

**University of Pune**  
**T.Y.B.Sc. (Environmental Science)**  
**Course Design**  
**To be implemented from the year 2015-16**

Paper	Semester	Course Number	Course Title	Marks			
				Internal	University	Subtotal	Total
I	III	ENV-301	Terrestrial Ecosystems and Management	10	40	50	100
	IV	ENV-301	Aquatic Ecosystems and Management	10	40	50	
II	III	ENV-302	Wildlife biology	10	40	50	100
	IV	ENV-302	Nature Conservation	10	40	50	
III	III	ENV-303	Water Quality	10	40	50	100
	IV	ENV-303	Air and soil Quality	10	40	50	
IV	III	ENV-304	Issues in Environmental Science	10	40	50	100
	IV	ENV-304	Issues in Environmental Science	10	40	50	
V	III	ENV-305	Environmental Governance and Equity: Law and ethics	10	40	50	100
	IV	ENV-305	Environmental Governance and Equity: EMS, ISO 14000	10	40	50	
VI	III	ENV-306	Environmental Biotechnology-I	10	40	50	100
	IV	ENV-306	Environmental Biotechnology-II	10	40	50	
VII	I and II	ENV-307	Practical – 24	20	80	100	100
VIII	I and II	ENV-308	Practical – 24	20	80	100	100
IX	I	ENV-309	Practical – 12	10	40	50	100
	II	ENV-309	Project work	10	40	50	

**UNIVERSITY OF PUNE**  
**T.Y.B.Sc. (Environmental Science)**  
**ENV-301: Terrestrial Ecosystems and Management**  
**(Paper-I, Semester-III) 48 Lectures**

Unit	Contents	Lectures
1	Introduction, The Terrestrial Environment, The terrestrial biota and biogeographic regions, general structure of terrestrial communities.	4
2	The soil subsystem, the vegetation subsystem, parameters of the terrestrial environment, hotspots in India: Western Ghats and Eastern Himalaya.	4
3	Distribution of major terrestrial communities, patterns, structure and classification, ecotone and edge effect, keystone species and control of community structure, types of interactions: predation, parasitism, antibiosis, commensalism, cooperation, and mutualism.	7
4	The biomes: introduction, concept, types: Tundra, northern conifer forests, Temperate deciduous and rain forests, temperate grassland, chaparral, desert, tropical rain forest, tropical deciduous forest, tropical scrub forest, tropical grassland and savanna, mountains.	8
5	Terrestrial ecosystem services and management: aesthetic and cultural benefits, tourism and recreation, industry, drugs and medicines, carbon pool and sequestration potential, etc. Bio-geocycles, importance, applications, Bio-geocycles as a source of plant nutrients for ecosystem maintenance.	6
6	Methods of terrestrial ecosystem management: remote sensing, geographical information system, Joint Forest Management, Eco-development program, community based forest management, traditional methods, Forest fire: reasons, effects, control measures and management Methods of vegetation sampling and data analysis: sampling approaches, quadrat methods, line and belt transect, the point frame method, vegetation classification, species association.	8
7	Case studies: habitat restoration, restoration of surface mined lands, restoring a dry tropical forest of Guan caste National Park, chipko movement, and community based forest management in Orissa.	5
8	Exploitation and Consequences of terrestrial natural resources, Sustainable management of the same, Role of Local Government and people in conservation, Impact of Tourism, Eco-tourism Managing rain for the Future, Conservation and Sustainable use of India's Forest resources.	6

## ENV-301: Aquatic Ecosystems and Management

### (Paper-I, Semester-IV) 48 Lectures

Unit	Contents	Lectures
1	Introduction, Limnology, The aquatic environment, the aquatic biota and water resources, water and plant functioning, structure of aquatic communities.	3
2	The parameters of the aquatic environment.	2
3	Distribution of major aquatic ecosystems, patterns, structure and classification, ecotone and edge effect, types of interactions: predation, parasitism, antibiosis, commensalism, cooperation, and mutualism.	6
4	Freshwater ecology: The freshwater environment: types and limiting factors; Ecological classification of freshwater organisms, the freshwater biota (flora and fauna), lentic (lakes and ponds) and lotic (rivers, streams, springs, etc) communities, planktons.	6
5	Marine ecology: the marine environment, the marine biota (flora and fauna), zonation in the sea, study of planktons, communities in the marine environment.	5
6	Estuarine ecology: Definition and types, biota and productivity, food production potential, mangrove vegetation: distribution, ecological importance.	5
7	Aquatic ecosystem services and management: aesthetic and cultural benefits, tourism and recreation, pollution, etc.	4
8	Methods of aquatic ecosystem management: remote sensing, geographical information system, Eco-development program, traditional methods, Methods of aquatic sampling and data analysis: sampling approaches, species association.	6
9	Case studies: restoration of lake Chilika, restoration of lake Trummen, adaptive restoration of wetlands.	5
10	Exploitation and Consequences of wetlands, Sustainable management of the same, Role of Local Government and people in conservation, Impact of Tourism, Eco-tourism Conservation and Sustainable use of India's aquatic resources.	6



## ENV-302: Wildlife Biology

### (Paper-II, Semester-III) 48 Lectures

Unit	Contents	Lectures
1	Introduction, Concept of Wildlife Biology, Definition of Wildlife (Refer to Wildlife Protection Act), examples of protected wildlife species	3
2	Diversity of major groups of plants and animals Plants: Algae, Bryophytes, Pteridophytes, Gymnosperms, Angiosperms (Monocots and Dicots) Animals: Invertebrates- Arthropods (Insects, Arachnids, Crustaceans, Millipedes, Centipedes). Vertebrates- (Mammals, Birds, Fish, Reptiles, Amphibians), habitats of faunal species	8
3	Wildlife Habitats Aquatic (Marine, Freshwater, Brackish) Terrestrial habitats (Vegetation types:- forest, grassland, arid zones, hot and cold deserts, agriculture, landscape patterns Examples of food chain in each type of habitat	10
4	Threats to Wildlife Habitat destruction, developmental projects, urbanization, agricultural expansions, excessive harvesting and poaching, human-wildlife conflict, examples of excessive exploitation of plants and animals.	7
5	Wildlife Management Techniques: Population assessment techniques for flying insects, Birds and Mammals: Transects, Point Counts, net swipes, census from pug marks, camera trapping Diversity assessment for plants: Determination of sampling area, quadrates, transects, point centre method, Diversity Indices and its applications Application of GIS and Remote Sensing (Radio tagging) in monitoring of Wildlife and wildlife planning and management	11
6	Biodiversity hotspots, reasons for biodiversity formation, contribution to adaptive evolution, land races of crop plants, conservation of genetic resources, highly productive and unique habitats, examples of wetlands and mangrove ecosystem	9

**ENV-302: Nature Conservation**  
**(Paper-II, Semester-IV) 48 Lectures**

Unit	Contents	Lectures
1	Concept of Nature Conservation; Convention on Biological Diversity (CBD), Protected Area Network (PAN) in India, Details of PAN in Maharashtra state.	6
2	Approach: Species- Population dynamics and Population Genetics; Landscape/Habitat/Ecosystem approach.	6
3	Priority for Conservation: Hotspots, Conservation Status (IUCN Categories, Schedules according to Wildlife Protection Act).	4
4	Objectives of Nature Conservation Challenges (Social, Political, and Economical).	2
5	Methods: In situ-Concept, Principles, Protected area types (global and national level, Heritage sites), Examples, challenges, merits and limitations; Ex situ-Concept, Principles, Types (captive breeding and reintroductions, seed banks, gene banks), examples, challenges, merits and limitations; Traditional/community conservation-Concept, examples, challenges, merits and limitations.	10
6	Awareness about Conservation: Need, Importance, Methods, Examples National Initiatives for Nature Conservation Ecotourism: Objectives, Principles, Merits, Disadvantages, Limitations, Challenges, Examples.	6
7	International efforts for Conservation: Role of IUCN, WWF and other large organizations, Role of Governments, International Conventions and Protocols Role of NGOs, Green Peace, International Whaling Mission, BNHS, Reindeers, Tigers, Crocodile farms, Examples of extreme activism, and practical sustainable efforts.	9
8	Wildlife Law and Administration: Wildlife Protection Act, its merits and limitations State Symbols (Animals and Plants) Administrative Setup: MoEF, Central and State Pollution Control Boards, Interface between administration and NGO's. Personalities, Institutions, Groups & NGO working for environmental conservation.	5

**ENV-303: Water Quality**  
**(Paper-III, Semester-III) 48 Lectures**

Unit	Contents	Lectures
1	Introduction, uses and source of waters, water inventory and available water, quality of natural water, water cycle in nature and in urban area, Characteristics of water: physical, chemical and biological, effects of water on rock and minerals, Sewage water: its characteristics and effects.	6
2	Water pollution: definition, types of water pollution based on source (point and non point), characteristics (physical, chemical, physiological and biological) Lake water pollution: eutrophication, case study River water pollution: case studies Groundwater pollution: Case studies Sea water pollution: with special reference to oil spill and Ballast water. Detergents: definition, classification, effects, and control measures. Thermal pollution.	10
3	Water quality standards and criteria for different uses and by different agencies Water analysis methods for physical, chemical and biological parameters. History of water resources development as related to current and future sustainability of water quality and quantity. Role of science and policy in solving water problems	5
4	Control of water pollution: at source level, by treatment methods – primary, secondary, tertiary, through law Classification of water pollutants based on characteristics, physical, chemical, and biological with special reference to fertilizers, pesticides, and toxic compounds and heavy metals.	8
5	Water born diseases, bacterial, and viral, potential and wide spread effects, epidemics, preventive and curative measures.	4
6	Characterization of waste water: quality of various industrial effluents – sources of pathogens – human risks – pollution of fresh water and estuaries.	5
7	Fundamentals of waste water treatment technologies: measurement of purification – insoluble and soluble material, concept of oxygen demand, tests for biologically degradable organic matter.	8
8	Water crisis World water day – 22 <sup>nd</sup> March, background and awareness. Introduction to GIS-application for management of water resources.	2



**ENV-303: Air and Soil Quality**  
**(Paper-III, Semester-IV) 48 Lectures**

Unit	Contents	Lectures
1	<b>Atmosphere:</b> Composition of Atmosphere, Chemical and photochemical reactions in the atmosphere, Human Activities and meteorology, Global Warming, Ozone Hole, El Nino, La Nina Phenomenon.	5
2	<b>Air pollution:</b> Meaning and definition, Sources and Types of air pollutants, major air pollutants; types of air pollution – indoor air pollution, vehicular pollution, industrial pollution; Status of Air pollution in India, Effects of air pollution on plants; animals; human; and materials, Smog and Acid rains, Control of air pollution. Emission Standards.	6
3	<b>Analytical Methods for Monitoring Air Pollutants;</b> Sampling, Monitoring, Carbon Monoxide, Nitrogen Oxides, Sulphur Dioxide, Hydrogen Sulphide, Hydrocarbons, Particulate Matter <b>Air Pollution Accidents:</b> Bhopal Disaster, Chernobyl Disaster, London Smog.	9
4	<b>Toxicology of gaseous pollutants:</b> Carbon monoxide, Oxides of Nitrogen, Sulphur dioxides, Petroleum and Solvents.	4
5	<b>Soil:</b> Introduction to soil and its role within a natural ecosystem and an agro-ecosystem Composition of Soil, Soil types and their formation, Soil horizons, texture, soil structure, soil erosion, soil conservation.	4
6	<b>Soil Reactions:</b> Acid Base Reaction, Ion Exchange, Micro and Macro Nutrients, Nitrogen Pathways and NPK in soil.	4
7	<b>Soil Analysis:</b> pH, Lime, Silica and Phosphorous, Total Nitrogen, Total Manganese, Total Sulphur, Soluble Salts, Pesticides, Environmental Friendly Technologies.	6
8	<b>Factors influencing soil:</b> Factors influencing soil structures and plant growth, Effect of soil aeration on plant growth, Effect of soil temperature on soil properties and on plant growth. Soil fertility- concept and evaluation.	4
9	<b>Soil toxicology:</b> Organic and inorganic chemicals in the soil environment Soil sickness due to biological agents and toxins etc.	3
10	<b>Soil Management:</b> Soil as sink for waste disposal. Remediation of contaminated soil. GIS-application for management of soil resources.	3

## ENV-304: Issues in Environmental Science-I

### (Paper-IV, Semester-III) 48 Lectures

Unit	Contents	Lectures
1	Global Environmental issues - ozone depletion, global warming and climatic change. Ecological restoration, Energy crisis and conservation, Clean Development Mechanism, Carbon emissions, Carbon Sequestration, Carbon credits.	6
2	Biodiversity conservation, Hotspots Life cycle analysis, Bio-resources and their impact on local economy.	4
3	Sustainable development. Conventions and Protocols, Climate change, Copenhagen outcome, GM plants and it's controversies, Role of NGO's in Environment conservation.	5
4	WTO and environmental issues. Environmental Movements: Genesis of global environmental movement, Chernobyl disaster	5
5	<b>Green House Effect:</b> Introduction; sources of green house gases; major green house gases; emission of CO <sub>2</sub> ; impact of green house gases on global climate; consequences of green house effects; remedial measures of green house effects; impact of global warming on – human health, agriculture, biodiversity etc.	9
6	The green revolution, food crisis and population explosion, Pastoralism.	3
7	Rehabilitating degraded lands, The Gender and environment debate.	2
8	Environmentalism and political economy, Aspects related to Eco-housing, E- waste management, Eco-journalism, Biological warfare, Eco- terrorism, Issues related to Shipping, Water Crisis	7
9	Citizen participation and representation in environmental issues The national environmental advisory forum Access to environmental information	5
10	Environmental Toxicology, Nano- technology	2



## ENV-304: Issues in Environmental Science-II

### (Paper-IV, Semester-IV) 48 Lectures

Unit	Contents	Lectures
1	Ecological conflicts and the environmental movements in India: Narmada Bachao Andolan, Appiko Movement, Chipko movement, Silent Valley Movement, Tehri Dam conflicts, Almatti dam, Bhopal gas tragedy, Soil Erosion, Formation and reclamation of Usar, Alkaline and Saline Soil.	9
2	CNG and pollution in various cities in India.	1
3	Resources depletion and pollution (case studies), environmental problems of urbanization, environmental problems of slums, population, poverty and environment in India, international trade and economic reforms on the environment, industrial growth, environmental and ecology in India, major issues in sustaining growth and development in less developed countries.	9
4	Use of computer in environmental health modelling, environmental health modelling, Resource management by Remote sensing & GIS	1
5	Global warming and India.	1
6	Land use policy for India. Urban planning for India. Rural planning and land use pattern. Concept and strategies of sustainable development. Cost-Benefit analysis. Environmental priorities in India and sustainable development	8
7	Ganga Action plan, Interlinking of rivers, Case studies related with SEZ. Handling of Solid waste management, Tribal community problems and their rehabilitation, Natural disasters and their management.	6
8	Waste lands and their reclamation. Desertification and its control. Vehicular pollution and urban air quality. Depletion of Nature resources. Biodiversity conservation and Agenda-21.	6
9	Waste disposal, recycling and power generation. Fly ash utilization. Water Crises-Conservation of water. Environmental Hazards. Eutrophication and restoration of Indian lakes. Rain water harvesting. Wet lands conservation. Epidemiological issues (e.g. Goitre, Fluorosis, Arsenic)	6
10	Occupational Health & Safety	1

**ENV-305: Environmental Governance and Equity:**  
**Law and Ethics**

**(Paper-V, Semester-III) 48 Lectures**

<b>Unit</b>	<b>Contents</b>	<b>Lectures</b>
1	Introduction, necessity, What is environmental governance? Elements of environmental governance.	3
2	Stockholm conference, The Earth Summit 1992 – The Rio declaration on environment and development, the Earth Summit agreements.	5
3	Environmental governance in India since 1972 Environmental protection and Fundamental Rights.	3
4	India's International Obligations, Public interest litigation, Public participation.	3
5	The Water (Prevention and Control of Pollution) Act – 1974 The Air (Prevention and Control of Pollution) Act – 1981 The public liability Insurance Act, 1991 The National Environmental Tribunal Act, 1995 Environmental Policy Resolution. Legislation, public Policy Strategies in Pollution Control. Motor Vehicle Act, 1988. Public Liability Insurance Act, 1991 and Rules 1991.	9
6	The Indian Wildlife (Protection) Act – 1972 amended 1991 The Biological Diversity Act, 2002 Forest Conservation Act, 1980. Indian Forests Act (Revised) 1982. National Forest Policy. The Environment (Protection) Act, 1986 and Rules 1986. Scheme of labelling of environmentally friendly products (Ecomark),	7
7	Environmental Ethics: Introduction, concept.	2
8	Development of environmental ethics, ethical theories applied to the environment.	3
9	Environmental ethics in spirituality, fundamental concerns, relationship between people and environment, What attitude should govern people's relationship to the environment?	5
10	The ethical dilemma, environmental ethics and population, pollution.	2
11	Value options, environment and technology.	2
12	Human life and its environment – The art of ethics and an ethical dilemma, Challenges of world environmental ethics.	4

**ENV-305: Environmental Governance and Equity:**  
**EMS and ISO 14000**

**(Paper-V, Semester-IV) 48 Lectures**

<b>Unit</b>	<b>Contents</b>	<b>Lectures</b>
1	Introduction, Generic, Management system, benefits, ISO and the environment, Environmental management and sustainability, ISO/TC 207, Scope of ISO/TC 207's work.	9
2	Overview of the ISO 14000 family of standards, ISO 140000 essentials, An ISO 14001:2004-based EMS, EMS standards, The ISO 14000 family and the Plan-Do-Check-Act (PDCA) cycle.	9
3	Environmental and economic benefits Specific applications: Automotive, Energy, Education, Food safety, Health care, Ship recycling and risks.	8
4	Environmental standards: Ambient air quality standards, BIS standards for drinking water, WHO water quality standards.	5
5	Environmental audits, Compliance and governance mechanism, Environment Status Report, Various instrumental techniques, EIA in detail with case studies, Environmental Economics, CETP	3
6	Environmental governance and Regulation in India: Legislative efforts, Constitutional Directives, Role of the Judiciary, Working of Environmental Regulation, Enforcement, Monitoring, Role of NGOs.	8
7	National Environmental Policy – 2006.	2
8	Environment protection-issues and problems. International and National efforts for Environment Protection. Provision of Constitution of India regarding Environment (Article 48A and 58A).	4



## ENV-306: Environmental Biotechnology-I

### (Paper-VI, Semester-III) 48 Lectures

Unit	Contents	Lectures
1	Environmental Biotechnology: Meaning, necessity and scope, history of environmental biotechnology, objectives of environmental biotechnology.	4
2	Biopesticides and Neem pesticides—Classification of Biological pest control agent, Manufacturing process, Stabilization of biopesticide, Formulation, mode of action, selectivity of bacteria, Plant products— insecticide, Neem pesticide, Simple Neem products for pest management, major states in production of Neem products, Unique multifacetol action of Neem bitters, Effects on Virus and organisms and Sustainable Agriculture.	12
3	Composting, Vermicomposting and Biofuels—Composting technology, Design aspect, composting process, Temp. Trend I and influencing factors, Vermicomposting—Earthworm life cycle, chemical characteristic of vermicompost, Operating vermicompost, Biofuels—Alternative to non fossil energy resources, Biological energy resources, Combustion of biomass, Biogas, Biodiesel, Ethanol and hydrogen.	9
4	GMO's in the environment—Risk of GMO's, Risk assessment, Directive principles for GMO's. Measures, Deliberate release, and release criteria. Biosafety—Cartagena Protocol, Biosafety regulation.	5
5	Natural Resource recovery—Introduction, Oil recovery, recovery of metals, Conclusion. Agricultural biotechnology—Introduction, Detection and diagnosis, micropropogation, Biofertilizers: types, and their role, Agro based solid waste and its uses.	6
6	Microbes in Environment-- Collection and Enumeration of aerial microbes, Dust droplet and droplet nuclei, Air pollution, control of air borne infection, effectiveness of the method. Ecological Relation of microbes—Enrichment, Isolation and counting method, Measurement of microbial activity in nature, aquatic habitat, Terrestrial environment, Deep sea microbes, Hydrothermal in vent, Microbes in Abiotic environment—Soil as an environment, Syntrophism in soil, microbiological examination of soil, Cycles of element, Rhizosphere, Plant diseases, microbiology and petroleum.	12

## ENV-306: Environmental Biotechnology-II

### (Paper-VI, Semester-IV) 48 Lectures

Unit	Contents	Lectures
1	Bioremediation—Principles, factors responsible, microbial population for bioremediation, Environmental variation in field, Enzymatic – biodegradative pathway, Genetic Engineering Approach, Bioremediation strategies; Phytoremediation—Metal and Organic Phytoremediation, need for Research and development.	6
2	Biotechnology for Pollution abatement—Abatement of air and water pollution, Biological treatment, Energy reaction, Anaerobic biological process and anaerobic biological treatment.	4
3	Biodegradation process: Bioleaching-- History, Advantages and disadvantages, microbes used; Biochemical extraction from mixture, types of bioleaching, methods of bioleaching and metal precipitation. Biosorption of Metals.	5
4	Biomethanation—Anaerobic treatment for gas generation, microbiology and biochemistry, factors affecting, Problems in Biomethanation, Design of digester, Biomethanation in industries, Potential of Biomethanation from MSW, Merits of Biomethanation from MSW and Biomass gasification.	5
5	Role of biotechnology in environment protection, Microbial fundamentals involved in the treatment of industrial wastes, Biochemistry of waste water treatment - impact of pollutants on organisms.	5
6	Aerobic Biological treatments - activated sludge, biofilm reactors and biological filters, Anaerobic biological treatments - UASB, Removal of specific pollutants - nitrate, phosphates, heavy metals, etc. Biosorption techniques for removal of pollutants.	6
7	Microbial metabolism of pesticides and other xenobiotic components Wastewater treatment using aquatic plants; Biotechnology for air pollution and odour control, Biotechnology of solid waste disposal; Use of immobilized enzymes and microbes for pollution abatement; Improvement of microbial strains by conventional and molecular biological techniques; Computer implementation for control and monitoring of waste water.	13
8	Energy production from biomass - biogas, ethanol, hydrogen Biotechnology application of hazardous waste management Mining with microbes.	4

**ENV-307: Practical Based on ENV-301 and 302**  
**(Paper-VII, Semester-III and IV) Any 24 Practical**

Sr. No.	Practical Title	No. of Practical
1	Study of flora of an urban terrestrial ecosystem (Field practical)	2
2	Study of fauna of an urban terrestrial ecosystem (Field practical)	2
3	Identification and classification of phytoplankton's from water sample	1
4	Identification and classification of zooplankton's from water provided sample	1
5	Quantitative analysis of phytoplankton's and determination of percentage composition Lackey's drop count method.	1
6	Estimation of biomass from grassland by harvest method.	1
7	Study of wetland ecosystem (Field practical)	2
8	Study of swamp (mangrove) ecosystem of Konkan coast (Visit)	2
9	To find out the diversity within an ecosystem using Shannon and Simpson's diversity indices	1
10	Studies on aquatic weeds, insects and birds	2
11	Studies on benthic fauna	1
12	To study the types of interactions: parasitism and mutualism with suitable examples from nearby ecosystem	1
13	To study the plants used in phytoremediation	1
14	Estimation of carrying capacity of soils from two different locations.	1
15	Total Chlorophyll estimation from plants of clean and polluted environment.	1
16	To study the effects of pollution on river ecosystem (Field practical)	2
17	Assessment of noise pollution in an urban environment	1
18	Estimation of biomass and its carbon	1
19	Analysis of toxic metal contamination in streams	1
20	Analysis of toxic metal contamination in lakes and ponds	1
21	Study of remote sensing techniques.	1
22	Interpretation techniques for aerial photographs and satellite imageries	1
23	Vegetation mapping by using aerial photographs	1
24	Vegetation mapping by using satellite imageries	1



**ENV-308: Practical Based on ENV-303 and 304**  
**(Paper-VIII, Semester-III and IV) Any 24 Practical**

Sr. No.	Practical Title	No. of Practical
1	Estimation of SPM from atmosphere	1
2	Sampling of waste water from different polluted sites	1
3	Sampling of soils from different polluted sites	1
4	Use of macrophytes as bio-indicators for water/soil pollution monitoring	1
5	Use of microorganisms as bio-indicators for water/soil pollution monitoring	1
6	Study of particulate matter in air	1
7	Visit to pollution control laboratories	1
8	Analyzing the pH, temperature and EC of different waste waters	1
9	Estimation of DO and free CO <sub>2</sub>	1
10	Determination of COD in water sample	1
11	Determination of BOD in water sample	1
12	Determination of SO <sub>x</sub>	1
13	Determination of NO <sub>x</sub>	1
14	Testing the bacteriological quality of drinking water	1
15	Examination of sewage water for microbial pathogens	1
16	Methods of disinfection in waste waters	1
17	Removal of nitrates and phosphates from waste water	1
18	Analysis of effluent before and after various treatment processes	1
19	Visit to common effluent treatment plant	1
20	Determination of MPN from drinking water resource for potability	1
21	Study of phytoremediation techniques to remove pollutants	1
22	Study of Safety instructions	1
23	Determination of Soil Bulk Density	1
24	Determination of Sludge Volume Index	1
25	Determination of colour and odour of industrial effluents	1
26	Jar Test for Coagulation & Flocculation	1

**ENV-309: Practical Based on ENV-305 and 306**  
**(Paper-IX, Semester-III) Any 12 Practical**  
**(Paper-IX, Semester-IV) Project Work**

Sr. No.	Practical Title	No. of Practical
1	Preparation of compost by using different methods of composting - Indore method & Bangalore method.	1
2	Vermi-composting of farm/ other solid wastes	1
3	Determining the factors influencing the composting process, nutrients, moisture, temperature and air, microbial populations	1
4	Study of micro organisms by Standard Plate Count (SPC) method	1
5	Microbial analysis of flocs in activated sludge system	1
6	To study the value added products from biological treatment processes	1
7	Biological de-colourization using microbial columns	1
8	Isolation of mineral leaching bacteria	1
9	Identification and classification of bacteria	1
10	Isolation of bacteria from soil and decaying matter	1
11	Study of allergenic and non allergenic pollen grains	1
12	Survey of plants in and around air polluted sites	1
13	Effect of SO <sub>2</sub> on cereal crops/ vegetables/ commercial crops	1
14	Automobile exhausts – analysis and impact on flowering plants	1
15	Determination of hydrogen sulfide (H <sub>2</sub> S) from sewage sample	1
16	Uptake of heavy metals by microorganisms	1
17	Analysis of residual pesticides in agricultural land and crops	1
18	Study of Eutrophication effects of polluted waters on water bodies	1
19	Effect of hydrocarbon pollution on soil and plant ecosystem	1

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