

# MOHANLAL SUKHADIA UNIVERSITY, UDAIPUR

## M. Sc. BOTANY SEMESTER –I

### Core course 1: *MIBOT01-CT01*

#### Paper-I: *Biology and Diversity of Plants (Microbes, Algae and Fungi)*

##### Unit-I Credit hours: 12

**Archaeobacteria and Eubacteria:** General characters, distribution, ultra-structure, nutrition, multiplication, biology, economic and evolutionary importance. Methods of genetic recombination and their significance. Isolation, culture and identification of bacteria.

##### Unit-II Credit hours: 12

**Viruses:** Physical and chemical characteristics, ultra-structure, multiplication, isolation and purification and economic importance. Plant virus transmission.

**Mycoplasma, phytoplasma, L-forms, viroids, rickettsias, spiroplasma and prions:** A general account, economic and evolutionary importance.

##### Unit –III Credit hours: 12

**Algae:** General account, thallus organisation, cell structure, reproduction, life cycle pattern, classification schemes. Salient features of Cyanophyta, Chlorophyta, Charophyta, Xanthophyta, Bacillariophyta, Phaeophyta and Rhodophyta.

##### Unit-IV Credit hours: 12

**Algae:** Salient features of Prochlorophyceae, Glaucophyceae, Eustigmatophyceae. Economic and evolutionary importance of algae.

**Fungi:** General characters, life cycle patterns, ultra-structure, mycelial growth, cell composition, nutrition (necrotrophs, biotrophs and symbionts), methods of reproduction. Recent trends in classification and phylogenetic relationship among fungal groups.

##### Unit-V Credit hours: 12

**Fungi:** General account of morphology, reproduction, life cycle and economic importance of Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina and Fungi *imperfecti*. Economic importance of fungi. Heterothallism, Heterokaryosis and Parasexuality in fungi.

**Fungal associations:** Mycorrhizae and Lichens; General account of morphology, reproduction, life cycle and significance.

### **Practicals:**

1. Isolation culture and identification of bacteria from various sources.
2. Identification of cultured bacteria using Gram's stain.
3. Identification of cyanobacteria and study of heterocyst.
4. Microscopic preparations and study of following algal materials: *Nostoc*, *Oscillatoria*, *Anabaena*, *Microcystis*, *Spirulina*, *Chlamydomonas*, *Volvox*, *Coleochaete*, *Hydrodictyon*, *Ulva*, *Cladophora*, *Pithophora*, *Oedogonium*, *Vaucheria*, *Chara*, *Ectocarpus*, *Sargassum*, *Batrachospermum*, *Polysiphonia*, Diatoms- Available genera.
5. Isolation and establishment of axenic algal culture
6. Study and identification of following fungal genera: *Synchytrium*, *Phytophthora*, *Peronospora*, *Mucor*, *Penicillium*, *Erysiphe*, *Claviceps*, *Agaricus*, *Puccinia*, *Uromyces*, *Melampsora*, *Sphacelotheca*.
7. Isolation and identification of mycorrhizae associated with various plant species.
8. Study of lichens
9. Local field trip

### **Reference Books:**

1. Bold H. C and Wynne M.J (1975). Introduction to the Algae: Structure and Reproduction Prentice Hall Biological Science Series.
2. Chapman V.J and Chapman D.J (1973). The Algae. Macmillan and company, New York.
3. Fritsch F.E (1945). The Structure and Reproduction of the Algae Volume I and II, Cambridge University Press.
4. Kumar H.D. 1988. Introductory Phycology. Affiliated East-West Press Ltd., New Delhi.
5. Morris I. 1986. An Introduction to the Algae. Cambridge University Press, U.K.
6. Round F.E. 1986. The Biology of Algae. Cambridge University Press, Cambridge.
7. Vijayraghavan M.R and Bela Bhatia (1997), Brown Algae: Structure, Ultrastructure and Reproduction, APH publishing Corporations, New Delhi.

8. Vijayraghavan M.R and Bela Bhatia (1997), Red Algae: Structure,Ultrastructure and Reproduction, APH publishing Corporations, New Delhi.
9. Alexopoulos, C. J., Mims, C. W. and Blackwel, M., Introductory Mycology, John Wiley & Sons Inc. Mandahar, C. L. Introduction to Plant Viruses. Chand & Co. Ltd., Delhi. Mehrotra, R. S. and Aneja, R. S. An Introduction to Mycology. New Age Intermediate Press.
10. Manual of Microbiology: Tools and Techniques; Kanika Sharma. Ane books. New Delhi. 2007
11. Textbook of Microbiology; Kanika Sharma. Ane books. New Delhi. 2011

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**M. Sc. BOTANY SEMESTER –I**

**Core course 2: M1BOT02-CT02**

**Paper II: *Biology and Diversity of Archegoniate***

**Unit –I      Credit hours: 12**

**Bryophytes:** Origin of Bryophytes. General characters and classification. Comparative study of structure, reproduction and life cycle of Hepaticopsida, Anthocerotopsida and Bryopsida. Evolution of gametophyte and sporophyte.

**Unit –II      Credit hours: 12**

**Bryophytes:** General characters, structure, reproduction, interrelationships of Bryophytes with special reference *Sphaerocarpos, Asterella, Calobryum, Notothylas*.

**Pteridophyta:** Evolution of stelar system; Evolution of Prothallus; soral evolution; Heterospory and seed habit; Cytological evolution of ferns; Apogamy and Apospory. Telome theory.

**Unit –III      Credit hours: 12**

**Pteridophyta:** General account of present and past distribution with special reference to India. Study of structure, reproduction, evolution, classification and inter-relationships of the Pteridophyta with special reference to Rhyniophytosida, Psilotopsida, Lycopsida, Sphenopsida, Pteropsida.

**Unit –IV      Credit hours: 12**

**Palaeobotany:** Geological time scale, types and nomenclature of fossils, fossilization, methods of study of fossils. Study of fossil archegoniates.

**Gymnosperms:** General account of present and past distribution of gymnosperms with special reference to India. Economic importance of gymnosperms, phylogeny and relationships of the main groups of gymnosperms.

**Unit –V      Credit hours: 12**

**Gymnosperms:** Study of structure, reproduction, evolution, classification, life history with special reference to Cycadopsida, Coniferopsida, Gnetopsida. Evolution of the female strobilus in Coniferales.

## Practicals:

- Study of external and internal morphology and microscopic preparations of following Bryophytes: *Marchantia*, *Plagiochasma*, *Astellia*, *Targionia*, *Pellia*, *Porella*, *Anthoceros*, *Notothylus*, *Sphagnum*, *Funaria*, *Rhodobryum* and *Polytrichum*.
- Study of temporary, double stained microscopic preparations of Root/ stem/ rhizome/ petiole/ reproductive parts of following pteridophytes:
- *Psilotum*, *Lycopodium*, *Selaginella*, *Isoetes*, *Equisetum*, *Ophioglossum*, *Osmunda*, *Lygodium*, *Gleichenia*, *Cyathea*, *Dryopteris*, *Pteris*, *Actiniopteris*, *Adiantum*, *Marsilea*, *Salvinia* and *Azolla*.
- Permanent double stained microscopic preparations of T.S., T.L.S. and R.L.S. of stem of *Ginkgo*, *Pinus*, *Biota*, *Araucaria*, *Taxus*, *Taxodium*, *Agathis*, *Picea*, *Cephalotaxus*, *Cedrus*, *Podocarpus*, *Abies*, *Cupressus*, *Juniperus*, *Gnetum*, *Ephedra*
- T.S. Leaflet and Rachis of *Cycas* and *Zamia* and needle of *Pinus*.
- T.S. of coralloid root of *Cycas*.
- Microscopic preparations of male cone of *Pinus* and male and female cones of *Ephedra*.
- Study of male cone and megasporophyll of *Cycas*.
- Study of fossil slides and specimens.
- Local field trip

## Reference books

1. Chandrakant, Pathak (2003). Bryophyta, Dominant Publishers and Distributors, New Delhi.
2. Parihar N.S. 1991. Bryophyta. Central Book Depot, Allahabad.
3. Puri P. 1980. Bryophytes. Atma Ram and Sons, Delhi.
4. Rashid A (1998). An introduction to Bryophyta. Vikas Publishing House Pvt. Ltd, New Delhi.
5. Bhatnagar S.P and Moitra Alok 1996. Gymnosperms. New Age International Pvt. Ltd. Publishers, New Delhi, 470 pp.
6. Bierhorst D.W. 1971. Morphology of Vascular Plants. New York and London.
7. Biswas C and Johari B.M 2004. The Gymnosperms Narosa Publishing House, New Delhi. 497 pp.
8. Parihar N.S. 1996. Biology and Morphology of Pteridophytes. Central Book Depot, Allahabad.
9. Stewart W.N. and Rathwell G.W. 1993. Paleobotany and the Evolution of Plants. Cambridge University Press. Cambridge.

# MOHANLAL SUKHADIA UNIVERSITY, UDAIPUR

## M. Sc. BOTANY SEMESTER –I

### Core course 3: M1BOT03-CT03

#### Paper III: *Cell Biology and Biochemistry*

##### Unit-I            Credit hours: 12

**Cell:** Types, Intracellular compartments; Signal hypothesis, protein sorting to mitochondria and chloroplasts. Structure and functions of: cellular membranes, cell wall and cell organelles (nucleus, mitochondria, chloroplasts, Golgi apparatus, lysosomes, endoplasmic reticulum, vacuoles, ribosomes, and cytoskeleton). Synthetic cell and recent developments. Cell division: mitosis and meiosis.

##### Unit-II            Credit hours: 12

**Chromosomes:** Structure of chromatin and chromosomes, unique and repetitive DNA, heterochromatin, euchromatin, Nucleosome structure, DNA scaffolds and loops. Types, occurrence, organization and biological significance of Lampbrush and Polytene chromosomes, Supernumerary chromosomes, Structural and numerical alterations in chromosomes: duplication, deficiency, inversion, translocation heterozygotes, Haploids, aneuploids and euploids; C-value and C-value paradox, Cot curve and its significance.

##### Unit-III            Credit hours: 12

**Bioenergetics:** Principles of the thermodynamics, Gibb's free energy and chemical potential, redox potential. Types of Phosphorylations, structure and functions of Energy carriers (ATP, GTP, NADP, FADH)

**Fats and Lipids:** Fatty acids and fatty oils, Structure and function of lipids, classification of lipids, fatty acids and their biosynthesis.

##### Unit-IV            Credit hours: 12

**Carbohydrates:** Classification, structure, properties. Biosynthesis of starch and sucrose.

**Enzymes:** General characters, nomenclature and classification, Mode of enzyme action, Michaelis – Menton equation and its significance. Regulation of enzymes, allosteric modulation, enzyme inhibition, coenzymes, isoenzymes, abzymes. Factors effecting enzyme activity.

##### Unit-V            Credit hours: 12

**Amino acids:** Structure, Types, Properties, Stereo-isomers, Functions, Amino Acids as Precursors of Biomolecules. General Biosynthetic pathways of amino acids: Reductive

amination and transamination, GS-GOGAT pathway. General account of regulation of amino acid biosynthesis

**Proteins:** Types, Properties, Structure, function, Cellular localization, Reverse turn and Ramchandran Plot.

**Practicals:**

1. General study of chromosomes: Mitosis: Onion, Meiosis: Onion.
2. Meiotic irregularity in *Rhoeo discolor*.
3. Study of Salivary gland chromosome in *Chironomas*.
4. Ultrastructure of cells, cell organelles (study through microphotographs)
5. Estimation of total fats in fatty seeds.
6. Preparation of standard curve of proteins (BSA)
7. Estimation of protein content in extracts of plant material by Bradford's method.
6. Determination of catalase activity
8. Demonstration of polyphenoloxidase activity.
9. Determination of saponification value of fats and oils

**Reference Books:**

1. G. Karp, 2015. Cell and Molecular Biology, John Wiley & Sans, Inc.
2. EDP De Robertis, 1987. Cell and Molecular Biology, Zea and Febiger.
3. H. Lodish, A. Berk, P. Matsudaira, C.A. Kaiser etc., 2009. Molecular Cell Biology, Scientific American Books.
4. Biochemistry; Voet and Voet, John Wiley & Sons, Inc., New York, USA.1992.
5. Biochemistry & Molecular Biology of Plants; Eds: Bob Buchanan, Wilhelm Gruissem, Russell Jones (Editor) Wiley; 1st. edition. 2002.
6. Biochemistry. Lubert Stryer, Jeremy M. Berg, John L. Tymoczko. W. H.Freeman and Co. 5th edition. 2002
7. Biochemistry; The molecular basis of cell structure and function. A. L. Lehninger. Worth Publishers. 1982.

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**M. Sc. BOTANY SEMESTER –I**

**Core course 4: M1BOT04-CT04**

**Paper IV: *Plant Ecology and Biodiversity Conservation***

**Unit-I            Credit hours: 12**

**Ecosystem:** Ecosystem structure and function, Ecosystem stability; concept of resistance and resilience, Ecological energetic; energy flow through ecosystem. Global biogeochemical cycles of C, N, P and S, Principles of limiting factor.

**Unit-II            Credit hours: 12**

**Community:** biological and physical structure, organismal and individualistic model of community. Raunkiaer's Life form. Edges and ecotones. Succession; Concept, models and mechanisms. concept of niche, species coexistence

**Unit-III            Credit hours: 12**

**Population:** Properties of populations; birth rate, death rate, survivorship curves, population growth, Logistic model, carrying capacity, population pyramids, r- and k-strategies, intraspecific population regulation, interspecific competition; Lotka-Volterra model, type of interactions, Concept of Population Genetics (Hardy-Weinberg principle)

**Unit-IV            Credit hours: 12**

**Pollution:** Environmental pollutions, global environmental changes; green house gases, consequences of climate change, carbon foot print, carbon credits, carbon sequestration, Clean Development mechanism (CDM), Sustainability; global carrying capacity, phytoremediation, plant indicator

**Unit-V            Credit hours: 12**

**Phytogeography:** Major biomes of the world with special reference to desert and grassland; phytogeographical regions of India.



**Plant Biodiversity:** Concept of Biodiversity, types of biodiversity, biodiversity characteristics of India, measurement of biodiversity, IUCN categories of threat. Concept of Hotspots. Strategies for conservation – *In situ* and *Ex situ* conservation. International efforts and peoples participation for conservation

**Practicals:**

1. Determination of minimum size of quadrat of the grassland ecosystem.
2. Determination of minimum number of quadrats required for grasslands.
3. Determination of frequency, density, abundance and cover
4. Determination of Important Value Index (IVI)
5. Measurement of biodiversity using diversity indices.
6. Determination of leaf area index
7. Analysis of soil texture, moisture content, pH and water holding capacity
8. Water analysis for Hardness, carbonate, bicarbonate and chloride.
9. Estimation of dissolved oxygen content in eutrophic and oligotrophic water samples by Winkler's method.
10. Local field trip

**Reference books:**

- Aery, N.C. 2010. Manual of Environmental Analysis, Ane Books Pvt. Ltd., New Delhi.
- Kormondy, E.J. 1996. Concepts of Ecology. PrenticeHall India Pvt.Ltd., New Delhi.
- Odum, E.P. 1983. Basic Ecology. Saunders, Philadelphia.
- Smith, R.L. and Smith T.M. 1998. Elements of Ecology. Benjamin/Cummings Publication.
- Townsend, C.R., Begon, M., Harper, J.L. 2007. Essentials of Ecology. Blackwell Publishing.
- Heywood, V. (ed) 1995. Global Biodiversity Assessment. United Nations Environment Programme. Cambridge University Press, Cambridge, U.K.
- Katewa, S.S. & Jain Anita. Ethnobotany, Phytogeography, Plant Resources Utilization and conservation. Apex Publishing House, Jaipur. 2007.
- Swaminathan, M.N. & Jain, R.S. Biodiversity: Implications for global security, Macmillan, India. 1982.