Core I **Semester-I**

Microbiology and Phycology

Course Objectives:

- To introduce the diverse group of microorganisms and their habitat relationship.
- To learn the discovery, nature and multiplication of virus particles.
- To know the characteristics, growth and physiology of bacteria and their role in agriculture, health and industry.
- To learn the general characteristics and ecological distribution of bacteria, algae and cyanobacteria and their immense importance to the mankind.
- To have knowledge about the habitats, distribution and diversity of algae in the soil, freshwater and marine environments.

Course Outcomes

- The students learn about the diverse nature of microbes and their interaction with other organisms.
- The students certainly get the opportunities to learn the basics of the nature and impact of viruses.
- The students shall be able to understand the potential of various microbes and the approaches to use them for human welfare.
- The students would be able to identify the important microbes including bacteria, cyanobacteria, and algae available in local environments and understand their beneficial roles.
- The students shall learn about the immense potential the algal resources and understand the methods of cultivation and use of algae.

Unit-I:

Learning Outcome: The learners are able to identify diverse group of microorganisms, general features of viruses and their economic importance**.**

- The microbial world, microbial nutrition, growth and metabolism.
- Viruses**:** Discovery, nature, physicochemical and biological characteristics; classification (Baltimore), general structure with special reference to viroids and prions; replication (a general account), DNA virus (T-phage), lytic and lysogenic cycle; RNA virus (TMV). Economic importance of viruses. Vaccine production, role in research, medicine and diagnostics. Viral plant diseases- symptoms, effect and control

Unit–II:

Learning Outcome: The students understand the growth, physiology and economic importance of bacteria and cyanobacteria.

- Bacteria**: -** Discovery, general characteristics, types- archaebacteria, eubacteria, mycoplasma and spheroplasts, Cell structure, inclusions, nutrition, reproduction- vegetative, asexual and recombination (conjugation, transformation and transduction). Economic importance of bacteria with reference to their role in agriculture, medicine and industry.

- Cyanobacteria**:-** Ecology, occurrence, cell structure, heterocyst, reproduction, economic importance; role in biotechnology. Morphology and life-cycle of *Nostoc*. General characteristics of prochlorophyceae, Evolutionary significance of Prochloron.

Unit–III:

Learning Outcome: The students able to grasp the general characteristics, ecological distribution and economic importance of algae and Chlorophyta.

- **Algae:-** General characteristics; Ecology and distribution; range of thallus organization; Cell structure and components; cell wall, pigments, reserve food (of only groups represented in the syllabus), flagella; methods of reproduction. Classification; criteria, system of Fritsch, and evolutionary classification of Lee (only upto groups); Role of algae in the environment, agriculture, biotechnology and industry.
- **Chlorophyta:-** General characteristics, occurrence, range of thallus organization, cell structure and reproduction. Morphology and life-cycles of *Chlamydomonas*, *Volvox*, *Oedogonium* and *Coleochaete*.

Unit-IV:

Learning Outcome: The students will able to understand the general characteristics, ecological distribution and economic importance of algae and cyanobacteria.

- **Charophyta:-** General characteristics; occurrence, morphology, cell structure and life-cycle of *Chara*; evolutionary significance.
- **Xanthophyta:-** General characteristics; Occurrence, morphology and life- cycle of *Vaucheria*.
- **Phaeophyta:-**Characteristics, occurrence, cell structure and reproduction. Morphology and life-cycles of *Ectocarpus* and *Fucus*.
- **Rhodophyta:-**General characteristics, occurrence, cell structure and reproduction. Morphology and life-cycle of *Polysiphonia*.

Practicals:

1. Electron micrographs/Models of viruses –T-Phage and TMV, Line drawings/ Photographs of Lytic and Lysogenic Cycle.
2. Types of Bacteria to be observed from temporary/permanent slides/photographs.
3. Examination of bacteria from bacterial culture by Gram's staining method.
4. Electron micrographs of bacteria, binary fission, endospore, conjugation, root Nodule (live materials and photographs).
5. Bacterial growth measurement by turbidometry
6. Hemocytometry
7. Colony counting using colony counter

8. Phycology: - Study of vegetative and reproductive structures of *Nostoc*, *Chlamydomonas* (electron micrographs), Volvox*, Oedogonium, Coleochaete, Chara, Vaucheria, Ectocarpus, Fucus* and *Polysiphonia, Procholoron*, Diatoms through, temporary preparations and permanent slides

Text Books:

- ✓ *Singh, V., Pandey, P.C., and Jain, D.K. (2017). Microbiology and Phycology, Rastogi Publication, Meerut.*
- ✓ *Pandey BP (2022). Botany for B.Sc. Students (Archigoniates & Plant Architecture), S. Chand publication, New Delhi*
- ✓ *Dubey RC & Maheshwari DK (2021) A text book of Microbiology, S. Chand publication, New Delhi*
- ✓ *Pandey BP (2023). Botany for B.Sc. Students Semester I, NEP 2020; S. Chand publication, New Delhi*

Reference Books:

- ✓ *Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.*
- ✓ *Prescott, L.M., Harley J.P., Klein D. A. (2010). Microbiology, McGraw-Hill, India. 8th edition.*
- ✓ *Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi.*
- ✓ *Campbell, N.A., Reece J.B., Urry L.A., Cain M.L., Wasserman S.A. Minorsky P.V., Jackson R.B. (2008). Biology, Pearson Benjamin Cummings, USA. 8th edition.*
- ✓ *Pelczar, M.J., Chan, E.C.S., Krieg, N.R. (2011) Microbiology, 8th edition, Tata McGraw-Hill Co, New Delhi.*
- ✓ *Willey, Sherwood and Christopher. Laboratory exercises in Microbiology. McGraw- Hill, India. 9th edition.*
- ✓ *Vasistha B.R. (2017) Botany for Degree student, Algae, S. Chand Publication, New Delhi.*
- ✓ *Mishra B. K. (2018) Microbiology and Phycology, Kalyani Publishers, New Delhi.*