B.Sc. ENVIRONMENTAL SCIENCE
Scheme of Examinations

Ist Semester

Paper-I  Elements of Ecology
Paper-II  Ecosystem Dynamics
Paper-V  Practicals

IInd Semester

Paper-III  Biodiversity Components
Paper-IV  Biodiversity Conservation and Ecosystem Services
Paper-V  Practicals

Outline of Examinations

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* At the end of Second Semester
Syllabus and Courses of Reading  
B.Sc. Environmental Science (First Semester)  
(w.e.f. 2008-2009)

**Paper-I:  Elements of Ecology**

Max. Marks : 40 + 10(IA)  
Time : 3 Hours

**Note:-** Total Nine questions will be set. The candidates will attempt 5 questions in all, one from each unit. Question number one will be compulsory, consisting of short answer question, covering the entire syllabus. All the questions carry equal marks.

**Unit-I**

Definition, Scope and basic principles of ecology and environment.  
Biological levels of organization, population, community, ecosystem and biosphere.  
Climatic factors - Solar radiations, temperature, water and precipitation.

**Unit-II**

Soil formation, soil types, soil profiles.  
Physical and chemical characters of soil, Soil biological characters.  
Topographic factors.

**Unit-III**

Population:  Basic concepts, population characteristics – density, natality, mortality, age-structure, population growth.  
Ecological niche and habitat.  
Positive and negative interactions of populations – competition, predation, parasitism, mutualism.

**Unit-IV**

Community:  Basic concepts, community structure, growth forms, life form.  
Analytical and synthetic characters of plant community.  
Methods of plant community analysis.  
Concept of keystone species and ecotone.
Paper-II: Ecosystem Dynamics

Max. Marks : 40 + 10(IA)
Time : 3 Hours

Note:- Total Nine questions will be set. The candidates will attempt 5 questions in all, one from each unit. Question number one will be compulsory, consisting of short answer question, covering the entire syllabus. All the questions carry equal marks.

Unit-I

Ecosystem : Basic concepts, components of ecosystem.
Trophic levels, food chains and food webs.
Ecological pyramids, ecosystem functions.
Energy flow in ecological systems, energy efficiencies.

Unit-II

Biogeochemical Cycles : Importance, gaseous and sedimentary cycles.
Carbon, Nitrogen, Phosphorus and Sulphur Cycles.
Global Oxygen Cycles.
Hydrological cycles.

Unit-III

Succession : Concepts of succession, Types of Succession.
Trends in succession.
Climax and stability.
Co-evolution and group selection.

Unit-IV

Major biomes of the world.
Characteristics of terrestrial fresh water and marine ecosystems.
Forests, grasslands, lake, river and marine ecosystems of India.
Suggesting Reading:

ELEMENTS OF ECOLOGY & ECOSYSTEM DYNAMICS

Syllabus and Courses of Reading  
B.Sc. Environmental Science (First Semester)  
(w.e.f. 2008-2009)  

Paper-III: Biodiversity Components  
Max. Marks : 40 + 10(IA)  
Time : 3 Hours  

Note:- Total Nine questions will be set. The candidates will attempt 5 questions in all, one from each unit. Question number one will be compulsory, consisting of short answer question, covering the entire syllabus. All the questions carry equal marks.  

Unit-I  
Biodiversity: Basic concepts, importance and conservation needs.  
Species diversity, Biological and phylogenetic species concept.  
Basic concepts of speciation, species extinction.  

Unit-II  
Biological classification, taxonomic nomenclature.  
Principles of classification and nomenclature of plants.  
Micro-organism: main taxonomic groups of micro-organism.  
Organization and function of a bacterial and fungal cell.  

Unit-III  
General characteristics, habitat and economic importance of photosynthetic bacteria.  
Chemoautotrophs, bacteria, blue-green algae, yeasts, fungi and algae.  
Microbial toxins in environment, microbial diseases of man.  

Unit-IV  
Bryophytes and lichen, land habit in Bryophytes, role of bryophytes in soil building.  
Lichens as ecological indicators.  
Pteridophytes, gymnosperms and angiosperms, general characteristics, habitat, role in environment and economic uses.
Paper-IV : Biodiversity Conservation and Ecosystem Services

Max. Marks : 40 + 10 (IA)
Time : 3 Hours

Note:- Total Nine questions will be set. The candidates will attempt 5 questions in all, one from each unit. Question number one will be compulsory, consisting of short answer question, covering the entire syllabus. All the questions carry equal marks.

Unit-I

Introduction to classification of animal kingdom.
Diversity of insects, nematodes, fishes, birds, reptile and other mammals.
Animal food and fisheries.
Role of animal and insects in pollination and seed dispersal.
Economic importance of wild life.

Unit-II

Factors for decline of biological diversity.
Approaches for conservation of biological diversity.
Protection of wild flora, fauna and natural habitats.
Concept of threatened species.
Threatened and endangered animals of India.
Unit-III

Food, timber and medicinal plants non-timber forest produce.
Importance of tropical rain forests and wetlands.
Wild life sanctuaries, National Parks and Biosphere Reserve.
Concept of genetic diversity, gene and germ-plasm banks.

Unit-IV

Biodiversity convention.
International and national efforts to conserve biodiversity.
Socio-cultural aspects of biodiversity.
Biotechnological needs for biodiversity conservation.
Traditional knowledge and biodiversity conservation.

Suggesting Reading:

BIODIVERSITY COMPONENTS & BIODIVERSITY CONSERVATION AND ECOSYSTEM SERVICES


Paper-V: Practical

Max. Marks: 100
Time: 6 Hours (in two sessions)

Section-A
1. Determination of requisite size of the quadrant for vegetation analysis.
2. Analysis of frequency distribution of plants in a piece of vegetation by quadrat method.
3. To determine chlorophyll content of the given plant material.
4. To determine basal cover of trees in a forest ecosystem/forest plantation.
6. Quantitative analysis of soil pH.
7. To study pore space, water holding capacity and bulk density of soil.
8. Identification of rocks and minerals on the basis of physical characters.

Section-B
1. Temporary wet amount technique for the observation of living organism.
2. Ecological comments on charts/material/fresh plant material (as per syllabus).
3. Comments on economic uses of plant material (as per syllabus).
4. Preparation of field report based on the survey of local flora.
5. Study of centre of diversity of plants from maps.

Section-C
1. Comments on life cycle of some economically important insects.
2. Identification of museum specimens of some economically important fishes.
3. Study of flora and fauna through charts and maps.
4. Preparation of field report based on the visit to a Wild Life Sanctuary/National Park/Zoo/Biosphere Reserve.
### Distribution of Marks:

1. One experiment from Section-A  
2. One experiment from Section-B  
3. One experiment from Section-C  
4. Viva-voce (based on theoretical aspects of Experiments prescribed)  
5. Lab Record  
6. Field Report  

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<tr>
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<td>One experiment from Section-C</td>
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<td>Lab Record</td>
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<td>Field Report</td>
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**Total**  
100 marks
### B.Sc. ENVIRONMENTAL SCIENCE

#### Scheme of Examinations

#### IIIrd Semester

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<tr>
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<td>Natural Resources and Forest Management</td>
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#### IVth Semester

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<td>Physico Chemical Environment</td>
<td>3</td>
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<td>IX</td>
<td>Environmental Pollution</td>
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*At the end of Fourth Semester*
Syllabus and Courses of Reading

Paper – VI : Renewable and Non Renewable Energy Resources
Max. Marks : 40+10(IA)
Time : 3 Hours

Note :- Total 9 questions will be set. The candidates will attempt 5 questions in one from each unit. Question number one will be compulsory, consisting of short answer question, covering the entire syllabus.

Unit -I
Energy Utilization : Basic concepts and role in human civilization
Energy scenario in India
Renewable and non renewable sources of energy
Sustainable use of energy resources

Unit -II
Non Renewable Energy Resources: Fossil fuels and their reserves
Nuclear energy, types, uses and effects
Energy utilization and its effects on environment
Energy crisis

Unit -III
Renewable Energy Resources: Hydropower,
Solar energy, geothermal, tidal and wind energy,
Biomass energy, biogas and its advantages.

Unit -IV
Energy conservation : In agriculture and industrial sector.
Energy plantation ; Petro crops
Hydrogen as a source of energy
Energy from waste
Syllabus and Courses of Reading

Paper – VII : Natural Resources and Forest Management

Max. Marks : 40+10(IA)
Time : 3 Hours

Note :- Total 9 questions will be set. The candidates will attempt 5 questions in one from each unit. Question number one will be compulsory, consisting of short answer question, covering the entire syllabus.

Unit -I

Biological resources : Types and uses of biological resources
Forest Management
Forest resources of India
Wild life conservation efforts in India,
Project tiger, range management

Unit -II

Water resources : Types and uses of water resources
Methods of enhancing fresh water supply
Watershed management & its importance
Sustainable use of water resources

Unit -III

Soil ; types of soil, soil erosion
soil conservation techniques
Types of land use,
Land conservation strategies

Unit -IV

Concept of sustainable development
Environment education
Major conservation efforts – WWF, IUCN, UNEP, CITES, ENVIS.
Role of NGO’s in Environment protection
Role of remote sensing in resource management.
Suggested Readings

Renewable and Non-Renewable Energy Resources
and
Natural Resources and Forest Management

Syllabus and Courses of Reading

Paper – VIII : Physico -Chemical Environment

Max. Marks : 40+10(IA)
Time : 3 Hours

Note :- Total 9 questions will be set. The candidates will attempt 5 questions in one from each unit. Question number one will be compulsory, consisting of short answer question, covering the entire syllabus.

Unit -I
Earth Atmosphere : Origin and Composition
Distribution of temperature and pressure in atmosphere.
Radiation budget of earth’s atmosphere
Thermal Inversion.

Unit -II
Brief idea about composition and origin of earth
Internal structure of earth,
landforms,
Rocks types ; igneous, Metamorphic and sedimentary rocks

Unit -III
Aquatic environment : Fresh water, Eco System, Coastal eco systems,- a general account of mangroves and coral reefs.
Ground water aquifers, Causes for depletion
Water conservation strategies

Unit -IV
Climate classification ; monsoons,
Influences of meteorological factors on air quality,
Types of ionizing radiations,
Effect of UV radiations on physical and biological systems.
Syllabus and Courses of Reading

Paper – IX: Environmental Pollution

Max. Marks : 40+10(IA)
Time : 3 Hours

Note :- Total 9 questions will be set. The candidates will attempt 5 questions in one from each unit. Question number one will be compulsory, consisting of short answer question, covering the entire syllabus.

**Unit -I**
Air pollution : sources of air pollution,
Primary and secondary air pollutants.
Origin and effects of $\text{SO}_x$, $\text{NO}_x$, $\text{Co}_x$, CFC, Hydrocarbon,
Photochemical smog, heavy metals, particulates, control of air pollution.

**Unit -II**
Water pollution : sources and types of water pollution,
Effects of water pollution,
Eutrophication,
A brief idea of marine and ground water pollution

**Unit -III**
Soil pollution : Causes of soil pollution
Effects of soil pollution
Pesticides in soil environment and their effects
Biological magnification, pollution through mining

**Unit -IV**
Climate change : Causes and effects,
Threats to stratospheric ozone,
Green house effect, acid rain, climate convention.
Sources and effects of noise pollution, noise standards.
Suggested Readings

Physico Chemical Environment
&
Environmental Pollution

Section – A

1. Identification of minerals and rocks on the basis of physical characteristics
2. To study a soil profile.
4. To determine dissolved oxygen in a water body.
5. Climate classification on the basis of climographs.
6. Analysis of pesticides residues using TLC.
7. To analyse water quality using a water quality analysis kit.
8. To prepare a report on various types of local industrial effluents.
9. To prepare a report on occupational health hazards in relation to a local industry.

Section – B

1. To prepare energy budget of a cropping system aquaculture.
2. To determine the calorific content of the given plant material
3. To determine energy efficiencies from the given data.
4. Techniques of vegetative propagation of forestry trees.
5. Demonstration of soil conservation techniques.
6. Demonstration of water conservation techniques.
9. Demonstration of Biogas plant
10. Visit to a water shed management project.
11. Demonstration of extraction of forest products.

Suggested Readings

**Distribution of Marks**:

1. One experiment from section – A  
   20 marks
2. One experiment from section – B  
   20 marks
3. Viva –voce (based on theoretical aspects of experiments prescribed)  
   10 marks
4. Practical Record  
   10 marks.
5. Project report based on field training and seminars  
   40 marks.

**Total**  
100 marks.

* Two trips are essential for the field training of the students.*
B.Sc. ENVIRONMENTAL SCIENCE
Scheme of Examinations

Vth Semester

Paper-XI  Environmental Monitoring

Paper-XII  Environmental Techniques & Impact Assessment

Paper-XV  Practicals

VIth Semester

Paper-XIII  Environmental Management

Paper-XIV  Eco Restoration and Development

Paper-XV  Practicals

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* At the end of Sixth Semester
Syllabus and Courses of Reading

Paper – XI : Environmental Monitoring

Max. Marks : 40+10(IA)

Time : 3 Hours

Note :- Total 9 questions will be set. The candidates will attempt 5 questions in one from each unit. Question number one will be compulsory, consisting of short answer question, covering the entire syllabus.

Unit -I

Environment monitoring : Concept, aims, measurement and data collection on Meteorological parameters – solar radiation, temperature Humidity, precipitation, wind direction and speed. Plume behaviour, wind rose – a brief idea.

Unit -II

Chemical aspect of air quality monitoring : sampling of gaseous and suspended particulate matter ; basic considerations, devices and methods used : absorption, adsorption, condensation, sedimentation, filtration, Impingement, electrostatic precipitation, centrifugal methods.

Unit -III

Water quality monitoring : water quality parameters, Physical and chemicals characteristics of water : Colour, turbidity, odour and taste, total solids, conductivity, pH, acidity, alkalinity, hardness, Dissolved Oxygen, Biological Oxygen Demand Chemical Oxygen demand

Unit -IV

Biological aspects of Environment Monitoring: Bio indicators of environmental monitoring Microbiological quality of water Bio indicators of water quality Vegetation monitoring – a brief idea.
Syllabus and Courses of Reading

**Paper – XII : Environmental Techniques & Impact assessment**

Max. Marks : 40+10(IA)
Time : 3 Hours

Note :- Total 9 questions will be set. The candidates will attempt 5 questions in one from each unit. Question number one will be compulsory, consisting of short answer question, covering the entire syllabus.

**Unit -I**

Basic environmental techniques : Colorimetery, Flame photometery, Chromatography – paper chromatography, Thin layer chromatography, Column chromatography, Gas chromatography, Gas Liquid chromatography.

**Unit -II**

Sampling methods : Random and non random sampling – concepts of mean (Arithmetic mean, Geometric mean, Harmonic mean), mode, median, Standard deviation and Standard error t-test and Chi. Square test

**Unit -III**

Principles of Environmental management, Computer application in ecology and environmental monitoring, Data tabulation of meterological parameter, weather forecasting, Measurement of soil salinity and acidification.

**Unit -IV**

EIA – Aims, objectives and methods EIA case studies river valley, projects and thermal power plants Geographical Information System Remote sensing and application in environment
Syllabus and Courses of Reading

Paper – XIII : Environmental Management

Max. Marks : 40+10(IA)
Time : 3 Hours

Note :- Total 9 questions will be set. The candidates will attempt 5 questions in one from each unit. Question number one will be compulsory, consisting of short answer question, covering the entire syllabus.

Unit -I
Air pollution : Sources, types and effects,
Effects of air pollution on plants and air quality,
Human health and animals,
Economic losses.

Unit -II
Control of Pollution : Control of stationary sources of pollution,
Particulate emission control, gaseous emission control
Role of plants and trees in air pollution abatement, green belt development for industries.

Unit -III
Waste Generation : Biodegradable and non biodegradable wastes
Agricultural, domestic and industrial wastes
Plastic waste and disposal,
Hazardous waste – origin and types

Unit -IV
Waste Management : Methods of waste disposal, incineration, landfill,
Composting, Anaerobic waste degradation
Production of liquid and gaseous fuels from waste
Hazardous waste management
Syllabus and Courses of Reading

Paper – XIV : Eco Restoration and Development

Max. Marks : 40+10(IA)
Time : 3 Hours

Note :- Total 9 questions will be set. The candidates will attempt 5 questions in one from each unit. Question number one will be compulsory, consisting of short answer question, covering the entire syllabus.

Unit -I
Degraded lands : agricultural practices and land degradation,
Mining and its impact on soil quality
Conservation of degraded lands,
Rehabilitation of mine soils and salt affected soils,

Unit -II
Soil Conservation : Biological reclamation techniques
Bio fertilizers, micorrhizae,
Vermi composting, afforestation,
Organic farming, Bio remediation.

Unit -III
Approaches for environmental awareness and education,
Role of media in environmental awareness,
Role of women in environmental awareness.
Eco development and environmental friendly products and technologies.

Unit -IV
National environmental policy
Environmental laws in India
Sustainability – concept, principles and practices
Sustainable management of resources
Ecological modelling – a brief idea.
Suggested Readings

Environmental Management
&
Eco Restoration and Development

Section – A
1. A study of local sources and types of industrial waste.
2. To prepare a report on the effect of local industrial activities on human health.
3. Demonstration of composting techniques.
4. Visit to sewage treatment plants.
5. Vermi composting of organic wastes.
6. Anaerobic digestion of cattle waste.
7. Study of soil microbial activity
8. Field Ecology – Terrestrial and aquatic flora
9. Visit to waste water treatment plants.
10. Visit to industry for a survey of air pollution control equipments

Section – B
2. Preparation of ombrothermic diagram from long term data on temperature and rainfall.
3. To analyse physical and chemical properties of water.
4. To determine soil salinity and alkalinity
5. Demonstration of the working of flame photometer.
6. Demonstration of working of an atomic absorption spectrophotometer for detecting heavy metals.
7. Estimation of Kjeldahl Nitrogen and phosphorous in

Suggested Readings
Distribution of Marks:

1. One experiment from section – A 20 marks
2. One experiment from section – B 20 marks
3. Viva –voce (based on theoretical aspects of experiments prescribed) 10 marks
4. Practical Record 10 marks.
5. Project report based on site visited 40 marks.

Total 100 marks.

* Two excursion trips are essential for field training of the students.