Course Code: ALS BOT DSC 01
Course Title: Microbial World and Plant Diversity
Discipline Specific Core Course (DSC)
Total Credits: 04 (Theory 02, Practical 02)
Total Lectures: Theory 30, Practical 60

Learning Objectives:

The Learning Objectives of this course are as follows:

- To make students aware about the diversity of microbes and plants.
- To study their evolutionary relationships.

Learning Outcomes:

The Learning Outcomes of this course are as follows:

By studying this course, students will be able to:

- gain the knowledge about the diversity of microbes and plants.
- general characteristics of various groups of plants.
- evolutionary relationships amongst them.
- basic principles and concepts of evolution that contribute to diversity.

Theory:

Unit 1. Origin of life: **Lectures: 02**

Principles and concepts of evolution and classification (up-to six kingdoms)

Unit 2. Bacteria: **Lectures: 03**

General characteristic features, cell structure, wall-less forms (L-forms and Mycoplasma), asexual reproduction and modes of gene transfer (conjugation, transformation and transduction), a brief introduction to Archaebacteria.

Unit 3. Viruses: **Lectures: 02**

General characteristic features, replication, RNA virus (structure of TMV), DNA virus (structure of T-phage), Lytic and Lysogenic life cycle (Lambda phage).

Unit 4. Algae: **Lectures: 03**

General characteristic features, Reproduction, Classification of Lee (only up to groups). A brief account of *Volvox* and *Polysiphonia*.

Unit 5. Fungi: **Lectures: 04**

General characteristic features, Reproduction, Classification (Webster and Weber, 2007), A brief account of *Rhizopus*, *Penicillium,* and *Agaricus*.

Unit 6. Bryophytes: **Lectures: 04**

General characteristic features and reproduction, adaptation to land habit, broad classification, Evolutionary trends in Bryophytes. Brief account of *Marchantia* and *Funaria*.

Unit 7. Pteridophytes: **Lectures: 04**

General characteristic features and reproduction, broad classification, Evolutionary trends in Pteridophytes, affinities with Bryophytes. A brief account of *Equisetum* and *Pteris*.

Unit 8. Gymnosperms: **Lectures: 04**

General characteristic features and reproduction, broad classification, evolutionary trends in Gymnosperms, affinities with Pteridophytes. A brief account of *Pinus*.

Unit 9. Angiosperms: **Lectures: 04**

General characteristic features and reproduction, concept of natural, artificial and phylogenetic system of classification, APG-IV (a brief reference), affinities with Gymnosperms.

Practical:

1. To study structure of TMV and Bacteriophage (electron micrographs/models).
2. To study Gram negative and positive bacteria through Gram's Staining Technique.
3. To study Bacteria through Electron Micrograph, Binary fission, Conjugation, Root nodules through digital resources /specimen.
4. To study morphology of *Volvox* and *Polysiphonia* through temporary preparations and slides.
5. To study *Rhizopus*, *Penicillium and Agaricus* through temporary preparations, specimens and slides.
6. To study *Marchantia* (morphology, WM of rhizoids and scales) and *Funaria* (morphology WM of rhizoids and leaf) through temporary preparations, specimens and slides
7. To study *Equisetum* (morphology, WM of spores) and *Pteris* (morphology, tease mount of sporangia and spores) through temporary preparations, specimens and slides.
8. To study *Pinus* (morphology of dwarf shoot, needle anatomy, male and female cones, WM pollen grains through temporary preparation/s, specimens and slides.

9. To study variation in leaf venations in dicots and monocots (at least two specimens each).
10. To study the types of inflorescence in angiosperms (through specimens).
11. To study the types of fruits in angiosperms (through specimens).

Suggested Readings:

1. Campbell, N.A., & Reece, J. B. (2008). *Biology* (8th ed.). Pearson Benjamin Cummings,
2. Evert, RF., & Eichhorn, S.E. (2012). *Raven Biology of Plants* (8th ed.). W.H. Freeman and Company.
3. Bhatnagar, S.P., & Moitra, A. (1996). *Gymnosperms*. New Age International (P) Ltd Publishers.
4. Kumar, H.D. (1999). *Introductory Phycology* (2nd ed.). Affiliated East-West. Press Pvt. Ltd.
5. Pelczar, M.J. (2001). *Microbiology* (5th ed.). Tata McGraw-Hill Co.
6. Puri, P. (1985). *Bryophytes*. Atma Ram and Sons.
7. Sethi, I.K., & Walia, S.K. (2018). *Text book of Fungi and Their Allies* (2nd Ed.). MedTech Publishers.
8. Tortora, G.J., Funke, B.R., & Case. C.L. (2007). *Microbiology*. Pearson Benjamin Cummings.
9. Vashishta, P.C., Sinha, A.K., & Kumar, A. (2010). *Pteridophyta*. S. Chand & Co Ltd.
10. Singh, G. (2019). *Plant Systematics- An Integrated Approach* (4^{th} ed.). CRC Press, Taylor and Francis Group.
11. Blackmore, S., & Crane, P. (2019). *How Plants Work – Form, Diversity, Survival* (Illustrated ed.). Princeton University Press.
12. Ingrouille, M., & Eddie, B. (2006). *Plants: Evolution and Diversity.* Cambridge University Press.

Additional Readings:

1. Parihar, N.S. (1991). *An Introduction to Embryophyta,* Pteridophytes (Vol. II). Central Book Depot.
2. Singh, V., Pandey, P.C., & Jain, D.K. (2001). *A Text Book of Botany*. Rastogi and Co.
3. Webster, J., & Weber, R. (2007). *Introduction to Fungi*. Cambridge University Press.

Keywords:

Evolution, Bacteria, Viruses, Bryophytes, Pteridophytes, Gymnosperms, Angiosperms.

Teaching Learning Process:

Learning material will be delivered through a series of lectures with conventional chalk and talk method, supported by power point presentations, charts, flow charts and video education resources. Emphasis would be on an interactive classroom environment so as to encourage students to ask questions and clarify their doubts. Students would also be encouraged to refer to the referenced books in the library to inculcate reading habits for better understanding of the subject.

Assessment Methods:

Performance of the students will be evaluated on the basis of regular class test, presentations and assignments as a part of internal assessment during the course, as per the curriculum. There would be a continuous evaluation of laboratory exercises and the record files. End semester university examination will be held for both theory and practical components. In practical, assessment will be done based on continuous evaluation and performance in the practical examination.