of organic carbon from soil.
2. Determination of available nitrogen from soil.
3. Determination of available carbonate and Bicarbonate from water - by titrimetric method.
4. Determination of the SAR value by given data.
5. Study of economical and medical values of minimum five plants available in local areas.
6. Identification and classification of the given mineral samples.
7. Identification and classification of given rock samples.
8. Determine the Electrical conductivity (EC) and salinity of given soil samples.
9. Study of hardness of given water samples by EDTA-Titrimetric method.
- 10 . Determination of the bulk density of given wate samples.
11. Study of physico-chemical properties as dissolved oxygen, turbidity and salinity of water samples
12. Case study of rain water harvesting and ground water in local area.
13. Study of any five forest resources available in local market (Gum, Bamboo, Spices, Timber, Resins, etc) and submission of report at practical examination.

SEMESTER - IV, PAPER – III**PAPER CODE : EVS 2303****Practicals based on EVS - 2401 and EVS- 2402.****No. of Practicals - 13**

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. Determinatio 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 – vermicompost plant / Water filtration unit/ Sewage treatment plant/ Biogas unit and submission of GEOTAG photoprint at the practical examination.