

SEMESTER - 1st

MAJOR COURSE

BOT122J BOTANY-1: BIODIVERSITY (MICROBES, ALGAE, FUNGI AND ARCHEGONIATE)

(CREDITS: THEORY - 4, PRACTICALS -2)

Objectives: To impart understanding to students about economic importance and diversity of viruses, bacteria, fungi, algae, bryophytes, pteridophytes and gymnosperms and to acquaint them about the classification, structure, morphology and reproduction of viruses, bacteria, fungi, algae, bryophytes, pteridophytes and gymnosperms.

THEORY (4 CREDITS)

UNIT I: MICROBES AND FUNGI

VIRUSES: Discovery, general structure, replication, DNA virus (T-phage); lytic and lysogenic cycle, RNA virus (TMV).

BACTERIA: General characteristics and cell structure; reproduction - vegetative, asexual and recombination (conjugation, transformation and transduction); economic importance.

FUNGI: General characteristics, classification (Alexopolous, Mims & Blackwell), cell wall composition, nutrition and reproduction; life cycle of *Rhizopus* (Zygomycota), *Venturia* (Ascomycota), *Agaricus* (Basidiomycota).

SYMBIOTIC ASSOCIATIONS: Lichens and Mycorrhiza - general account and significance.

UNIT II: ALGAE

General characteristics, classification of algae (Round 1965), criteria for algal classification; range of thallus organization; morphology, reproduction and life cycle of *Nostoc*, *Chlamydomonas*, *Oedogonium*, *Vaucheria*, *Ectocarpus*, *Batrachospermum*; economic importance of algae.

UNIT III: BRYOPHYTES

ARCHEGONIATE - General characteristics, adaptations to land habit.

BRYOPHYTES - General characteristics, Proskauer's classification (upto family); morphology, anatomy and reproduction (excluding developmental details) of *Marchantia* and *Funaria*; Evolution of sporophyte; apogamy and apospory; alternation of generation; economic importance of bryophytes.

UNIT IV: PTERIDOPHYTES AND GYMNOSPERMS

PTERIDOPHYTES - General characteristics; classification of pteridophytes (Sporne 1965); Early land plants (*Rhynia*); morphology, anatomy and reproduction (excluding developmental details) of *Equisetum* and *Dryopteris*; heterospory and origin of seed habit; evolution of stellar systems in pteridophytes.

GYMNOSPERMS - General characteristics, classification - Christenhusz et al. 2011 (upto family); morphology, anatomy and reproduction (excluding developmental details) of *Cycas* and *Pinus*; economic importance of gymnosperms.

PRACTICAL EXERCISES (2 CREDITS)

- i. Models / photographs of viruses - T-Phage and TMV, drawing / photograph of lytic and lysogenic Cycle.
- ii. Types of bacteria from temporary/permanent slides/photographs; Gram staining

- iii. Study of vegetative and reproductive structures of *Nostoc*, *Chlamydomonas*, *Oedogonium*, *Vaucheria*, *Ectocarpus* and *Batrachospermum* through temporary preparations and permanent slides.
- iv. *Rhizopus* and *Venturia*: Asexual stages from temporary mounts and sexual structures through permanent slides.
- v. *Agaricus*: Specimens of button stage and full-grown mushroom; sectioning of gills of *Agaricus*.
- vi. Study of growth forms of lichens (crustose, foliose and fruticose)
- vii. *Marchantia*- morphology of thallus, w.m. rhizoids and scales, v.s. thallus through gemma cup, w.m. gemmae (all temporary slides), v.s. antheridiophore, archegoniophore, l.s. sporophyte (all permanent slides).
- viii. *Funaria*- morphology, w.m. leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads, l.s. capsule and protonema.
- ix. *Selaginella*- morphology, w.m. leaf with ligule, t.s. stem, w.m. strobilus, w.m. microsporophyll and megasporophyll (temporary slides), l.s. strobilus (permanent slide).
- x. *Equisetum*- morphology, t.s. internode, l.s. strobilus, t.s. strobilus, w.m. sporangiophore, w.m. spores (wet and dry - temporary slides); t.s. rhizome (permanent slide).
- xi. *Dryopteris*- morphology, t.s. rachis, v.s. sporophyll, w.m. sporangium, w.m. spores (temporary slides), t.s. rhizome, w.m. prothallus with sex organs and young sporophyte (permanent slide).
- xii. *Cycas*- morphology (coralloid roots, bulbil, leaf), t.s. coralloid root, t.s. rachis, v.s. leaflet, v.s. microsporophyll, w.m. spores (temporary slides), l.s. ovule, t.s. root (permanent slide).
- xiii. *Pinus*- morphology (long and dwarf shoots, w.m. dwarf shoot, male and female), w.m. dwarf shoot, t.s. needle, t.s. stem, l.s./t.s. male cone, w.m. microsporophyll, w.m. microspores (temporary slides), l.s. female cone, t.l.s. & r.l.s. stem (permanent slide).

SUGGESTED READINGS

1. Alexopoulos, C.J. and Mims, C.W. 2002. Introductory Mycology. 5th edition. John Wiley and Sons, New York.
2. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition.
3. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
4. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.
5. Kumar, H.D. 1999. Introductory Phycology. East-west Press Ltd., New Delhi.
6. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.
7. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R., (2005). Biology. Tata McGraw Hill, Delhi, India.
8. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
9. Singh, R.S. 1990. Principles of Plant Pathology. Oxford and IBH Publishers, New Delhi
10. Singh, V., Pande, P. C. and Jain, D. K. 2010. Diversity of Microbes and Cryptogams. Rastogi Publications, Meerut, India.
11. Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition.
12. Vashishta, B.R., Sinha, A.K. and Singh, V.P. 2008. Botany for Degree Students- Algae. S. Chand and Company Pvt. Ltd., New Delhi.
13. Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi.