1. Introduction

Description of courses which address the Professional Ethics, Gender, Human Values, Environment and Sustainability into the Curriculum

The aim of education is fulfilled only when it involves ethical, moral and human values. The conveners and members of Academic bodies in UOK, Kota update and revise the curriculum keeping in mind the current and relevant social issues.

In the curriculum of UG (BSc Biology and BSc Maths), Environmental study is a compulsory paper in 1st year. In the syllabus students are expected to know the basic concepts of ecology, environmental sustainability, biodiversity and it loss, various conservation methods and strategies etc.

Curriculum of PG Botany, Chemistry, Zoology incorporates various topics that helps students to understand various social issues, wild life conservation, environmental laws, socio-economic issues, gender based issues, pollution, human population and applied aspects of human ecology, social forestry, eco-tourism and various issues related to sustainable environment.

2. B. Sc. Part-I (Bio) & B. Sc. Part-I (Math's)

Unit 1 : Introduction to environmental studies

• Multidisciplinary nature of environmental studies;

• Scope and importance; Concept of sustainability and sustainable development.

(2 lectures)

Unit 2 : Ecosystems

• What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems :

a) Forest ecosystem

b) Grassland ecosystem

c) Desert ecosystem

d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

(6 lectures)

Unit 3 : Natural Resources : Renewable and Non-renewable Resources

• Land resources and landuse change; Land degradation, soil erosion and desertification.

• Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.

• Water : Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).

• Energy resources : Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

(8 lectures)

Unit 4 : Biodiversity and Conservation

• Levels of biological diversity : genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots

• India as a mega-biodiversity nation; Endangered and endemic species of India

• Threats to biodiversity : Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity : In-situ and Ex-situ conservation of

Compulsory Paper- ENVIRONMENTAL STUDIES, DISASTER MANAGEMENT & PHILOSOPHY OF SPORTS (View syllabus)

biodiversity. • Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

(8 lectures)

Unit 5 : Environmental Pollution

• Environmental pollution : types, causes, effects and controls; Air, water, soil and noise pollution

• Nuclear hazards and human health risks

• Solid waste management : Control measures of urban and industrial waste. • Pollution case studies.

(8 lectures)

Unit 6 : Environmental Policies & Practices

• Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture 2/2

• Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).

• Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

(7 lectures)

Unit 7 : Human Communities and the Environment

• Human population growth: Impacts on environment, human health and welfare.

• Resettlement and rehabilitation of project affected persons; case studies.

• Disaster management : floods, earthquake, cyclones and landslides.

• Environmental movements : Chipko, Silent valley, Bishnois of Rajasthan.

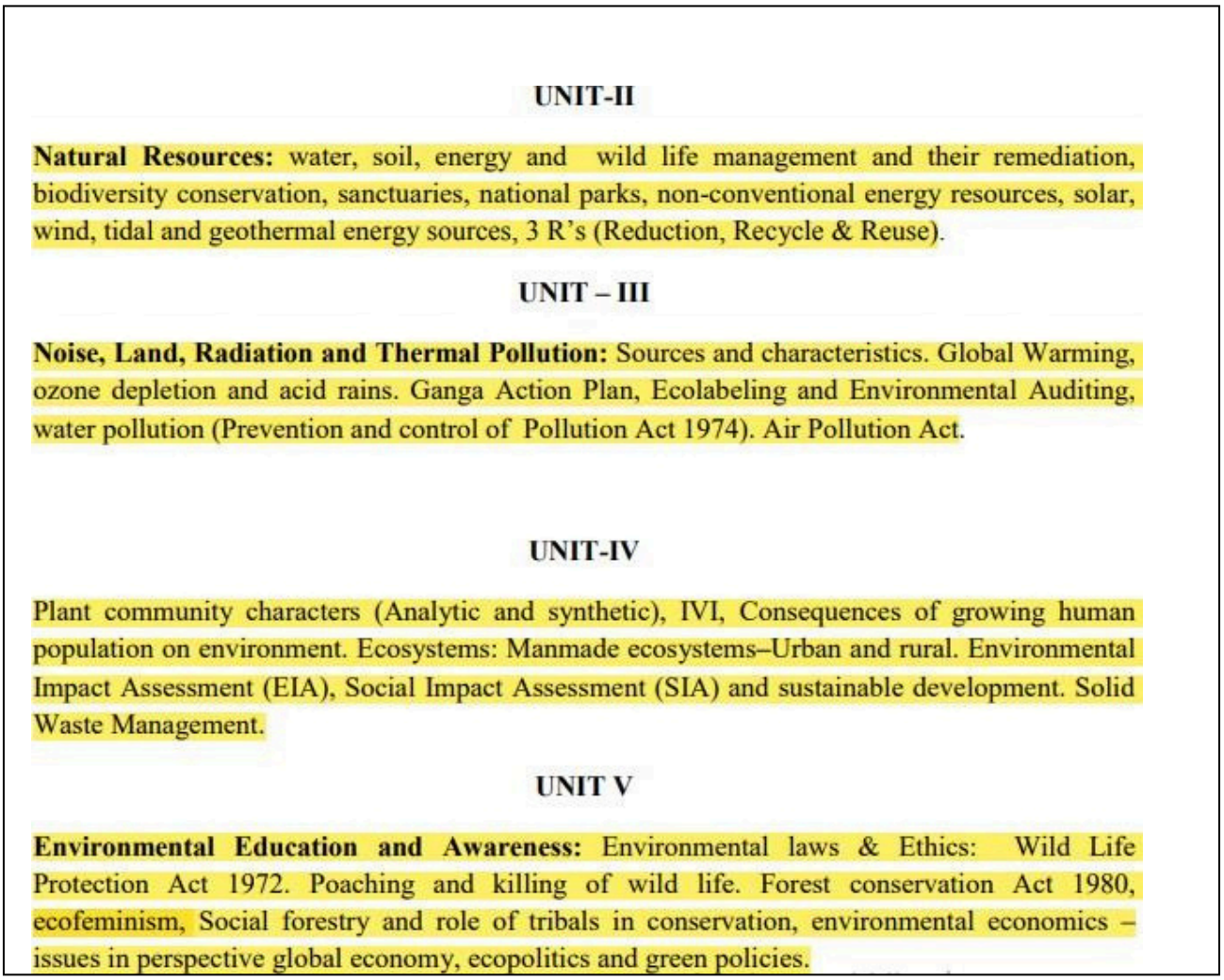
• Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.

• Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

Compulsory Paper- ENVIRONMENTAL STUDIES, DISASTER MANAGEMENT & PHILOSOPHY OF SPORTS (View syllabus)

3. M. Sc. Botany Sem-III

In M. Sc. (Botany) Sem-III, Paper XIV (b): Advanced Plant Ecology-I (Environmental Biology) covers topics: Management and remediation of natural resources; water, soil, energy and wildlife, biodiversity conservation, sanctuaries, national parks, non- conventional energy resources, sustainable development, and solid waste management. Environmental Education and Awareness: Environmental laws & Ethics: Wild Life Protection Act 1972. Poaching and killing of wildlife. Forest conservation Act 1980, ecofeminism, Social forestry and role of tribals in conservation, environmental economics – issues in the perspective of the global economy, ecopolitics and green policies.



UNIT-II

Natural Resources: water, soil, energy and wild life management and their remediation, biodiversity conservation, sanctuaries, national parks, non-conventional energy resources, solar, wind, tidal and geothermal energy sources, 3 R's (Reduction, Recycle & Reuse).

UNIT – III

Noise, Land, Radiation and Thermal Pollution: Sources and characteristics. Global Warming, ozone depletion and acid rains. Ganga Action Plan, Ecolabeling and Environmental Auditing, water pollution (Prevention and control of Pollution Act 1974). Air Pollution Act.

UNIT-IV

Plant community characters (Analytic and synthetic), IVI, Consequences of growing human population on environment. Ecosystems: Manmade ecosystems–Urban and rural. Environmental Impact Assessment (EIA), Social Impact Assessment (SIA) and sustainable development. Solid Waste Management.

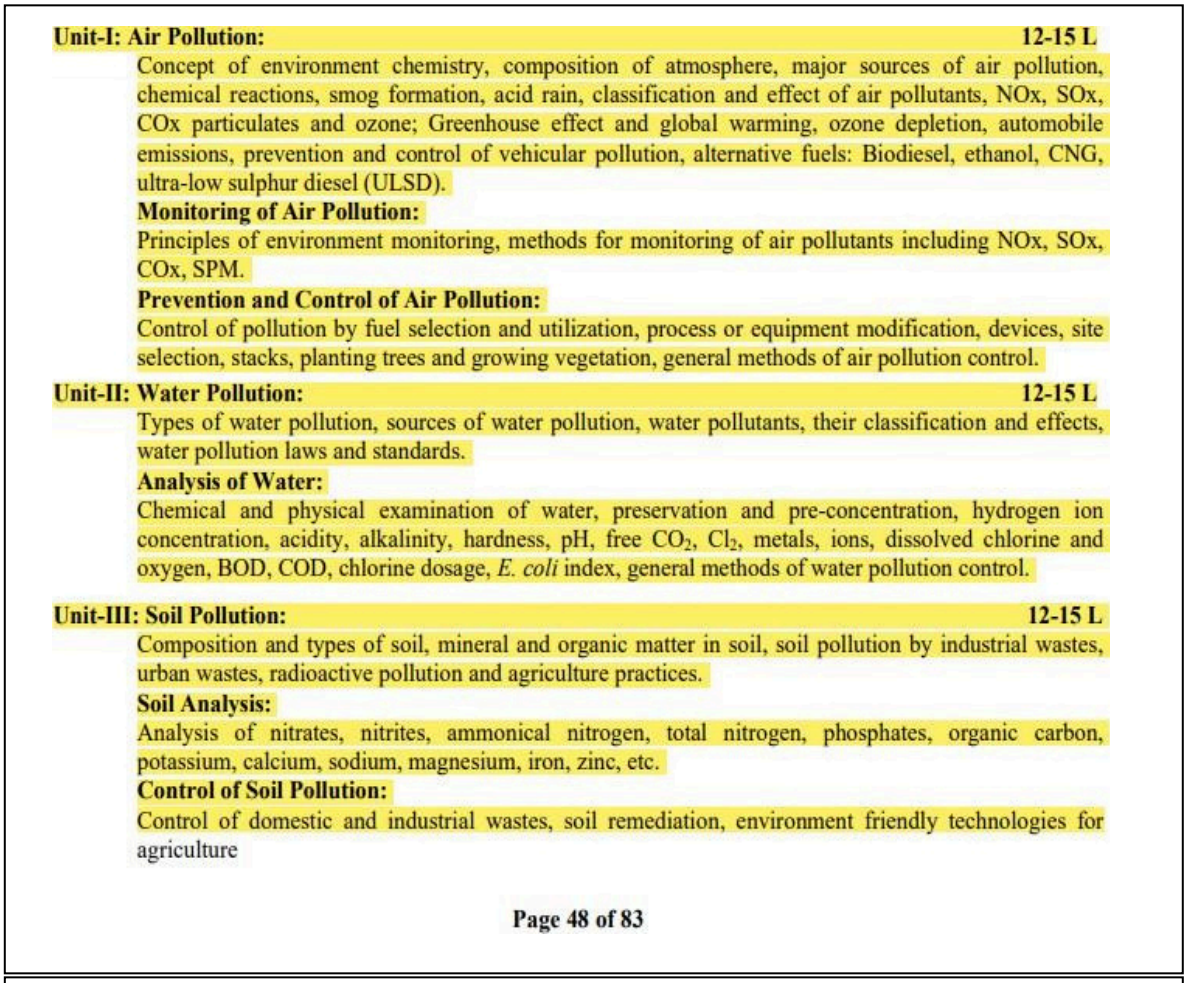
UNIT V

Environmental Education and Awareness: Environmental laws & Ethics: Wild Life Protection Act 1972. Poaching and killing of wild life. Forest conservation Act 1980, ecofeminism, Social forestry and role of tribals in conservation, environmental economics – issues in perspective global economy, ecopolitics and green policies.

Syllabus M. Sc. Botany Sem-III, Paper-XIV(b) Page 54 (View syllabus)

4. M. Sc. Chemistry Sem-IV

In M. Sc. (Chemistry) IVth Semester Paper-4.1: (CHEM-641):
Environmental Chemistry: Air, water, soil, industrial and radioactive Pollution: its monitoring, Prevention and Control of Air Pollution is part of the curriculum.



Unit-I: Air Pollution: **12-15 L**

Concept of environment chemistry, composition of atmosphere, major sources of air pollution, chemical reactions, smog formation, acid rain, classification and effect of air pollutants, NOx, SOx, COx particulates and ozone; Greenhouse effect and global warming, ozone depletion, automobile emissions, prevention and control of vehicular pollution, alternative fuels: Biodiesel, ethanol, CNG, ultra-low sulphur diesel (ULSD).

Monitoring of Air Pollution:

Principles of environment monitoring, methods for monitoring of air pollutants including NOx, SOx, COx, SPM.

Prevention and Control of Air Pollution:

Control of pollution by fuel selection and utilization, process or equipment modification, devices, site selection, stacks, planting trees and growing vegetation, general methods of air pollution control.

Unit-II: Water Pollution: **12-15 L**

Types of water pollution, sources of water pollution, water pollutants, their classification and effects, water pollution laws and standards.

Analysis of Water:

Chemical and physical examination of water, preservation and pre-concentration, hydrogen ion concentration, acidity, alkalinity, hardness, pH, free CO_2, Cl_2, metals, ions, dissolved chlorine and oxygen, BOD, COD, chlorine dosage, *E. coli* index, general methods of water pollution control.

Unit-III: Soil Pollution: **12-15 L**

Composition and types of soil, mineral and organic matter in soil, soil pollution by industrial wastes, urban wastes, radioactive pollution and agriculture practices.

Soil Analysis:

Analysis of nitrates, nitrites, ammonical nitrogen, total nitrogen, phosphates, organic carbon, potassium, calcium, sodium, magnesium, iron, zinc, etc.

Control of Soil Pollution:

Control of domestic and industrial wastes, soil remediation, environment friendly technologies for agriculture

Page 48 of 83

Unit-IV: Industrial Pollution: **12-15 L**

Environmental pollution from various industries and control of industrial pollution.

Industrial Wastes and their Treatment:

Characteristics and types of industrial wastes, principles of industrial waste treatment, protection of biosphere and surface water from pollution with industrial sewages, sampling and chemical analysis of industrial wastewater, wastewater treatment, solid waste management, hazardous waste management.

Unit-V: Radioactive Pollution: **12-15 L**

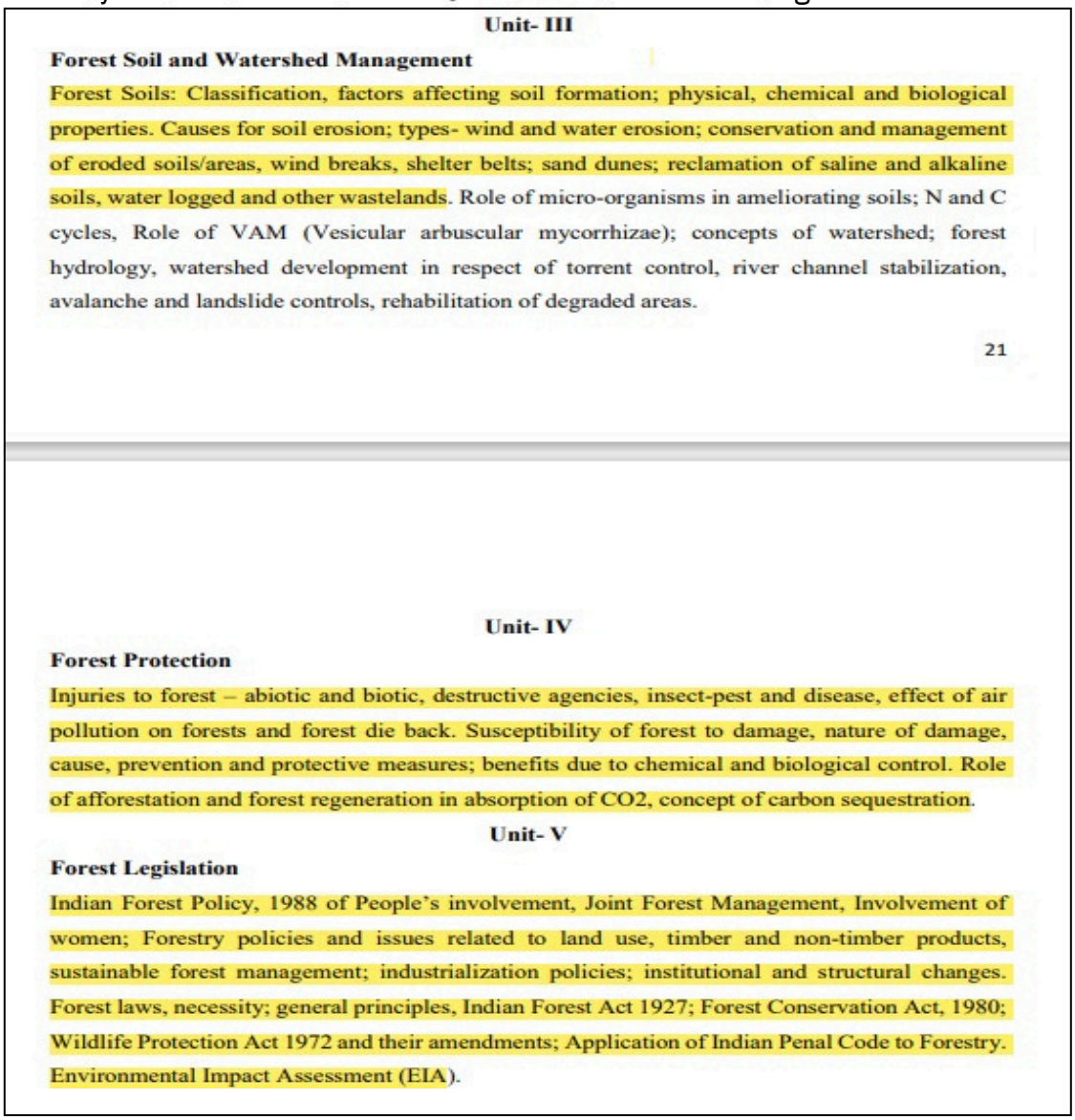
Radioactive substances, state of radioactive isotopes in solution, gases and solids; units of radiation, analysis of radionuclides, sources of radioactive pollution, radioactive fallout, nuclear reactors, nuclear installations, radioactive ore processing, nuclear accidents, effects of radioactive pollution on power plants and polymers, control of radioactive pollution.

M. Sc. Chemistry Sem-IV Paper-4.1: CHEM-641: Environmental Chemistry, Page 48-49 (View syllabus)

5. M. Sc. Zoology Sem –III

In M. Sc. Zoology Sem –III, Paper-Z-3.3 (E) SPECIAL PAPER: FORESTRY AND WILDLIFE MANAGEMENT:

Forest, Soil, and Watershed Management, rehabilitation of degraded areas are included in the curriculum. In Unit- IV under Forest Protection Injuries to the forest, susceptibility of forest to damage, nature of the damage, cause, prevention and protective measures, role of afforestation and forest regeneration are included In Unit- V, various laws and their amendments, application of Indian Penal Code to Forestry are included to make students aware of Forest Legislation.



Unit- III

Forest Soil and Watershed Management

Forest Soils: Classification, factors affecting soil formation; physical, chemical and biological properties. Causes for soil erosion; types- wind and water erosion; conservation and management of eroded soils/areas, wind breaks, shelter belts; sand dunes; reclamation of saline and alkaline soils, water logged and other wastelands. Role of micro-organisms in ameliorating soils; N and C cycles, Role of VAM (Vesicular arbuscular mycorrhizae); concepts of watershed; forest hydrology, watershed development in respect of torrent control, river channel stabilization, avalanche and landslide controls, rehabilitation of degraded areas.

21

Unit- IV

Forest Protection

Injuries to forest – abiotic and biotic, destructive agencies, insect-pest and disease, effect of air pollution on forests and forest die back. Susceptibility of forest to damage, nature of damage, cause, prevention and protective measures; benefits due to chemical and biological control. Role of afforestation and forest regeneration in absorption of CO_2, concept of carbon sequestration.

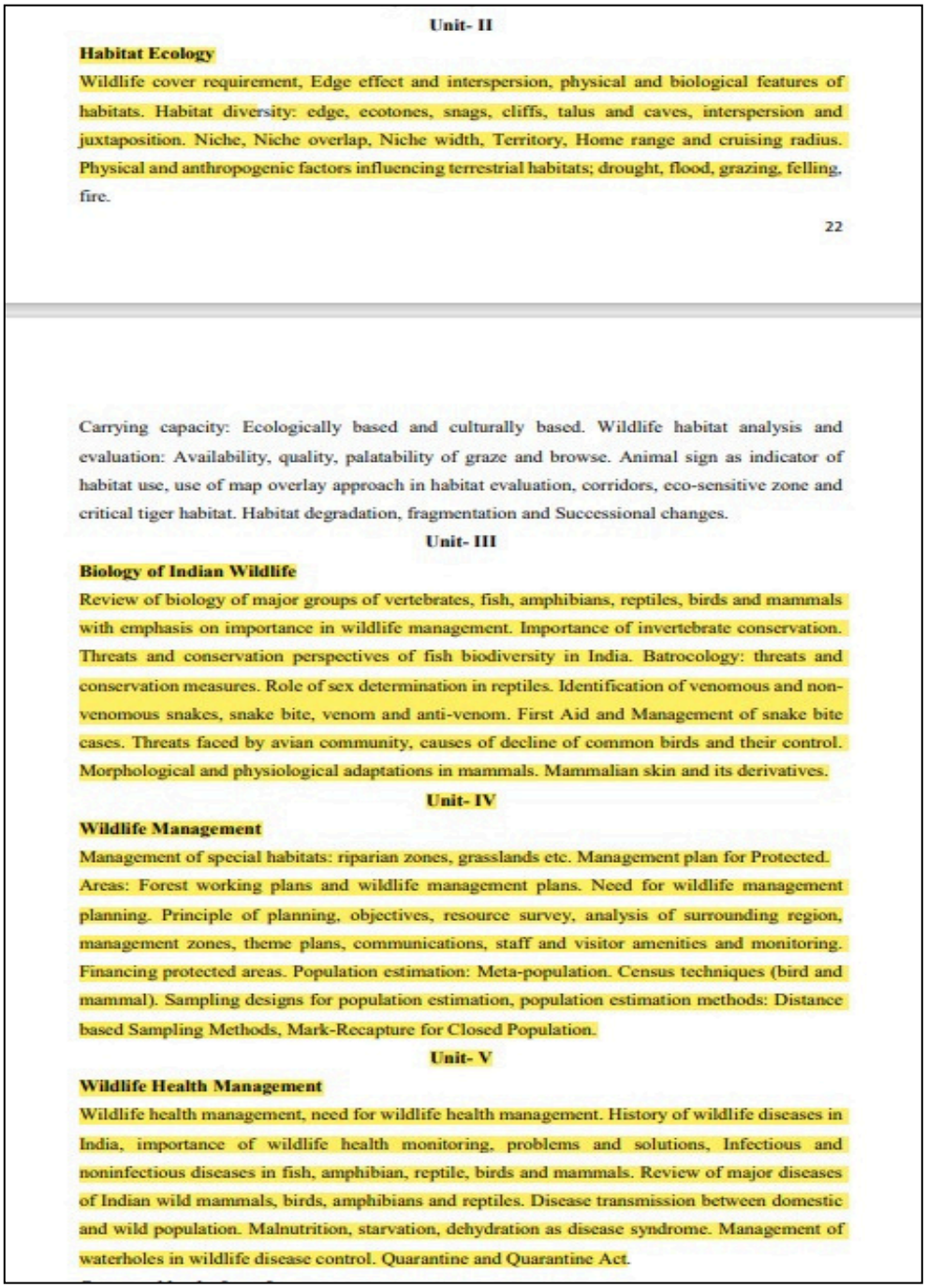
Unit- V

Forest Legislation

Indian Forest Policy, 1988 of People's involvement, Joint Forest Management, Involvement of women; Forestry policies and issues related to land use, timber and non-timber products, sustainable forest management; industrialization policies; institutional and structural changes. Forest laws, necessity; general principles, Indian Forest Act 1927; Forest Conservation Act, 1980; Wildlife Protection Act 1972 and their amendments; Application of Indian Penal Code to Forestry. Environmental Impact Assessment (EIA).

Syllabus M. Sc. Zoology, Sem-III, Paper Paper-Z-3.3 (E) SPECIAL PAPER: FORESTRY AND WILDLIFE MANAGEMENT-I Pages 21, 22 (View syllabus)

In Paper-Z-3.4 (E) SPECIAL PAPER: (FORESTRY AND WILDLIFE MANAGEMENT)-II: Human Ecology, Biology of Indian Wildlife, Wildlife Management of Protected Areas, the Need for wildlife management planning is part of the curriculum.



Unit- II

Habitat Ecology

Wildlife cover requirement, Edge effect and interspersion, physical and biological features of habitats. Habitat diversity: edge, ecotones, snags, cliffs, talus and caves, interspersion and juxtaposition. Niche, Niche overlap, Niche width, Territory, Home range and cruising radius. Physical and anthropogenic factors influencing terrestrial habitats; drought, flood, grazing, felling, fire.

22

Carrying capacity: Ecologically based and culturally based. Wildlife habitat analysis and evaluation: Availability, quality, palatability of graze and browse. Animal sign as indicator of habitat use, use of map overlay approach in habitat evaluation, corridors, eco-sensitive zone and critical tiger habitat. Habitat degradation, fragmentation and Successional changes.

Unit- III

Biology of Indian Wildlife

Review of biology of major groups of vertebrates, fish, amphibians, reptiles, birds and mammals with emphasis on importance in wildlife management. Importance of invertebrate conservation. Threats and conservation perspectives of fish biodiversity in India. Batrocology: threats and conservation measures. Role of sex determination in reptiles. Identification of venomous and non-venomous snakes, snake bite, venom and anti-venom. First Aid and Management of snake bite cases. Threats faced by avian community, causes of decline of common birds and their control. Morphological and physiological adaptations in mammals. Mammalian skin and its derivatives.

Unit- IV

Wildlife Management

Management of special habitats: riparian zones, grasslands etc. Management plan for Protected. Areas: Forest working plans and wildlife management plans. Need for wildlife management planning. Principle of planning, objectives, resource survey, analysis of surrounding region, management zones, theme plans, communications, staff and visitor amenities and monitoring. Financing protected areas. Population estimation: Meta-population. Census techniques (bird and mammal). Sampling designs for population estimation, population estimation methods: Distance based Sampling Methods, Mark-Recapture for Closed Population.

Unit- V

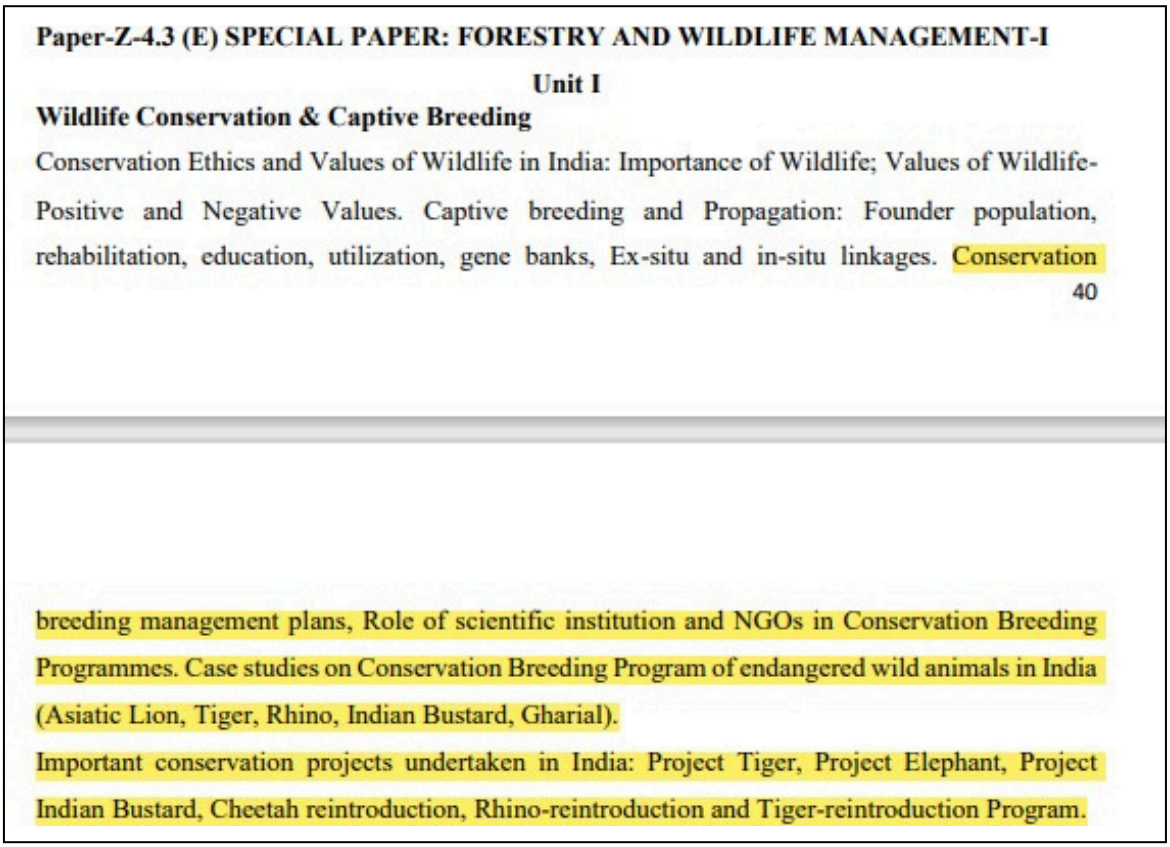
Wildlife Health Management

Wildlife health management, need for wildlife health management. History of wildlife diseases in India, importance of wildlife health monitoring, problems and solutions, Infectious and noninfectious diseases in fish, amphibian, reptile, birds and mammals. Review of major diseases of Indian wild mammals, birds, amphibians and reptiles. Disease transmission between domestic and wild population. Malnutrition, starvation, dehydration as disease syndrome. Management of waterholes in wildlife disease control. Quarantine and Quarantine Act.

M. Sc. Zoology Sem-III, Paper-Z-3.4 (E) SPECIAL PAPER: FORESTRY AND WILDLIFE MANAGEMENT-II Page 22-23 (View syllabus)

6. M. Sc. Zoology Sem-IV

In Sem-IV: Paper –Z-4.3 (E) SPECIAL PAPER: FORESTRY AND WILDLIFE MANAGEMENT-I, Wildlife Conservation, Management plans, Role of NGO's, case studies of conservation breeding of endangered animals in India and important conservation projects undertaken in India are studied.



Paper-Z-4.3 (E) SPECIAL PAPER: FORESTRY AND WILDLIFE MANAGEMENT-I

Unit I

Wildlife Conservation & Captive Breeding

Conservation Ethics and Values of Wildlife in India: Importance of Wildlife; Values of Wildlife-Positive and Negative Values. Captive breeding and Propagation: Founder population, rehabilitation, education, utilization, gene banks, Ex-situ and in-situ linkages. Conservation

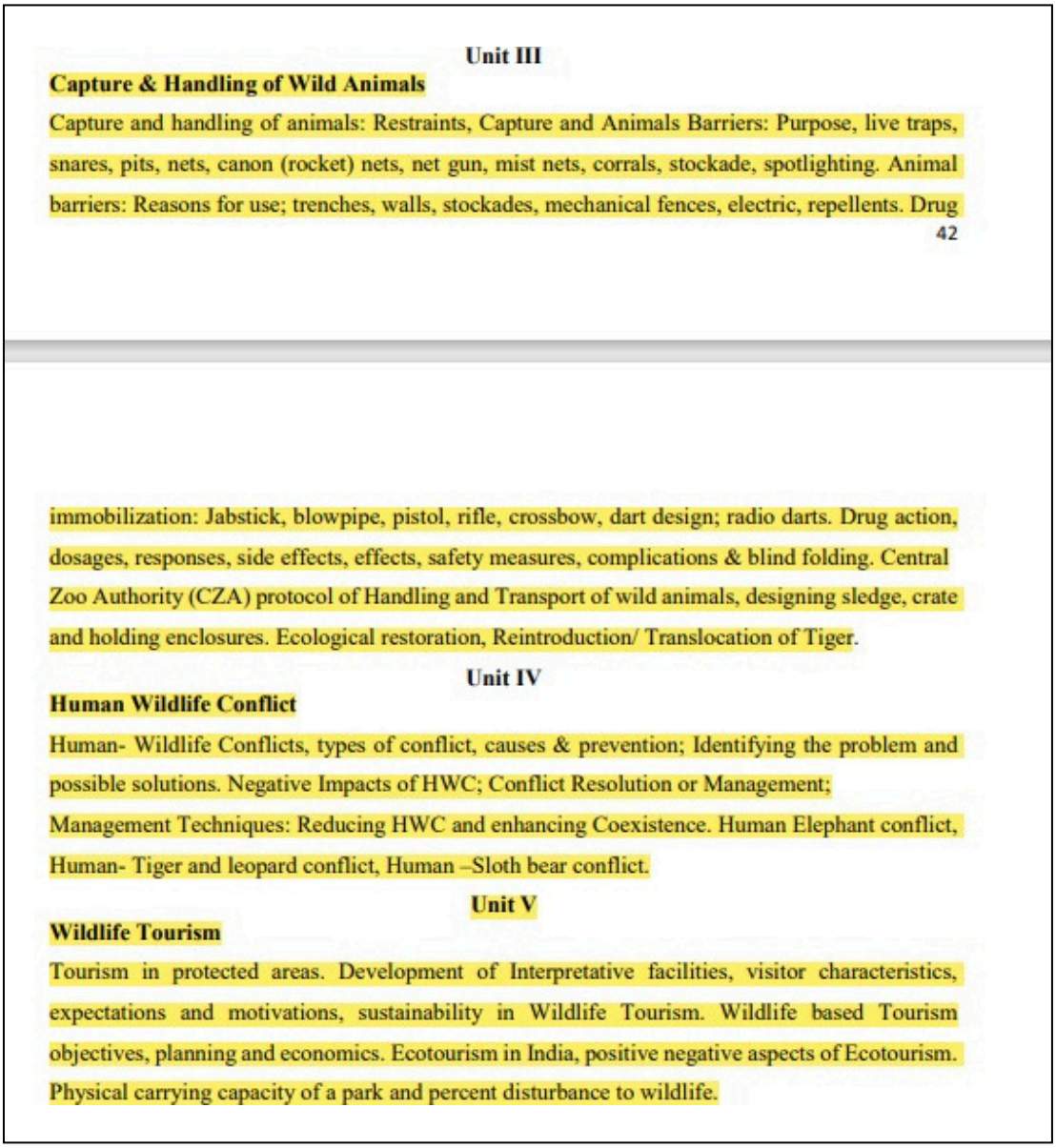
40

breeding management plans, Role of scientific institution and NGOs in Conservation Breeding Programmes. Case studies on Conservation Breeding Program of endangered wild animals in India (Asiatic Lion, Tiger, Rhino, Indian Bustard, Gharial).

Important conservation projects undertaken in India: Project Tiger, Project Elephant, Project Indian Bustard, Cheetah reintroduction, Rhino-reintroduction and Tiger-reintroduction Program.

M. Sc. Zoology, Sem-IV: Paper –Z-4.3 (E) SPECIAL PAPER: FORESTRY AND WILDLIFE MANAGEMENT-I, Page 40-41 (View syllabus)

In Sem-IV: Paper-Z-4.4 (E) SPECIAL PAPER: FORESTRY AND WILDLIFE MANAGEMENT-II Human-Wildlife Conflict Human, Eco-tourism in India, positive and negative aspects of Eco-tourism is added to enhance the environmental ethics in students.



Unit III

Capture & Handling of Wild Animals

Capture and handling of animals: Restraints, Capture and Animals Barriers: Purpose, live traps, snares, pits, nets, canon (rocket) nets, net gun, mist nets, corrals, stockade, spotlighting. Animal barriers: Reasons for use; trenches, walls, stockades, mechanical fences, electric, repellents. Drug

42

immobilization: Jabstick, blowpipe, pistol, rifle, crossbow, dart design; radio darts. Drug action, dosages, responses, side effects, effects, safety measures, complications & blind folding. Central Zoo Authority (CZA) protocol of Handling and Transport of wild animals, designing sledge, crate and holding enclosures. Ecological restoration, Reintroduction/ Translocation of Tiger.

Unit IV

Human Wildlife Conflict

Human- Wildlife Conflicts, types of conflict, causes & prevention; Identifying the problem and possible solutions. Negative Impacts of HWC; Conflict Resolution or Management; Management Techniques: Reducing HWC and enhancing Coexistence. Human Elephant conflict, Human- Tiger and leopard conflict, Human –Sloth bear conflict.

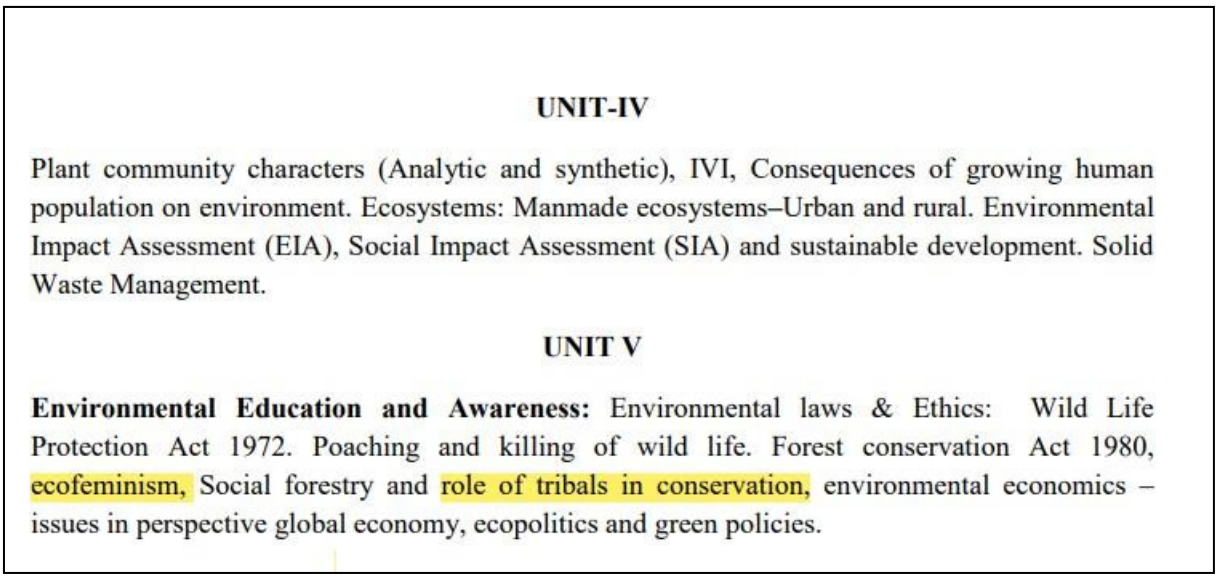
Unit V

Wildlife Tourism

Tourism in protected areas. Development of Interpretative facilities, visitor characteristics, expectations and motivations, sustainability in Wildlife Tourism. Wildlife based Tourism objectives, planning and economics. Ecotourism in India, positive negative aspects of Ecotourism. Physical carrying capacity of a park and percent disturbance to wildlife.

Syllabus M.Sc.Zoology, Sem-IV, Paper- Paper-Z-4.4 (E) SPECIAL PAPER: FORESTRY AND WILDLIFE MANAGEMENT-II, Pages 42-43 (View syllabus)

7. Gender based issues



UNIT-IV

Plant community characters (Analytic and synthetic), IVI, Consequences of growing human population on environment. Ecosystems: Manmade ecosystems–Urban and rural. Environmental Impact Assessment (EIA), Social Impact Assessment (SIA) and sustainable development. Solid Waste Management.

UNIT V

Environmental Education and Awareness: Environmental laws & Ethics: Wild Life Protection Act 1972. Poaching and killing of wild life. Forest conservation Act 1980, ecofeminism, Social forestry and role of tribals in conservation, environmental economics – issues in perspective global economy, ecopolitics and green policies.

M. Sc. Botany Sem-III, Paper- Paper XIV (b): Advanced Plant Ecology-I(Environmental Biology), Page no. 54 (View syllabus)

8. Intellectual Property Rights Cell:

Intellectual Property Rights Cell is constituted in the college to make the students aware of the Intellectual Property Rights, Copyright, and Plagiarism etc. Professional ethics is also inoculated in the students through various seminars/activities under the umbrella of Research Cell.

Programs and activities (seminar, quizzes etc.) are also organized by IPR Cell, Human Rights Cell and Women Cell to make the students aware about the IPR, copyright, plagiarism, and issues related to human rights and legal aspects of all such issues. To inculcate the sense of responsibility towards environment and nature, significant days like Earth Day, World Biodiversity day, World Wetland Day, Nature Conservation Day, Ozone Protection Day, Water Conservation and Pollution Prevention Day and other days of important issues are celebrated. UG and PG association in the college, organize events for the students, faculty and drive campaigns like Green Campus-Clean Campus. IPR cell, Human Rights Cell and Women Cell to make the students aware about the IPR, copyright, plagiarism and issues related to human rights and legal aspects of all such issues. To inculcate the sense of responsibility towards environment and nature,

significant days like Earth Day, World Biodiversity day, World Wetland Day, Nature Conservation Day, Ozone Protection Day, Water Conservation and Pollution Prevention Day and other days of important issues are celebrated. UG and PG association in the college, organize events for the students, faculty and drive campaigns like Green Campus-Clean Campus.

View IPR Cell

View Academic activities (Days/ Weeks/ UG & PG Association)

9. Experiential Learning through Co-curricular and Extra-curricular activities:

National Social Service (NSS), Rangering, Consumer Club, Women Cell and Red Ribbon Club actively organize programs for teaching and inoculating sensibility and awareness about Human values and Gender based issues.

View Red Ribbon Club & Road Safety Club

View Rangering & Consumer Club

View NSS

View Women Cell