

GENERIC ELECTIVE COURSES

GE-1A: INDUSTRIAL & ENVIRONMENTAL MICROBIOLOGY

(Credits-6: Theory-4, Practical-2)-Max. Marks: 100

THEORY (Each class 1 hr.): Marks-70

PRACTICAL (Each class 2 hrs.): Marks-30

Lectures: 60 (40 Theory + 20 Practical classes)

UNIT-I: Microbes : Viruses Discovery, general structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance; Bacteria Discovery, General characteristics and cell structure; Reproduction vegetative, asexual and recombination (conjugation, transformation and transduction); Economic importance. (8 lectures)

UNIT-II: Algae: General characteristics; Ecology and distribution; Range of thallus organization and reproduction; Classification of algae; Morphology and lifecycles of the following: Nostoc, Chlamydomonas, Oedogonium, Vaucheria, Fucus, Polysiphonia. Economic importance of algae. (10 lectures)

Fungi : Introduction- General characteristics, ecology and significance, range of thallus organization, cell wall composition, nutrition, reproduction and classification; True Fungi- General characteristics, ecology and significance, life cycle of Rhizopus (Zygomycota) Penicillium, Alternaria (Ascomycota), Puccinia, Agaricus (Basidiomycota); Symbiotic Associations-Lichens: (6 lectures)

UNIT-III: Introduction to Archegoniate : Unifying features of archegoniates, Transition to land habit, Alternation of generations. (2 lectures)

Bryophytes : General characteristics, adaptations to land habit, Classification, Range of thallus organization. Classification (up to family), morphology, anatomy and reproduction of Marchantia and Funaria. (Developmental details not to be included). Ecology and economic importance of bryophytes with special mention of Sphagnum. (6 lectures)

UNIT-IV: Pteridophytes : General characteristics, classification, Early land plants (Cooksonia and Rhynia). Classification (up to family), morphology, anatomy and reproduction of Selaginella, Equisetum and Pteris. (Developmental details not to be included). Heterospory and seed habit, stellar evolution. Ecological and economical importance of Pteridophytes. (5 lectures)

UNIT-V: Gymnosperms: General characteristics, classification. Classification (up to family), morphology, anatomy and reproduction of Cycas and Pinus. (Developmental details not to be included). Ecological and economical importance. (6 lectures)

PRACTICAL

1. EMs/Models of viruses T-Phage and TMV, Line drawing/Photograph of Lytic and Lysogenic Cycle.
2. Types of Bacteria from temporary/permanent slides/photographs; EM bacterium; Binary Fission; Conjugation; Structure of root nodule.
3. Gram staining.
4. Study of vegetative and reproductive structures of Nostoc, Chlamydomonas (electron micrographs), Oedogonium, Vaucheria, Fucus* and Polysiphonia through temporary preparations and permanent slides. (*: Fucus - Specimen and permanent slides)
5. Rhizopus and Penicillium: Asexual stage from temporary mounts and sexual structures through permanent slides.
6. Alternaria: Specimens/photographs and tease mounts.

7. Puccinia: Herbarium specimens of Black Stem Rust of Wheat and infected Barberryleaves; section/tease mounts of spores on Wheat and permanent slides of both the hosts.
8. Agaricus: Specimens of button stage and full grown mushroom; Sectioning of gills of Agaricus.
9. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose)
10. Mycorrhiza: ecto mycorrhiza and endo mycorrhiza (Photographs)
11. 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).
12. Funaria- morphology, w.m. leaf, rhizoids, operculum, peristome, annulus, spores(temporary slides); permanent slides showing antheridial and archegonial heads, l.s. capsule and protonema.
13. 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).
14. 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).
15. Pteris- 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).
16. Cycas- morphology (coralloid roots, bulbil, leaf), t.s. coralloid root, t.s. rachis, v.s. leaf, v.s. microsporophyll, w.m. spores (temporary slides), l.s. ovule, t.s. root (permanent slide).
17. 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. Kumar, H.D. (1999). Introductory Phycology. Allied East-West. Press Pvt. Ltd. Delhi. 2nd edition.
2. Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition.
3. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
4. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition.
5. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R., (2005). Biology. Tata McGraw Hill, Delhi, India.
6. Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India.
7. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
8. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.

GE-4B: BOTANY & PLANT BIO-TECHNOLOGY

(Credits-6: Theory-4, Practical-2)-Max. Marks: 100

THEORY (Each class 1 hr.): Marks-70

PRACTICAL (Each class 2 hrs.): Marks-30

Lectures: 60 (40 Theory + 20 Practical classes)

UNIT-I: Origin of Cultivated Plants: Concept of centres of origin, their importance with reference to Vavilovs work. (3 lectures)

UNIT-II: Cereals: Wheat -Origin, morphology, uses 3 lectures Legumes : General account with special reference to Gram and soybean (4 lectures)

UNIT-III: Spices : General account with special reference to clove and black pepper (Botanical name, family, part used, morphology and uses) (4 lectures)

Beverages: Tea (morphology, processing, uses) (3 lectures)

UNIT-IV: Oils and Fats : General description with special reference to groundnut 3 lectures Fibre Yielding Plants: General description with special reference to Cotton (Botanical name, family, part used, morphology and uses) (3 lectures)

UNIT-V: Introduction to biotechnology (2 lectures)

Plant tissue culture: Micropropagation ; haploid production through androgenesis and gynogenesis; brief account of embryo and endosperm culture with their applications, Gene cloning by recombinant DNA technology, transgenic plants. (6 lectures)

Molecular Techniques: Blotting techniques: Northern, Southern and Western Blotting, DNA Fingerprinting; Molecular DNA markers i.e. RAPD, RFLP, SNPs; DNA sequencing, PCR and Reverse Transcriptase-PCR. Hybridoma and monoclonal antibodies, ELISA and Immunodetection. Molecular diagnosis of human disease, Human gene Therapy. (9 lectures)

PRACTICAL

1. Study of economically important plants : Wheat, Gram, Soybean, Black pepper, Clove Tea, Cotton, Groundnut through specimens, sections and microchemical tests
2. Familiarization with basic equipments in tissue culture.
3. Study through photographs: Anther culture, somatic embryogenesis, endosperm and embryo culture; micropropagation.
4. Study of molecular techniques: PCR, Blotting techniques, AGE and PAGE.

Suggested Readings:

1. Kochhar, S.L. (2011). Economic Botany in the Tropics, MacMillan Publishers India Ltd., New Delhi. 4th edition.
2. Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
3. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.