

**ZOOLOGY**  
**Practical-VI (Related to (Option-i) ZOO-VI A and ZOO-VI B)**

**Time: 3hrs.**

**Max. Marks: 30**

**Important Note for Practical:**

1. Candidates will be required to submit their original note books containing record of their laboratory work.
2. Wherever possible, students must be taken out for excursion to the field (Zoological gardens, sea shores, ponds and hill stations etc.) to study habitat and ecology of the animals.
3. As per the latest UGC guidelines the dissections may please be avoided. In no case an animal falling under the categories of wildlife protection act 1972 should be caught or dissected. The rules of the Prevention of cruelty to Animals act 1960 should be familiar to all who are teaching the zoology courses. The guidelines on this issue are also available on the UGC website: [www.ugc.ac.in](http://www.ugc.ac.in)

1. Demonstration of safety rules in laboratory like proper handling of patients, specimens and disposal of syringes, needles etc.
2. Demonstration of the use of autoclave, centrifuge and spectrophotometer.
3. Cleaning and sterilization of glass ware, using hot air oven, autoclave etc.
4. Physico-chemical examination of urine.
5. Preparation of thick and thin blood smear.
6. Counting of WBC, RBC and DLC.
7. Study of permanent slides and specimens of parasitic protozoans, helminthes and arthropods mentioned in the theory syllabus.
8. ESR and haematocrit
9. Estimation of blood sugar, protein.

Demonstration of fixation, embedding, cutting of tissue sections, and their staining (routine haemotoxylin and eosin).

**Visit to a pathology Lab and preparation of report.**

**Note:- Some changes can be made in the practicals depending on the availability of material.**

**Guidelines for conduct of Practical Examination:**

1. Write down the principle and working of the given equipment. 5
2. Write down the procedure, precautions and perform the experiment for physico-chemical examination of urine/ haematology. 5
3. Write down the procedure for histological histochemical preparation. 5
4. Identification, pathogenicity and host of parasitic organism. 5
5. Estimation of blood sugar/urea/cholesterol/ protein in the given sample. 5

Viva-voce and practical file.

**SEMESTER-VI**  
**BOTANY**

**Botany Practicals-VI (Based on Papers- VIA and VIB)**

**Practical Hours: 4½ Hours/week**

**Practical Marks: 30**

**Suggested Laboratory Exercises**

1. To determine minimum number of quadrats required for reliable estimate of biomass in grasslands through species area curves.
2. To study the frequency of herbaceous species in grassland and to compare the frequency distribution with Raunkiaer's Standard Frequency Diagram.
3. To estimate Importance Value Index for grassland species on the basis of relative frequency, relative density and relative dominance in protected and grazed grassland.
4. To measure the vegetation cover of grassland through point frame method.
5. To measure the above ground plant biomass in a grassland.
6. To study the morphological anatomical features of hydrophytes (*Hydrilla, Eichhornia*)
7. Xerophytes (*Nerium, Calotropis*).
8. To determine diversity indices (richness, Simpson, Shannon-Weaver) in grazed and protected grassland.
9. To estimate bulk density and porosity of grassland and woodland soils.
10. To determine moisture content and water holding capacity of grassland and woodland soil.
11. To study the vegetation structure through profile diagram.
12. To estimate transparency, pH and temperature of different water bodies.
13. To measure dissolved oxygen content in polluted and unpolluted water samples.
14. To estimate salinity of different water samples.
15. To determine the percent leaf area injury of different leaf samples collected around polluted sites.
16. To estimate dust-holding capacity of the leaves of different plant species.
17. **Food Plants:** Study of the morphology, structure and simple microchemical tests of the foodstoring tissues rice, wheat, maize, potato and sugarcane. Microscopic examination of starch in these plants (excepting sugarcane).
18. **Fibres:** Study of cotton flowers, sectioning of the cotton ovules/developing seeds to trace the origin and development of cotton fibers. Microscopic study of cotton and test for cellulose.
19. Sectioning and staining of jute stem to show the location and development of fibers.
20. Microscopic structure. Tests for lignocelluloses.
21. **Vegetable Oils:** Study of hand sections of groundnut, mustard and coconut and staining of oil droplets by Sudan III and Sudan Black.
22. **Field Visits:** To study sources of firewood (10 plants)/timber yielding trees (10 trees)/bamboos, list to be prepared mentioning special features, collection of plant based articles of common use.
23. **Spices:** Examine black pepper, cloves, cinnamon (hand sections) and opened of cardamom and describe them briefly.
24. Preparations of an illustrated inventory of 10 medicinal plants used in indigenous systems of medicine or allopathy: Write their botanical and common names parts used and diseases/disorders for which they are prescribed.
25. **Beverages:** Section boiled coffee beans and tea leaves to study the characteristic structural features.
26. Visit to *in situ* conservation site/Botanical Garden.

### **Suggested Readings (for laboratory exercises)**

1. Council of Scientific & Industrial Research. (1986). The Useful Plants of India. Publications and Information Directorate. CSIR, New Delhi.
2. Kocchar, S.L. (2000). Economic Botany of the Tropics, Macmillan India Pvt. Ltd., New Delhi.
3. Krebs, C.J. (1989). Ecological Methodology. Harper and Row, New York, USA.
4. Ludwig, J.A. and Reynolds, J.F. (1988). Statistical Ecology, Wiley, New York.
5. Moore, P.W. and Chapman, S.B. (1986). Methods in Plant Ecology, Blackwell Scientific Publications.
6. Prinientel, D. and Hall, C.W. (Eds.) (1989). Food and Natural Resources. Academic Press, London, New York.
7. Sharma, O.P. (1996). Hill's Economic Botany. Tata McGraw Hill Co. Ltd., New Delhi.
8. Swaminathan, M.S. and Kocchar, S.L. (Eds.) (1989). Plants and Society. Macmillan Publications Ltd., London.

## **SEMESTER–VI**

### **GEOGRAPHY**

#### **MAP PROJECTIONS-II AND FIELD WORK (PRACTICAL)**

**Max. Marks: 30**

**Written Paper of 3 Hours: 15 Marks**

**Practical Record (File): 08 Marks**

**Viva: 07 Marks**

#### **Objectives:**

- To Provide an analytical understanding of use of common map projections.
- To acquaint the students with the importance of field work as one of the methodologies in geography.
- To sensitize the students about pre-field work and post-field work i.e. data processing and analysis and writing of field work report.

#### **UNIT–I**

Construction, Properties and Limitations of following Map Projections:

Zenithals: Gnomonic, Stereographic, Orthographic, Equi-distant and Equal- Area (Polar cases only).

Introduction to Sinusoidal and Molleweide's Projections.

General principles of identification and choice of projections

#### **UNIT–II**

Role of field work in Geography.

Scale of study and field work methodology.

Methods of collecting Primary data (questionnaire, observation, interview and measurement) and Secondary data and parts of report.

Methods of field study of: a Farm, a Village, a Town and Physical Features of an area.

#### **Note:**

1. A compulsory question containing 10 short answer type questions will be set covering the whole syllabus. The students will attempt 6 short answer type questions in about 25–30 words each. Each short answer type question will carry ½ mark (Total 3 marks).
2. The whole syllabus will be divided into 2 UNITS. Eight questions will be set out of the whole syllabus, four from each UNIT. The students will be required to attempt two questions from each UNIT. Each question will carry 3 marks. These will be in addition to the compulsory question at serial number 1. (Total 12 marks)
3. Evaluation of Practical record will be done at the time of viva–voce examination.
4. In case the candidate has applied for the improvement, he/she should be required to make a fresh practical note book.
5. For practical classes, the number of students in one group shall not exceed fifteen.

### Books Recommended:

1. Kellaway, George P.: *Map Projections*, Methue and Co., London.
2. Singh, Gopal: *Mapwork and Practical Geography*, Surjeet Book Depot, Delhi, 1993.
3. Singh, Malkiat: *Cartography*, Rasmeet Prakashan, Jalandhar, **Reprint 2014**.
4. Singh, L.R: *Practical Geography*, Chaitanya, Publishing House, Allahabad, 2006.
5. Jones, P.A.: *Field Work in Geography*, Longman, London, 1968.
6. Archer, J.E. & Dalton T.H.: *Field Work in Geography*, E.T. Bastford Ltd., London, 1968.
7. Singh, Gopal: *Map work and Practical Geograpy*, Surjeet Book

### SEMESTER-IV BOTANY Botany Practicals-IV (Based on Papers-IV A and IV B)

Practical Marks: 30  
Practical Hours: 4½ Hours/week

### Suggested Laboratory Exercises

1. Angiosperms The following species are suitable for study.
2. This list is only indicative. Teachers may select plants available in their locality. Teachers may select plants/material available in their locality/institution.
  1. Ranunculaceae: Ranunculus, Delphinium
  2. Brassicaceae: Brassica, Alyssum, Iberis, Coronopus.
  3. Malvaceae: Hibiscus, Abutilon.
  4. Rutaceae: Murraya, Citrus.
  5. Fabaceae: Faboideae: Lathyrus, Cajanus, Melilotus, Trigonella, Caesalpinioideae: Cassia, Caeslpainia, Mimosoideae: Prosopis, Mimosa, Aeacia.
  6. Apiaceae: Coriandrum. Foeniculum, Anethum.
  7. Acanthaceae: Adhatoda, Peristrophe.
  8. Apocynaceae: Vinca, Thevetia, Nerium.
  9. Asclepiadaceae: Calotropis.
  10. Solanaceae: Solanum, Withania, Datura.
  11. Euphorbiaceae: Euphorbia, Phyllanthus.
  12. Lamiaceae: Ocimum, Salvia.
  13. Chenopodiaceae: Chenopodium, Beta.
  14. Liliaceae: Asphodelus, Asparagus.
  15. Poaceae: Avena, Triticum, Hordeum Poa, Sorghum.
3. The Students should be made familiar with the use of identification keys including use of computers in taxonomy. The teachers should prevent students from collecting plants from the wild and submitting them for the practical examination. Instead, the student should be asked to prepare field reports.

### *Gymnosperms*

Cycas (i) Habit, armour, of leaf bases on the stem (if specimen is not available show photography), very young leaf (circinate vernation) and old foliage leaves, sclae leaf, bulbils, male cone (specimen); Microsporophyll, megasporophyll mature seed. (ii) Study through permanent slides—normal root (T.S.), stem (T.S.) (if sections are not available show photographs), ovule (L.S.). (iii) Study through hand sections or dissections-coralloid root (T.S.), rachis (T.S.), leaflet (V.S.), microsporophyll (V.S.) pollen grains (W.M.).

Pinus (i) Habit, long and dwarf shoot showing cataphylls and scale leaves, T.S. wood showing growth rings, male cone, 1st year, 2nd year and 3rd year female cones, winged seeds. (ii) Study through permanent slides-root (T.S.), female cone (L.S.) ovule (L.S.), embryo (W.M.) showing polycotyledonous condition. (iii) Study through hand sections or dissections-young stem (T.S.), old stem (wood) (T.L.S. and R.L.S.), needle (T.S. male cone (L.S.), male cone (T.S.), Pollen grains (W.M.).

Ephedra (i) Habit and structure of whole and female cones. (ii) Permanent slides-female cone

(L.S.). (iii) Hand sections/dissections-node (L.S.), internode (T.S.), macerated stem to see vessel structure; epidermal peel mount of vegetative parts to study stomata, male cone (T.S. and L.S.), pollen grains. Ginkgo (i) Habit and structure of whole plant. (ii) Permanent slides-male and female reproductive parts. (iii) pollen grains

Suggested Readings:

1. Angiosperm Phylogeny Group (2003). An update of the Angiosperm Phylogeny Group classification for the orders and families of the flowering plants: APG
2. Botanical Journal of the Linnaean Society 141: 399-436. 2. Cronquist, A. (1981). An Integrated System of Classification of Flowering Plants. Columbia University Press, New York.
3. Simpson, M.C. (2006). Plant Systematics. Elsevier, Amsterdam

**SEMESTER-IV ZOOLOGY**  
**Practical-IV (Related to ZOO-IVA and ZOO-IV B)**

**Time: 3hrs.**

**Marks: 30**

**Important Note for Practical:**

1. Candidates will be required to submit their original note books containing record of their laboratory work.
2. Wherever possible, students must be taken out for excursion to the field (Zoological gardens, sea shores, ponds and hill stations etc.) to study habitat and ecology of the animals.
3. As per the latest UGC guidelines (D.O.No. F. 14-6/2014(CPP-II) dated 01-08-2014) the dissections should not be conducted. The guidelines on this issue are available on the UGC website: [www.ugc.ac.in](http://www.ugc.ac.in)
  1. Study of the skeleton of *Scoliodon*, *Rana*, *Varanus*, *Gallus* and *Oryctolagus*.
  2. Identification of food stuffs: starch, glucose, proteins and fats in solution.
  3. Demonstration of osmosis and diffusion.
  4. Demonstrate the presence of amylase in saliva, denaturation by pH and temperature.
  5. Determination of coagulation and bleeding time of blood in man/rat/rabbit.
  6. Determination of blood groups of human blood sample.
  7. Recording of blood pressure of man.
  8. Analysis of urine for urea, chloride, glucose and uric acid.
  9. Estimation of haemoglobin content.
  10. Field study: Visit to a fossil Park/Lab/ Science City and submit a report.
  11. Familiarity with the local vertebrate fauna.

*Note:- Some changes can be made in the practicals depending on the availability of material.*

**Guidelines for conduct of Practical Examination:**

1. Identify the given bones, make labeled sketches of their respective-views. 10
2. Write down the steps and determine the constituents in the given sample. 5
3. Write the procedure and perform the given physiology experiment. 5
4. Report on visit to a fossil park/lab/Science City/study of local vertebrate fauna. 5

**SEMESTER-IV**

**PHILOSOPHY**

**INDUCTIVE LOGIC AND ENVIRONMENTAL ETHICS (OPT. I)(ONLY FOR  
REGULAR STUDENTS)**

**Lectures to be delivered: 6+4=10 per week**  
**Time: 3 Hours**

**Marks: 100**  
**Theory Marks: 80**

*Pass Marks: 35%*

*Practical Marks: 20*

**Instructions for the Paper Setters:-**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

*SECTION-A*

1. Induction: Definition and Characteristics of Induction; Types of Induction (Simple Enumeration, Scientific Induction and Analogy); Difference between Deduction and
2. Causation: Nature of Cause, Plurality of Causes (Mill), Uniformity of Nature.
3. Definition, Nature and Conditions of Valid Hypothesis; and its uses.

*SECTION-B*

4. Indian Logic: Definition, Nature and Scope.
5. Nyaya Syllogism: Difference between Nyaya Syllogism and Aristotelian Syllogism
6. Anumana in Nyaya Darshan: Meaning, Kinds, Panca-avayava, Vyapti.

*SECTION-C*

7. Environmental Ethics: Definition, Nature, Problems.
8. Ecology: Definition, Scope and its relation to Ethics.
9. Man-Nature Relationship (Indian Tradition).

*SECTION-D*

10. Population: Meaning, Population Dynamics, Migration, Problem, Causes of Over-Population and Solutions.
11. Pollution: Kinds, Causes and Solutions.
12. Nuclear Threat: Challenges and Solutions.

**SEMESTER-I**

**ZOOLOGY**

**PRACTICAL-I (RELATED TO ZOO-IA and ZOO-IB)**

Time: 3 Hrs.

Marks: 30

**Important Note for Practical:-**

1. Candidates will be required to submit their original note books containing record of their laboratory work.
2. Wherever possible, students must be taken out for excursion to the field (Zoological gardens, sea shores, ponds and hill stations etc.) to study habitat and ecology of the animals.
3. As per the latest UGC guidelines (D.O.No. F. 14-6/2014(CPP-II) dated 01-08-2014) the dissections should not be conducted. The guidelines on this issue are available on the UGC website: [www.ugc.ac.in](http://www.ugc.ac.in)

*I. Classification up to orders with ecological notes and economic importance (if any) of the following animals (Through Specimens or slides):*

**A. Protozoa.** *Amoeba, Euglena, Trypanosoma, Noctiluca, Eimeria, Monocystis, Paramecium Opalina, Vorticella, Balantidium, Nyctotherus and Polystomella.*

**B. Parazoa.** *Sycon, Grantia, Euplectella, Hyalonema, Spongilla, Euspongia.*

**C. Cnidaria.** *Porpita, Velella, Physalia, Aurelia, Rhizostoma, Metridium, Millipora, Alcyonium, Tubipora, Zoanthus, Madrepora, Favia, Fungia and Astrangia.*

*Hydra (W.M.), Hydra with buds, Obelia (colony and medusa), Sertularia, Plumularia, Tubularia, Bougainvillea and Aurelia*

**D. Platyhelminthes.**

*Dugesia, Fasciola, Taenia, Echinococcus.*

Miracidium, Sporocyst, Redia, Cercaria of *Fasciola*, scolex and proglottids of *Taenia* (mature and gravid).

**E. Aschelminthes.** *Ascaris* (male and female), *Trichinella, Ancylostoma.*

**F. Annelida.** *Pheretima, Nereis, Heteronereis, Polynoe, Eunice, Aphrodite, Chaetopterus, Arenicola, Tubifex and Pontobdela*

**2. Study of the following permanent stained preparations:**



- A. L.S. and T.S. *Sycon*, gemmules, spicules and spongin fibers of a sponge.
- B. T.S. *Hydra* (Testis and ovary region)
- C. T.S. *Fasciola* (Different regions)
- D. T.S. *Ascaris* (Male and Female)
- E. T.S. *Pheretima* (pharyngeal and typhlosolar regions), Setae, septal nephridia, spermathecae and ovary of *Pheretima* (Earthworm).

3. Preparation of the following slides:

Temporary permanent preparation of freshwater Protozoa culture.

4. **Demonstration of** digestive, reproductive and nervous systems of earthworm with the help of charts/videos/models.

5. Cell Biology:

- A. Paper chromatography.
- B. Thin layers chromatography
- C. Gel electrophoresis through photographs or through research laboratories
- D. Familiarity with TEM & SEM.
- E. Study of different ultra structures of cell organelles through photographs.

6. Visit to a vermi-composting unit and submission of report.

**Note:- Some changes can be made in the practicals depending on the availability of material. Guidelines**

**for conduct of practical Examination:-**

- |    |   |   |
|----|---|---|
| 1. | Identify and classify the specimens upto order. Write a note on their habit, habitat, special features and economic importance. | 6 |
| 2. | Identify the slides/micrographs and give two reasons for identification.  | 6 |
| 3. | Make a temporary mount of protozoa.   | 2 |
| 4. | Draw a well labelled sketch of the given system of the organism and explain to the examiner.                                    | 5 |
| 5. | Write down the theory and procedure of gel electrophoresis/ paper chromatography/thin layer chromatography/ SEM & TEM.          | 2 |
| 6. | Report  | 5 |

Viva-voce & Practical file.

**SEMESTER-II  
ZOOLOGY  
PRACTICAL-II (RELATED TO ZOO-II A and ZOO-II B)**

Time: 3hrs.

Marks: 30

**Important Note for Practical:-**

1. Candidates will be required to submit their original note books containing record of their laboratory work.
2. Wherever possible, students must be taken out for excursion to the field (Zoological gardens, sea shores, ponds and hill stations etc.) to study habitat and ecology of the animals.
3. As per the latest UGC guidelines (D.O.No. F. 14-6/2014(CPP-II) dated 01-08-2014) the dissections should not be conducted. The guidelines on this issue are available on the UGC website: [www.ugc.ac.in](http://www.ugc.ac.in)

**1. Classification up to orders with ecological notes and economic importance (if any) of the following animals :**

- A. Arthropoda : *Peripatus*, *Palaemon* (prawn), *Lobster*, *Cancer* (crab), *Sacculina*, *Eupagurus* (hermit Crab), *Lepas*, *Balanus*, Cyclops, *Daphnia*, *Lepisma*, *Periplaneta* (cockroach), *Schistocerca* (locust), *Poeciloceris* (ak grasshopper), *Gryllus* (cricket), *Mantis* (praying mantis), *Cicada*, *Forficula* (earwig), Dragonfly, Termite queen, Bug, Moth, Beetles, Polistes, (wasp), *Apis* (honey bee), *Bombyx*, *Pediculus* (body louse) Millipede and Centipede, *Palamnaeus* (scorpion), *Aranea* (spider) and *Limulus* (king Crab).
- B. Mollusca: *Anodonta*, *Mytilus*, *Ostrea*, *Cardium*, *Pholas*, *Solen* (razor fish), Pecten, *Haliotis*, *Patella*, *Aplysia*, *Doris*, *Limax*, *Loligo*, *Sepia*, *Octopus*, *Nautilus* shell (Complete and T.S.), *Chiton*, *Dentalium*.

C. Echinodermata: *Asterias*, *Echinus* *Ophiothrix*, *Antedon*.

D. Hemichordata: *Balanoglossus*.

**2. Study of the following permanent stained preparations:**

- A. Trachea and mouth parts of Insects
- B. Radula and osphradium of *Pila*
- C. T.S. Star fish (Arm).

3. **Demonstration** of digestive and nervous systems of *Periplaneta* (cockroach) with the help of charts/models/videos.

**4. Ecology:**

- A. Study of animal adaptations with the help of specimens, charts and models.
- B. Study of abiotic and biotic components of an ecosystem.

**C. Study of different types of nests of birds.**

D. Study and preparation of Zoogeographical charts.

## 5. Assignment

**Note:- Some changes can be made in the practicals depending on the availability of material.**

*Guidelines for conduct of practical Examination:-*

1. Identify and classify the specimens upto order. Write a note on their habit, habitat, special features and economic importance. 6
2. Draw a well labelled sketch of the given system of the animal & explain it to the examiner. 4
3. Identify the slides/models and give two reasons for identification. 4
4. Identify the adaptive feature/nest. 4
5. Mark the distribution of animals of a realm on the map. 4
6. Assignment 3
7. Viva-voce & Practical file. 5

## SEMESTER-III

### ESL 221 Environmental Studies (Compulsory)

**Time: 3 Hrs.**

**Max. Marks: 100**

#### **Teaching Methodologies**

The Core Module Syllabus for Environmental Studies includes class room teaching and field work. The syllabus is divided into 8 Units [Unit-1 to Unit-VII] covering 45 lectures + 5 hours for field work [Unit-VIII]. The first 7 Units will cover 45 lectures which are class room based to enhance knowledge skills and attitude to environment. Unit-VIII comprises of 5 hours field work to be submitted by each candidate to the Teacher in-charge for evaluation latest by 15 December, 2019.

**Exam Pattern:**            **End Semester Examination- 75 marks**  
                                 **Project Report/Field Study- 25 marks [based on submitted report]**  
                                 **Total Marks- 100**

**NOTE: Private Candidates may be exempted from Project Report (25 Marks) and Theory Paper (75 Marks) can be increased on *pro rata* basis for declaring their results.**

The structure of the question paper being:

#### **Part-A, Short answer pattern with inbuilt choice – 25 marks**

Attempt any five questions out of seven distributed equally from Unit-1 to Unit-VII. Each question carries 5 marks. Answer to each question should not exceed 2 pages.

#### **Part-B, Essay type with inbuilt choice – 50 marks**

Attempt any five questions out of eight distributed equally from Unit-1 to Unit-VII. Each question carries 10 marks. Answer to each question should not exceed 5 pages.

#### **Project Report / Internal Assessment:**

##### **Part-C, Field work – 25 marks [Field work equal to 5 lecture hours]**

The candidate will submit a hand written field work report showing photographs, sketches, observations, perspective of any topic related to Environment or Ecosystem. The exhaustive list for project report/area of study are given just for reference:

1. Visit to a local area to document environmental assets: River / Forest/ Grassland / Hill / Mountain / Water body / Pond / Lake / Solid Waste Disposal / Water Treatment Plant / Wastewater Treatment Facility etc.
2. Visit to a local polluted site – Urban / Rural / Industrial / Agricultural
3. Study of common plants, insects, birds
4. Study of tree in your areas with their botanical names and soil types
5. Study of birds and their nesting habits
6. Study of local pond in terms of wastewater inflow and water quality
7. Study of industrial units in your area. Name of industry, type of industry, Size (Large, Medium or small scale)
8. Study of common disease in the village and basic data from community health centre
9. Adopt any five young plants and photograph its growth
10. Analyze the Total dissolved solids of ground water samples in your area.
11. Study of Particulate Matter (PM<sub>2.5</sub> or PM<sub>10</sub>) data from Sameer website. Download from Play store.
12. Perspective on any field on Environmental Studies with secondary data taken from Central Pollution Control Board, State Pollution Control Board, State Science & Technology Council etc.

#### **UNIT-I**

##### **The multidisciplinary nature of environmental studies**

Definition, scope and importance, Need for public awareness

**(2 lectures)**

## UNIT-II

### **Natural Resources: Renewable and non-renewable resources:**

Natural resources and associated problems.

- a. Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
  - b. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
  - c. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
  - d. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
  - e. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
  - f. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conservation of natural resources.
  - Equitable use of resources for sustainable lifestyles.

**(8 Lectures)**

## UNIT-III

### **Ecosystems**

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)

**(6 Lectures)**

## UNIT-IV

### **Biodiversity and its conservation**

- Introduction – Definition: genetic, species and ecosystem diversity
- Biogeographical classification of India
- Value of biodiversity: consumptive use, productive use, social, ethical aesthetic and option values
- Biodiversity at global, national and local levels
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity

**(8 Lectures)**

## UNIT-V

### **Environmental Pollution**

Definition

- Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear pollution
- Solid waste management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides

**(8 Lectures)**

## UNIT-VI

### Social Issues and the Environment

- From unsustainable to sustainable development
- Urban problems and related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Environmental ethics: Issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation
- Consumerism and waste products
- Environmental Protection Act, 1986
- Air (Prevention and Control of Pollution) Act, 1981
- Water (Prevention and control of Pollution) Act, 1974
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation
- Public awareness

(7 Lectures)

## UNIT-VII

### Human Population and the Environment

- Population growth, variation among nations
- Population explosion – Family Welfare Programmes
- Environment and human health
- Human Rights
- Value Education
- HIV / AIDS
- Women and Child Welfare
- Role of Information Technology in Environment and Human Health
- Case Studies

(6 Lectures)

## UNIT-VIII

### Field Work

- Visit to a local area to document environmental assets river/forest/grassland/hill/mountain
- Visit to a local polluted site – Urban / Rural / Industrial / Agricultural
- Study of common plants, insects, birds
- Study of simple ecosystems-pond, river, hill slopes, etc

(Field work equal to 5 lecture hours)

### References:-

1. Bharucha, E. 2005. Textbook of Environmental Studies, Universities Press, Hyderabad.
2. Down to Earth, Centre for Science and Environment, New Delhi.
3. Heywood, V.H. & Waston, R.T. 1995. Global Biodiversity Assessment, Cambridge House, Delhi.
4. Joseph, K. & Nagendran, R. 2004. Essentials of Environmental Studies, Pearson Education (Singapore) Pte. Ltd., Delhi.
5. Kaushik, A. & Kaushik, C.P. 2004. Perspective in Environmental Studies, New Age International (P) Ltd, New Delhi.
6. Rajagopalan, R. 2011. Environmental Studies from Crisis to Cure. Oxford University Press, New Delhi.
7. Sharma, J. P., Sharma. N.K. & Yadav, N.S. 2005. Comprehensive Environmental Studies, Laxmi Publications, New Delhi.
8. Sharma, P. D. 2009. Ecology and Environment, Rastogi Publications, Meerut.
9. State of India's Environment 2018 by Centre for Sciences and Environment, New Delhi
10. Subramanian, V. 2002. A Text Book in Environmental Sciences, Narosa Publishing House, New Delhi.

**SEMESTER–III**  
**BOTANY Botany Practicals–III (Based on Papers–III A and III B)**

1. Study of any commonly occurring dicotyledonous plant (for example *Solanum nigrum* or *Kalanchoe*) to the body plan, organography and modular type of growth.
2. Life forms exhibited by flowering plants (by a visit to a forest or a garden, Study of treelike habit in cycads, bamboo, banana, traveller's tree (*Revenala madagascariensis*) and *Yucca* and comparison with true trees as exemplified by conifers and dicotyledons.
3. L.S. Shoot tip to study the cytohistological zonation and origin of leaf primordia.
4. Monopodial and sympodial types of branching in stems (especially rhizomes).
5. Anatomy of primary and secondary growth in monocots and dicots using free hand razor technique (*Solanum*, *Boerhavia*, *Helianthus*, *Mirabilis*, *Nyctanthus*, *Draceana*, *Maize*) hand sections (or prepared slides). Structure of secondary phloem and xylem. Growth rings in wood, Microscopic study of wood in T.S., T.L.S. and R.L.S.
6. Field study of diversity in leaf shape, size, thickness, surface properties. Internal structure of leaf. Structure and development of stomata (using epidermal peels of leaf).
7. Anatomy of the root. Primary and secondary structure.
8. Examination of a wide range of flowers available in the locality and methods of their pollination.
9. Structure of anther, microsporogenesis (using slides) and pollen grains (using wholemounts). Pollen viability using in vitro pollen germination.
10. Structure of ovule and embryo sac development using serial sections from permanent slides.
11. Nuclear and cellular endosperm. Embryo development in monocots and dicots (using permanent slides/dissections).
12. Simple experiments to show vegetative propagation (leaf cuttings in *Bryophyllum*, *Sansevieria*, *Begonia*; stem cuttings in *rose*, *Salix*, *money plant*, *Sugarcane* and *Bougainvillea*).
13. Germination of non-dormant and dormant seeds.

**Suggested Readings (for laboratory exercises):**

1. Bhojwani, S.S. and Bhatnagar, P. (2000). *The Embryology of Angiosperms* (4th revised and enlarged edition), Vikas Publishing House, New Delhi.
2. Mauseth, J.D. (1988). *Plant Anatomy*, The Benjamin/Cumminas Publishing Co., Inc., Mehlo Park, California, USA.
3. Raven, P.H., Evert, R.F. and Eichhorn, S.E. (1992). *Biology of Plants* (5th Edition). Worth Publishers, New York.
4. Steeves, T.A. and Sussex, I.M. (1989). *Patterns in Plant Development* (2nd Edition). Cambridge University Press, Cambrid.

## **SEMESTER-III**

### **PHILOSOPHY**

#### **DEDUCTIVE LOGIC AND APPLIED ETHICS (OPT. I)** **(Only for Regular Students)**

**Lectures to be delivered: 6+4=10 per week**

**Time: 3 Hours**

**Pass Marks: 35%**

**Marks: 100**

**Theory Marks: 80**

**Practical Marks: 20**

#### **Instructions for the Paper Setters:-**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

#### **SECTION–A**

1. Definition, Nature and Utility of Western Logic.
2. Laws of Thought: Identity, Contradiction, Excluded Middle, Law of Sufficient Reason and Characteristics.
3. Terms: Classification, Connotation and Denotation. Inverse Relation between Connotation and Denotation.

#### **SECTION–B**

4. Proposition: Classification of Propositions, Four-fold division of Propositions.
5. Immediate Inference: Square of Opposition of Proposition, Contradiction, Contrary, Sub-Contrary, Subalternation.
6. Mediate Inference: Categorical Syllogism, Rules of Validity, Figures and Moods.

#### **SECTION–C**

7. Applied Ethics: Nature, Scope and Uses.
8. De-ontological Approach to Moral Action: Immanuel Kant, Bhagavat Gita.
9. Teleological Approach to Moral Action: J.S. Mill, Bentham.

#### **SECTION–D**

10. Medical Ethics: Definition, Nature, Problems; Euthanasia.
11. Educational Ethics & Legal Ethics: Definition, Nature, Problems.
12. Business Ethics: Definition, Nature, Problems.



## SEMESTER-III

### ZOOLOGY

#### Practical-III (Related to ZOO-III A and ZOO-III B)

Time: 3hrs.

Marks: 30

#### Important Note for Practical:-

1. Candidates will be required to submit their original note books containing record of their laboratory work.
2. Wherever possible, students must be taken out for excursion to the field (Zoological gardens, sea shores, ponds and hill stations etc.) to study habitat and ecology of the animals.
3. As per the latest UGC guidelines (D.O.No. F. 14-6/2014(CPP-II) dated 01-08-2014) the dissections should not be conducted. The guidelines on this issue are available on the UGC website: [www.ugc.ac.in](http://www.ugc.ac.in)

#### I. Classification up to order level, except in case of Pisces and Aves where classification up to subclass level, habits, habitat, external characters and economic importance (if any) of the following animals is required :

**Urochordata** : *Herdmania, Molgula, Pyrosoma, Doliolum, Salpa & Oikopleura.*

**Cephalochordata** : *Amphioxus.* Study of the following prepared slides:

T.S. *Amphioxus* through various regions, Pharynx of *Amphioxus*

**Cyclostomata** : *Myxine, Petromyzon & Ammocoetes* Larva.

**Chondrichthyes** : *Zygaena* (hammer head shark), *Pristis* (saw fish), *Narcine* (electric ray), *Trygon, Rhinobatus and Chimaera* (rabbit fish).

**Actinoptergii** : *Polypterus, Acipenser, Lepidosteus, Muraena, Mystus, Catla, Hippocampus, Syngnathus, Exocoetus, Anabas, Diodon, Tetradon, Echeineis and Solea.*

**Dipneusti (Dipnoi)** : *Protopterus* (african lung fish)

**Amphibia** : *Uraeotyphlus, Necturus, Amphiuma, Amblystoma* and its Axolotl Larva, *Triton, Salamandra, Hyla, Rhycophorus*

**Reptilia** : *Hemidactylus, Calotes, Draco, Varanus, Phrynosoma, Chamaeleon, Typhlops, Python, Eryx, Ptyas, Bungarus, Naja, Hydrus, Vipera, Crocodilus, Gavialis, Chelone* (turtle) and *Testudo* (tortoise), Differences in nonpoisonous and poisonous snakes.

**Aves** : *Casuaris, Ardea, Anas, Milvus, Pavo, Eudynamics, Tyto* and *Alcedo.*

**Mammalia** : *Ornithorynchus, Echidna, Didelphis, Macropus, Loris, Macaca, Manis, Hystrix, Funambulus, Panthera, Canis, Herpestes, Capra, Pteropus.*

<b>II.</b>	Study of the following systems with the help of charts/models/videos:
<b><i>Herdmania</i></b>	: General anatomy
<b><i>Labeo</i></b>	: Digestive and reproductive systems, heart, afferent and branchial arteries, cranial nerves and internal ear.
<b>Chick</b>	: Digestive, arterial, venous and urino-genital systems.
<b>White Rat</b>	: Digestive, arterial, venous and urino-genital systems.

Study of permanent slides of whole mount of Pharynx of *Herdmania* and *Amphioxus*.  
Cycloid scales of *Labeo*, blood smear of mammal, Histology of rat/rabbit (compound tissues)

Demonstration of evolutionary phenomena like homology, analogy,  
mimicry, crypsis. Study of evolution of horse/elephant/man.

Study of fossils.

Assignment

**Note:- Some changes can be made in the practicals depending on the  
availability of material.**

**Guidelines for conduct of Practical Examination:**

1. Draw a labelled sketch of the system of the given animal & explain it to the Examiner. 4
2. Identify and classify the specimens upto order level. Write a short note on  
habitat, special features, feeding, habits and economic importance of the  
specimens. 8
3. Identify and write a note on the evolutionary phenomenon in the given specimen. 4
4. Identify the slides/specimens, give two reasons for identification. 5
5. Assignment 4
6. Viva-voce & Practical file. 5