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Item no. 4.69

UNIVERSITY OF MUMBAI



Syllabus for the Semester V and VI

Program: B.Sc.

Course: Environmental Science and Pollution

Applied Component

(Credit Based Semester and Grading System with

PREAMBLE

Applied component was introduced for T.Y. B.Sc. class in the academic year 1979-80 with a view to enhance essential for employability. There after the syllabus of T.Y.B.Sc. Applied Component in Environment Science and Pollution has been revised hardly anytime. And then the syllabus lastly has been revised in 1994. Environment Science is the subject which is need based and multidisciplinary. The syllabus needs to get updated as per the requirement of the time. Similarly the emphasis on entrepreneurial potential and skills needs to get added in the syllabus by incorporating applied topics having commercial propositions. Similarly the syllabus needs to have a flexi concept as it is a multidisciplinary. Hence as per the decision of Faculty of Science the syllabus of Applied Component is adopted in BOS Zoology where the flexi concept is introduced in the applied component. In this the BOS experimented the flexibility in terms of selecting any four out of eight units included in the syllabus during the last revision. The experiment has been successful and appreciated. It is continued in this revised syllabus also. Hence in the syllabus of Applied Component Environmental Science and Pollution the concept is incorporated from the academic year 2013-2014.

From the academic year 2010-2011, the University has introduced Credit Based Semester and Grading System with continuous evaluation involving Internal and External Assessment. The revised syllabi in the Applied Component subjects in Zoology are modularized offering opportunity to learners to study any four out of a total of eight units in each course.

The jurisdiction of our esteemed University extends from Colaba in South Mumbai to Banda in Sindhudurga. The diversity of the colleges affiliated to the University in terms of infrastructure, expertise and opportunity has been an important consideration while drafting the syllabus. The syllabus offers freedom to select any four units out of eight in each paper in the semester according to the requirements of the College. This also satisfies the purpose of choice based syllabus.

Thus the revolutionary initiative of the BOS in Zoology, with an inherent flexibility, aimed at providing need based training catering to the needs of rural as well as urban niches has been continued with this revision of syllabi also. However this flexibility is, at present, available for only Applied Component subjects.

Dean Faculty Of Science,

Chairman of Pyramid Committee

for Syllabi in Zoology

T.Y.B.Sc.

Applied Component - Environmental Science & Pollution

Semester V

Theory (Any four Units to be opted)				
Course Code	Unit	Topics	Credits	L / Week
USACEVS501	I	Ecosphere or Environmental Components	2	4
	II	Natural Resources		
	III	Types of Pollution		
	IV	Environmental Monitoring & Risk Assessment		
	V	Solid Waste Management		
	VI	Climate Change		
	VII	Environmental Education & Legislation		
	VIII	Sustainable Development		
Practicals				
USACEVS5P1		Practical based on Course USACEVS501	2	4

Semester V: Theory

Environmental Science & Pollution

Course code: USACEVS501

(Any four Units to be opted)

Lectures 60

Credits 2

Unit 1 Ecosphere

- 1.1 Atmosphere: Physico-chemical characteristics, division, composition & significance of components.
- 1.2 Hydrosphere: Water resource & water cycle, physico-chemical characteristics of aquatic environment.
- 1.3 Lithosphere: Composition, inorganic & organic components in soil, types of soil, soil profile & nutrients in soil.
- 1.4 Biosphere: Composition of Biosphere & brief account of types of biomes.

Unit 2 Natural Resources

- 2.1 Concept & types of resources.
- 2.2 Current status of major resources: Water, land, mineral, biological & energy resources.
- 2.3 Need for conservation of resources.
- 2.4 Rational use of resources.

Unit 3 Types of Pollution

- 3.1 Air Pollution: Sources, types & effects of pollutants.
- 3.2 Water Pollution: Sources, types & effects of pollutants.
- 3.3 Noise Pollution: Sources, types & effects of pollutants.
- 3.4 Radiation Pollution: Sources, types of radiations & effects on health.

Unit 4 Environmental Monitoring & Risk Assessment

- 4.1 Remote Sensing and GIS: Principle, types & applications.
- 4.2 Water pollution monitoring & assessment techniques.
- 4.3 Air pollution monitoring & assessment techniques.
- 4.4 Concept & evaluation of environmental risk assessment.

Unit 5 Solid Waste Management

- 5.1 Introduction, Definition and Classification based on the sources of generation.
- 5.2 Composition and Segregation at source, treatment (Chemical/Mechanical/Biological).
- 5.3 Introduction to open dumping and sanitary landfill methods of waste disposal.
- 5.4 Solid Waste as a useful resource.

Unit 6 Climate Change

- 6.1 Introduction to climate change & global warming.
- 6.2 Greenhouse Gases: Sources & effects.
- 6.3 Effects of climate change.
- 6.4 Role of IPCC in climate change monitoring.
- 6.5 Kyoto Protocol, Montreal Protocol, Earth Summit & UN Convention on Climate Change.

Unit 7 Environmental Education & Legislation

- 7.1 Goals, objectives & principles of Environmental Education.
- 7.2 Environmental Education Programmes in India.
- 7.3 Environmental Organizations & Agencies-CITES, EPA, IUCN & MAB.
- 7.4 Environmental Laws in India: Water Prevention & Control of Pollution Act 1974, Air Prevention & Control of Pollution Act 1981, Environment Protection Act 1986 & Biological Diversity Act 2002.

Unit 8 Sustainable Development

- 8.1 Concept of sustainable development.
- 8.2 Strategy for sustainable development.
- 8.3 Sustainable development indicators & policies.
- 8.4 Ecotourism

Semester V

Practical

Course Code USACEVS5P1

2 Credits

- 1) Study of Physico-chemical properties of water: Conductivity, Turbidity, Dissolved oxygen, Salinity & Total hardness.
- 2) Estimation of Pollutant: BOD, COD & MPN.
- 3) Study of soil microflora.
- 4) Measurement of intensity of light by Lux meter.
- 5) Bioassay studies using water hyacinth or any suitable material.
- 6) Observation & study of: Solar panel, Biogas plant, Air & Noise pollution monitoring device, CFL bulbs.

Report of Field or Industrial Visit/Excursion.

Suggested Assignment Topics for Group Activity

Case studies:

- 1) Meuse valley-Belgium
- 2) London smog
- 3) Torry Canyon
- 4) Bhopal gas tragedy
- 5) Chernobyl
- 6) Minamata & Itai itai
- 7) Best out of waste (Plastic waste, metal waste, e-Waste, etc.)
- 8) Recycling of paper (Paper making).
- 9) Eco-friendly festivals.

Suggested Field Visits

Field visits are to be organized to facilitate students to have firsthand experience & exposure to technology/production/functioning of organization/units or witness a relevant activity.

Each student must make at least 01 (one) such visit to the Units/Treatment Plants/Aquatic or Terrestrial habitat organized by the College.

- 1) Visit to sewage treatment plant.
- 2) Visit to Vermicomposting unit.
- 3) Visit to Air Monitoring Laboratory.
- 4) Environment Pollution Detecting Laboratory.
- 5) Visit to cooling towers in industries.
- 6) Visit to Rain Water Harvesting System.
- 7) Visit to Biogas Plant.
- 8) Visit of Green Building/Ecotel Hotel.
- 9) Visit to Water Filtration Plant.
- 10) Visit to office of Pollution Control Board.
- 11) Visit to Greenhouse.
- 12) Visit to Solid Waste Management Plant.
- 13) Visit to hydro/thermal power plants.
- 14) Visit to Environmental Agencies-CITES
- 15) Visit to National Parks, Sanctuaries, Biosphere Reserves etc.

T.Y.B.Sc.

Applied Component - Environmental Science & Pollution

Semester VI

Theory (Any four Units to be opted)				
Course Code	Unit	Topics	Credits	L / Week
USACEVS601	I	Biodiversity	2	4
	II	Energy Resources		
	III	Safety Standards		
	IV	Pollution Control		
	V	Disaster Management		
	VI	Environmental Management		
	VII	Environmental Economics		
	VIII	Novel Technologies		
Practicals				
USACEVS6P1		Practical based on Course USACEVS601	2	4

Semester VI: Theory
Environmental Science & Pollution
Course code: USACEVS601
(Any four Units to be opted)

Lectures 60
Credits 2

Unit 1 Biodiversity

- 1.1 Concept, definition & scope of Biodiversity.
- 1.2 Genetic & Species diversity.
- 1.3 Biodiversity Conservation: In-situ & Ex-situ.
- 1.4 Hotspots of biodiversity & Biosphere Reserves in India.
- 1.5 Indicator species, Bioprospecting, Biopiracy & Bioweapons.

Unit 2 Energy Resources

- 2.1 Conventional energy sources: Oil, Coal, Natural gas, Uranium & Nuclear energy.
- 2.2 Non-conventional energy resources: Photovoltaic cell, solar, wind & tidal energy.
- 2.3 Biological Energy resources: Biomass & biofuels, Petro crops & power from biomass.
- 2.4 Use of wastes: Water-based biomass, energy from waste & solid waste.

Unit 3 Safety Standards

- 3.1 Environmental Protection Standards in India (Factories Act, 1948 & 1987 Amendments)
- 3.2 International Standards (OSHA, NIOSH, ACGIH) Threshold Limit Value (TLV), Short Term Exposure Limits (STEL).
- 3.3 Personal Protective Equipments (Respiratory: RPPE & Non Respiratory: NRPPE)
- 3.4 Biosafety guidelines for GMO.

Unit 4 Pollution Control

- 4.1 Water & Waste Water Treatment: Potable & Municipal Sewage Treatment.
- 4.2 Control of air emissions: Gaseous & Particulate matter.
- 4.3 Hazardous waste treatment & disposal.
- 4.4 Bioremediation concept & application, Biodegradation of PAH & Petrochemicals.

Unit 5 Disaster Management

- 5.1 Natural disasters: Earthquakes, Tsunami, Floods, Volcanoes & Windstorms.
- 5.2 Environmental Hazards: Concerns & Management.
- 5.3 Anthropogenic activities related to environmental changes.
- 5.4 Future Planning for Sustainable Development: Disaster Management Plan for chemicals, fertilizer, electronics, Industries, Schools & Colleges, Commercial, Government Establishments etc.

Unit 6 Environmental Management

- 6.1 Concept & process of EIA.
- 6.2 Methodology of EIA evaluation.
- 6.3 Concept of Life Cycle Assessment.
- 6.4 Ecological foot prints, Carbon sequestration & Carbon credits.
- 6.5 Environmental Quality Monitoring: ISO-14000

Unit 7 Environmental Economics

- 7.1 Concept & Economics of Pollution Control.
- 7.2 Environmental Accounting: Definition, concept & issues.
- 7.3 Concept of Environmental Audit.
- 7.4 Benefits of Environmental Auditing.
- 7.5 Environmental Audit Programmes in India.

Unit 8 Novel Technologies

- 8.1 Portable devices & biosensors used in environment monitoring.
- 8.2 Alternatives to conventional resources: Biodegradable plastic, Biodiesel, Bioethanol & Biopesticides.
- 8.3 Green buildings: Basic concept, types, waste management, rain water harvesting & sustainable use of energy.
- 8.4 Goals & significance of Green Chemistry.

Semester VI

Practical

Course Code USACEVS6P1

- 1) Study of safety standards-Personal protection equipments, Safety symbols (Toxic, Hazardous, Radioactive, Corrosive, Poisonous, Irritant) & fire extinguisher.
- 2) Study of air microflora and determination of sedimentation rate.
- 3) Study of physical properties of soil: pH, temperature, moisture, organic carbon & texture of soil.
- 4) Population analysis by Quadrant method & Line Transect method.
- 5) Observation & study of indicator species.
- 6) Project (Individual activity) & assignment (Group activity)

Suggested Topics for Individual Project

- 1) Effects of anthropogenic activities on different ecosystems.
- 2) Effect of tourism activities on different ecosystems.
- 3) Assessment of ecotourism potential.
- 4) Water audit in your area.
- 5) Survey of NGO's working in environmental field in your area.

- 6) Study of various environmental movements.
- 7) Costing, accounting & budgeting of eco-friendly idols during festivals.
- 8) Costing, accounting & budgeting for paper making from waste.
- 9) Study the role of microbes in biodegradation of: Plastic, Pesticides, Heavy metals, Hydrocarbons, etc.
- 10) Preparation of proposal for Green building & sustainable development.
- 11) Preparation of Feasibility Report of eco-friendly practices/eco-friendly products.
- 12) Study of different methods of energy conservation.

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Semester V & VI

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