

**Mahatma Gandhi University
B.Sc Botany Programme**

SEMESTER I

Course 1

BO1B01U

**Methodology and Perspectives of Science
&
An Introduction to the World of Plant Diversity**
(Theory 36 hours, Practical 36 hours) (Theory Credit 2, Practical credit 1)

Methodology and Perspectives of Science (Theory 18hours, Practical 18 hours)

Module 1. 8 hours

Introduction to science and scientific methods

- Introduction to science
- Steps in scientific methods
 - observation and thoughts
 - formulation of a hypothesis
 - designing of experiments
 - testing of hypothesis
 - formulation of theories
 - Revision of scientific theories with the advent of new technologies

Module 2. 10 hours

Experimentation in science

- Selection of a problem
- Searching the literature
- Selection of variables, study area, and a suitable design
- Necessity of units and dimensions
 - Units of length, volume, area, concentration, temperature, pressure
- Setting of hypothesis, Null- hypothesis and alternative hypothesis
- Need of control, treatments and replication
- Analysis, presentation and interpretation of data
- Testing of hypothesis, need of statistical tools (study of specific tools is not required)
- Examples of great experiments in life sciences

- An example of moving from a question to hypothesis and then to an experimental design
- Contributions and the great experiments of Louis Pasteur, and Robert Koch
- Ethics in science

Practical

18 hours

1. Design and perform a simple experiment to familiarize with the methodology of science
2. Select an important classical experiment and find out the different elements of scientific method
3. Prepare a biographical sketch of great scientists with special emphasis on the scientific methodology involved in their experiments
4. Prepare $\text{CuSO}_4 \cdot \text{H}_2\text{O}$ solution of different molarity using a stock solution
5. Determination of the area of different types of leaves using graph paper

An Introduction to the World of Plant Diversity (Theory 18 hours, Practical 18 hours)

Module 1

3 hours

- Plants, their uniqueness and importance as
 - Primary producers
 - Source of oxygen
 - Source of materials for food and shelter
 - Medicines and other compounds derived from plants
 - Source of fuel (fossil fuel, biofuel)
 - Recreational value
- (a brief account with examples alone is required)

Module 2.

3 hours

Unity of living organisms

Unity in,

- Cellular organization
- Cell structure
- Metabolism
- Genetics
- Cell division
- Sexual reproduction (Only a preliminary study about the unity of different live forms in the above mentioned aspects alone is required)

Module 3.

12 hours

1. Diversity of living organisms [No type study is expected]

- **Prokaryotes**

- Bacteria – general characteristics, variation in form (bacillus, coccus, vibrio, spirillum)
- Cyanobacteria / BGA (No type study is intended) – general characteristics, pigments in Cyanobacteria, variation in form

- **Eukaryotes**

- Eichler's Classification

- **Cryptogams**

-Algae:-

- General characteristics
- Diversity in thallus morphology (Unicellular, colonial, unbranched filamentous, branched filamentous)
- Diversity in pigments (Pigments characteristic of Chlorophyceae, Rhodophyceae and Phaeophyceae)

- Fungi

General characteristics

- Diversity in thallus morphology (unicellular forms, aseptate and septate hyphal forms)

- Lichens

General characteristics

- Diversity in thallus morphology (crustose, foliose and fruticose forms)

- Bryophytes

- General characteristics
- Diversity in thallus morphology
- Alternation of generation, prominence of gametophyte
- Concept of embryo

-Pteridophytes

- General characteristics
- Diversity in morphology
- Concept of vasculature (study of different types of steles is not required)
- Alternation of generation, prominence of sporophyte

-**Phanerogams**

-Gymnosperms

- General characteristics
- Diversity in morphology
- As the first plant group exhibiting seed habit, advantages of seed
- Special structures which contributed to the development of seed (ovule, integuments of ovule, endosperm)

-Angiosperms

- General characteristics
- Diversity in morphology (dicots, monocots, herbs, shrubs, trees, climbers, twiners, branched, unbranched)
- Concept of fruit, advantages of fruit
- Special structures which contributed to the development of fruit (ovary, placenta)

-Animals

- Major differences between plants and animals
(Detailed study of different classes not required)
- **Habitat Diversity** (Brief study only)
 - Aquatic:- Fresh water, marine, mangrove
 - Terrestrial:- Evergreen forest, deciduous forest, grass land
 - Epiphytic
- **Evolutionary trends in the plant world** (shift in habitat from aquatic to terrestrial, shift in prominence of gametophyte to sporophyte, shift from thalloid forms to differentiated forms, evolution of conducting tissue; tracheids to vessels, origin of seed and fruit)
- Interactions in the plant world. Examples of,
 - Plant – plant interactions (Brief account of Parasitic plants and epiphytes)
 - Plant – microbe interactions (Brief account of root nodules and Micorrhiza)
 - Plant – animal interactions (Brief account of Leaf and stem galls and mermicophylly)

Practical

18 hours

1. Collect, identify, record and submit 3 genera each from algae, fungi, bryophytes, pteridophytes, gymnosperms and angiosperms. Use appropriate preservation techniques.
2. Study and submit a report on any one of the interactions observed in the plant world
3. Conduct a field visit to any one of the ecosystems/ botanic gardens to experience the plant diversity. Submit a report with photographs.

4. From a lot of given materials identify a particular plant group
5. From a lot of given materials identify plants with vascular elements, plants which can produce seeds, fruits, embryos

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