

**The University of Burdwan**  
**Syllabus for B.Sc. General**  
**(1+1+1 Pattern)**  
**in**  
**Environmental Science**  
**with effect from 2008-2009 onwards**

**SYLLABUS FOR 3 - YEAR (General) DEGREE COURSE IN  
ENVIRONMENTAL SCIENCE**

(with effect from the Session: 2008-2009 onwards)

**PART-1 (Total Marks -100)**

**PAPER-I : THEORETICAL (Marks : 100) : (TOTAL CLASSES : 100)**

[Short type questions 14 each of 2 marks (8 to be answered) and 8 questions each of (10+2) =12 marks (4 to be answered) are to be set covering entire contents. Ten questions each of (4+2/4+1+1/5+1)=6 marks (6 to be answered)]

**GROUP-A : Fundamentals of Environment**

**Lectures -20**

- 1) Concept and ideas of environment; components of environment; nature and scope of the subject
- 2) Environmental education; need of environmental education; primary objectives; guiding principles
- 3) Earth and atmosphere: Composition of the atmosphere, lithosphere, hydrosphere and biosphere - an overview

**GROUP-B : Ecology and Ecosystem**

**Lectures -20**

- 1) Concept and ideas of ecology; scope of ecology; autecology, synecology, habitat and ecological niche, habitat ecology – aquatic and terrestrial
- 2) Concept of ecosystem, different types of ecosystem ; structure and function of ecosystem; some major ecosystems; energy flow in an ecosystem
- 3) Food chains, food webs and ecological pyramids

**GROUP-C : Population Ecology**

**Lectures -15**

- 1) Definition and characters of population, population density, natality, mortality, age distribution, biotic potential of population, population dispersal
- 2) Biogeochemical cycles: Patterns and basic types of biogeochemical cycles, cycling of pattern in ecosystem like carbon, phosphorus, nitrogen

## **GROUP-D : Community Ecology**

### **Lectures -10**

- 1) Concept of biotic community, community structure, Analytical and Synthetic characters of community
- 2) Ecological succession : Causes, basic types, general process

## **GROUP-E : Biodiversity and its Conservation**

### **Lectures -10**

- 1) Definition, types , value and importance
- 2) Hotspots of biodiversity, Megabiodiversity nations
- 3) Conservation of biodiversity ( *Ex situ* and *in situ* conservation strategies )

## **GROUP-F : Forest Resource**

### **Lectures -10**

- 1) Uses, types and importance of forest
- 1) Forest resources of India
- 2) Deforestation and effects of deforestation
- 3) Management and conservation of forest

## **GROUP-G : Principles of Systematics / Taxonomy**

### **Lectures -15**

1. Definition of phenon, taxon, category, species and classification, variety, subspecies, race, superspecies
2. Principal of classification: General rules, identification, hierachical classification
3. Basic idea of artificial, natural and phylogenetic classification
4. Outline of a natural system of classification

### **Suggested Readings**

1. Fundamentals of Ecology, E P Odum. W B Saunders Com., 3<sup>rd</sup> Edition
2. Environmental Biology, Biswarup Mukherjee. Tata McGraw-Hill Publishing Com. Ltd.
3. A Textbook of Environment, K M Agarwal, P K Sikdar & S C Deb. MacMillan India Ltd.
4. Concepts of Ecology, Edward J Kormondy. Prentice-Hall of India Pvt. Ltd., New Delhi
5. Introduction to Environmental Science, Y Anjaneyulu. B S Publications
6. Principles of Systematic Zoology, E Mayur. McGraw-Hill Publishing Com., Ltd.
7. Principles of Animal Taxonomy, G G Simpson, Columbia University Press
8. Environmental Science : A Global Concern, William P Cunningham, Barbara Woodworth Saigo. WCB McGraw-Hill
9. Environmental Science, Richard T Wright. Pearson, Prentice Hall
10. Environmental Science: Earth as a Living Planet, Daniel B Botkin & Edward A Keller. John Wiley & Sons, Inc.
11. Elements of Ecology, Clerke. John Wiley & Son
12. Environmental Studies, A K De. New Age International Pvt., Ltd.
13. Environmental Chemistry, A K De. New Age International Pvt. Ltd.

14. An Introduction to Behavioural Ecology, J R Krebs & N B Davies. Sinauer Associates

**PART-II (TOTAL MARKS : 200)**

Theoretical Papers (100 marks) will be of 3 Hours duration

Practical Paper (100 marks) will be of 5 Hours duration

**PAPER-II : THEORETICAL (Marks : 100) : TOTAL CLASSES : 85**

[Short type questions 14 each of 2 marks (8 to be answered) and 8 questions each of (10+2) =12marks (4 to be answered) are to be set covering entire contents. Ten questions each of (4+2/4+1+1/5+1)=6 marks (6 to be answered)]

**GROUP-A : Environmental Chemistry**

**Lectures -20**

1. Molecular weight; equivalent weight, normality and molarity
2. Valency; oxidation state, oxidation and reduction, metals and non-metals
3. Aromatic and aliphatic organic compounds; saturated and unsaturated hydrocarbons
4. Basic principles of sedimentation, coagulation, filtration and absorption; concept of acid, base and buffers

**GROUP-B : Environmental Physics**

**Lectures -10**

1. Heat, heat transfer process, first and second law of thermodynamics
2. Concept of enthalpy, entropy, free energy, chemical potential
3. Definition and units of radioactivity; characterization of radioactive materials and rays and applications
4. Nuclear disasters (Chernobyl; Hiroshima- Nagasaki)

**GROUP-C : Earth Science**

**Lectures -20**

1. Environmental Geology- definition; principles of environmental geology
2. Rock and mineral – types and examples
3. Internal structure of earth – basic ideas; soil types of India; physical and chemical properties of soil
4. Natural hazards – Flood, Earthquake

**GROUP-D : Microbiology**

**Lectures -15**

1. Bacterial morphology – shape, size, structure and function of bacterial cell, cell membrane, capsule, flagella, pili
2. Normal growth cycle (growth curve) of bacteria; microbes of different environment
3. Contamination and microbial spoilage of food
4. Virology – descriptive properties of virus, morphology and structure of phages, General characters of protozoa, algae and fungi. General characters of protozoa, algae, fungi

**GROUP-E : Environmental Pollution-I**

**Lectures -10**

1. Concept of pollutant and contaminant; primary and secondary pollutants
2. Air pollution – definition, sources and effects

3. Soil pollution - definition, sources and effects
4. Water pollution - definition, sources and effects

**GROUP-F : Environmental Pollution-II**

**Lectures -10**

1. Noise pollution - sources, effects
2. Pesticides - definition, categories, general effects
3. Heavy metals - definition, examples, general effects
4. Basic idea about acid rain, green house gases and their effects; ozone hole, eutrophication , bioaccumulation, biomagnification

**Suggested Readings**

1. Ecology and Environment, P.D. Sharma, Rastogi Publications
2. A text book on soil science, D.K.Das,Kalyani Publications
3. A text Book of Plant Ecology and Soil Science, Shukla Chandel, S. Chand & Co. pvt. Ltd.
4. Text Book of Microbiology, Dubey & Mahewari
5. Microbiology, Powar and Dagainawala

**PART- II**

**PAPER – III : Practical Paper (100 marks) will be of 5 Hours duration**

**Description of Items**

**Distribution of**

**Marks**

1) Major experiment	25
2) Minor experiments	12.5 x 2= 25
3) Identifications	4 x 5 = 20
4) Submission of Field Report	10
5) Submission of Practical Records	10
6) Viva - voce	10

**PRACTICAL COURSE**

**MAJOR I EXPERIMENTS**

Estimation of total hardness; chloride; acidity and alkalinity of water sample by titrimetric method

**MINOR I EXPERIMENTS**

Measurement of pH; EC of water sample of your locality

**MINOR II EXPERIMENTS**

Measurement of pH, EC and bulk density of soil sample of your locality

**IDENTIFICATIONS**

Plant species of your locality - Common herbs, shrubs, trees, aquatic plants and crop field weeds

**FIELD REPORT :-**On industrial/mining/forest/local ecosystems(one excursion is essential)

**PART-III (TOTAL MARKS: 100)**  
**[Theoretical Paper (65 marks) will be of 2.5 Hours duration**  
**Practical Paper (35 marks) will be of 4 Hours duration]**

**Paper : IV : Theoretical Paper (Marks: 65):      TOTAL CLASSES : 50**  
**Time : 2 : 30 Hours**

[14 questions each of 2 marks (8 to be answered) and 4 questions each of 12.5 marks (2 to be answered) are to be set covering entire contents. Seven questions each of 6 marks (4 to be answered)] [4 Hours duration]

**GROUP – A : Environmental Economics and Statistics**

**Lectures-15**

- 1) Concept and scope; concept of supply and demand; ecological economics
- 2) Application of environmental economics - polluter's pay principal, principle; sustainable development
- 3) Elementary concept of statistics, data collection, computation and presentation
- 4) Calculation of mean, mode and standard deviation from field data, laboratory data

**GROUP – B : Environmental laws ; Environmental Impact Assessment**

**Lectures-10**

- 1) Constitutional provisions for protecting environment - Article 48(A), 51A (g)
- 2) Air, Water and wildlife protection Act
- 3) EIA - definition, characters and methods of evaluation of EIA
- 4) Life cycle assessment, eco-friendly products

**GROUP – C : Environmental Biotechnology**

**Lectures-15**

- 1) Biofertilizer – definition , types, applications, advantages
- 2) Biopesticides - definition, types, applications ,advantages
- 3) Bioremediation - definition, examples, applications, advantages
- 4) Biofuels - Definition, types, applications, advantages

**GROUP – D : Health and Sanitation**

**Lectures-10**

- 1) Concept of health and diseases; communicable and non-communicable diseases
- 2) Examples of air borne, water borne, vector borne and food borne diseases
- 3) Health programs in India, family planning; nutrition and health
- 4) Health education and health care for community; sanitation in rural Bengal

**GROUP – E: Environmental Management**

**Lectures-10**

- 1) Environmental Management and EM Systems
- 2) Management of air and water pollution
- 3) Management of soil and agricultural pollution
- 3) Hazardous waste management
- 4) Municipal solid waste management

**GROUP—F : Current Environmental Issues**

**Lectures-5**

- 1) Environmental movements in India - Narmada Bachao Andolan; Chipko movement; Silent Valley Movement
- 2) Biodiversity in India; its importance and protection
- 3) Wetland and their conservation
- 4) Wasteland - causes and effects

**Suggested Readings**

1. Environmental microbiology and Biotechnology, D.P. Singh and S. K. Dwivedi, New Age International Publications
2. Environmental Science, A Comparative treatise on Ecology and Environment, Shovan Roy, Publishing Syndicate

**PART: III**

**PAPER -IV : PRACTICAL (Marks: 35)**

**TIME: 4 HOURS**

**Description of Items**  
**Marks**

**Distribution of**

1. Experiment - I	5
2. Experiment - II	5
3. Identifications	4x3= 12
4. Submission of Field Report	4
5. Submission of Note Book	4
6. <i>Viva-voce</i>	5

**PRACTICAL COURSE**

EXPERIMENT - I : Estimation of soil organic carbon ( Walkley-Black method , 1934)

EXPERIMENT -II : Estimation of Dissolved Oxygen (Winkler's method ),Combined and Free CO<sub>2</sub>

IDENTIFICATION : Rocks-Basalt, Granite, Sandstone, Marble, Shale, Slate, pegmatite, limestone