

BOARD OF STUDIES IN M.Sc. BOTANY
2022-2023

DEPARTMENT OF BOTANY

SYLLABUS FOR M.Sc. BOTANY



PITHAPUR RAJAH'S GOVERNMENT COLLEGE
Autonomous and Accredited with 'A' Grade by NAAC (3.17 CGPA)
KAKINADA – 533 001, Kakinada Dist., ANDHRA PRADESH

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
M.Sc. – BOTANY, SEMESTER – I,
PAPER CODE: 101: BASIC CONCEPTS OF VIRUSES, BACTERIA, FUNGI AND
LICHENS

UNIT-I: VIROLOGY

- 1) Historical events in development of Virology; shapes, symmetry of viruses; ultra-structure and chemistry of viruses Corona & Pox virus; Baltimore classification of viruses;
- 2) Replication of Retroviruses and transmission of plant viruses
- 3) Plant disease symptoms due to viral particles
- 4) Prions, Viroids and Virusoids

UNIT – II: SPECIAL BACTERIA & EUBACTERIA

- 1) General characteristics of Mycoplasma
- 2) General characteristics of Bacteria-positive and negative types; cell wall biogenesis, Nutrition in Bacteria
- 3) Genetic recombination in Bacteria (Transformation, Transduction and Conjugation)
- 4) Economic importance of Bacteria in agriculture, pharmaceutical and food

UNIT –III: FUNGI

- 1) General characteristics of Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina, Deuteromycotina.
- 2) Ainsworth classification
- 3) Ultra structure of fungal cell
- 4) Nutrition of fungi—saprophytic, bio trophic and symbiotic

UNIT – IV: LICHENS

- 1) Economic importance of fungi
- 2) Mushroom cultivation-- Button mushroom
- 3) Cultivation of Morchella
- 4) Lichens - Types, ultra structure, reproduction, ecological and economic value

PAPER CODE: 101: BASIC CONCEPTS OF VIRUSES, BACTERIA, FUNGI AND LICHENS

SUGGESTED LABORATORY EXERCISES

- 1) Structure of Viruses using ultra microphotographs (TEM & SEM)
- 2) Symmetry of Viruses (photographs)
- 3) Isolation and purification of Viruses (demo)
- 4) Gram staining of Bacteria
- 5) Different types of Bacteria – Identification (morphology)
- 6) Culture media preparation
- 7) Isolation and culture of Bacteria
- 8) Morphological identification of fungi-type study
- 9) Isolation and culture of fungi
- 10) Viral diseases: Tobacco mosaic diseases, Bhendi vein clearing
Bacterial diseases: Leaf blight of Rice, Red stripes of sugar cane
Fungal diseases: Early blight disease of potato, Smut disease of Jowar

SUGGESTED READINGS & TEXT BOOKS

1. Kaursethi I and Surinder KW 2011. Text Book of Fungi and their Allies. Macmillan publishers, New Delhi, India.
2. Ram Reddy S & Reddy SM 2007. Essentials of Virology. Scientific publishers, Jodhpur, India.
3. Sharma K 2005. Manual of Microbiology Tools and Techniques. Ane Book, New Delhi, India.
4. Matthew RH 2004. Plant virology. 4th edition. Academic press an imprint of Elsevier, California, USA.
5. Prescott et al. 2003. Microbiology. McGraw Hill Education, New York.
6. Aneja KR 2003. Experiments in Microbiology, Plant pathology and Biotechnology. New Age International publishers, New Delhi.
7. Verma HN 2003. Basics of plant Virology. IBH publishing co. Pvt. Ltd., New Delhi.
8. Mehrotra KS and Aneja KR 2003. An Introduction to Mycology. New Age International Publishers, New Delhi.
9. Sullia SB and Shantharam S 2001. General Microbiology. Oxford and IBH publishing Co. Pvt. Ltd, New Delhi.
10. Reddy SM and Ram Reddy S 2000. Microbiology a Laboratory Manual. BSC Publishers and Distributors, Hyderabad.
11. Flint SJ, Enquist LW, Krug RM, Racaniello VR, Skalka AM 2000. Principles of Virology, Molecular Biology, Pathogenesis and Control. ASM press, Washington DC.
12. Rao AS 1999. Introduction to Microbiology. Prentice Hall of India Pvt. Ltd., Delhi.
13. Paul S 1995. Bacteria in Biology, Biotechnology and Medicine. 5th edition. John Wiley and son Ltd., UK.
14. Pelczar, Chan and Krieg 1993. Microbiology. 5th edition. McGraw Hill Education, New York.
15. Stainer RT, Ingraham JL, Wheelis ML and Painter PR 1987. General Microbiology. 5th Edition. Macmillan, London.
16. Smith KM 1968. Plant viruses. Elsevier, New York.
17. Rangaswamy G 1962. Bacterial Plant disease in India. Asia Publishing House, Bombay.

18. Agrios, G.N. 2005. Plant pathology. 5th ed. Academic press.
19. Allen T. Bull.2004. Microbial diversity and Bioprospecting. ASM Press, Washington.
20. Brock, T.D. & Madigan. 1991. Biology of Microorganisms. Prentice-Hall.
21. Dube, R.C. & D.K.Maheswari 2005. Microbiology. S.Chand & Co. Ltd., New Delhi.
22. Gilbert, O.L.2000. Lichens. Collins New Naturalist.
23. Ainsworth, G.C. Sparrow, F.K. and Susman, A.S. 1973. The Fungi-An advances treatise, Vol. I to VIB.
24. Alexopoulos, C.J. Mims, C.W. and Blackwel, M. 1996. Introductory Mycology, John Wiley & Sons Inc.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
M.Sc. – BOTANY, SEMESTER – I,
PAPER CODE: 102: DIVERSITY OF ALGAE, BRYOPHYTES, PTERIDOPHYTES
AND GYMNOSPERMS

UNIT –I: ALGAE

General characters; Thallus organization, cell structure, reproduction, life cycles in Chlorophyceae, Bacillariophyceae, Phaeophyceae and Rhodophyceae
Bold and Winny classification of algae

UNIT—II: BRYOPHYTA

General characters; Morphology, anatomy, reproduction in Hepaticopsida, Anthocerotopsida and Bryopsida
Classification of Bryophytes
Ecological and economic importance of Bryophytes

UNIT—III: PTERIDOPHYTA

General characteristics of morphology, anatomy, reproduction in Psilotopsida, Psilophytopsida, Lycopsidea, Sphenopsida and pteropsida
Stelar evolution, Heterospory and Seed habit
Ecological and economic importance of Pteridophytes

UNIT—IV: GYMNOSPERMS& PALEOBOTANY

General characters; Morphology, anatomy and reproduction in Cycadales, Coniferales and Gnetales.
Classification of Sporne
Structure of ovules in different classes of Gymnosperms
Paleobotany—Geological time scale, process of fossilization, types of fossils
General account of Pteridospermales and Pentoxylales

SUGGESTED LABORATORY EXERCISES

1. Examination of vegetative and reproductive morphology of Chlophyceae members.
2. Examination of Thallus structure and reproductive bodies of Xanthophyceae, Bacillariophyceae and Phaeophyceae members.
3. Examination of external and internal structure and reproductive organs of Rhodophyceae and Cyanophyceae members.
4. Field work to get acquaintance with locally available algae.
5. Examination of the external features, anatomy and reproductive structures of Psilotum, Selaginella, Isoetes, Equisetum, Adiantum, Salvinia and Azolla.
Observations of the slides of the following fossil plants:
Rhynia, Lepidodendron, Lepidocarpon, Miadnesia, Sphenophyllum and Calamites.
6. Examination of the external features, anatomy (TS, TLS&RLS) and reproductive structures of Ginkgo, Pinus, Cupressus, Cryptomeria, Araucaria, Ephedra & Gnetum.
Study of fossil gymnosperms from prepared slides. Lyginopteris, Lagenostoma, Medullosa, Trigonocarpus, Conostoma, Heterangium and Cordaites

SUGGESTED READINGS & TEXT BOOKS

1. Bold, H.C and Wynne.M.J. 1978. Introduction to the algae
2. Chapman, V.J.1962. The Algae
3. Graham, J.E, Lee W. Wilcox & L.E.Graham 2008. Algae. 2nd ed. Benjamin Cummings
4. Fritsch, F.E.1945. The structure and reproduction of Algae Vols. I & II. Cambridge University Press, London
5. Kumar, H.D.1988.Introductory Phycology
6. Kashyap, S. 1929. Liverworts of the Western Himalayas and Punjab Plains Part I and Part II.
7. Lewin,R.A. 1962. Physiology and Biochemistry of Algae
8. Morris, I 1967. An Introduction to the Algae
9. Prescott, G.W. 1969. The Algae- a review
10. Bernard Goffinet & A. Jonathan Shaw. 2008. Bryophyte Biology. 2nd ed. Cambridge
11. Parihar, N.S. 1991. Bryophyta
12. Puri,P. 1980. Bryophytes
13. Round, E.E. 1986. The Biology of Algae
14. Round, E.E. 1962. Ecology of algae
15. Smith, G.M. 1955. Cryptogamic Botany Vol. II Chopra, R.N. & P.K.Kumar, 1988. Biology of Bryophytes. Wiley Eastern.
16. Arnold, C.A. 1974. An introduction to Paleobotany, New York
17. Agashe, S.N. 1995. Palaeobotany. Oxford & IBH, New Delhi.
18. Bhatnagar, S.P. & Alok Mitra 1997. Gymnosperms. New Age Int. (P) Ltd.
19. Charles C. Beck and Charles B. Beck (Ed.). 1988. Origin and Evolution of Gymnosperms. CUP.
20. Kramer, K.U., P. S. Green & Erich Gvtz. 2008. Pteridophytes and Gymnosperms. Springer.
21. Sambamurty AVSS. 2005. A Textbook of Bryophytes, Pteridophytes, Gymnosperms and Paleobotany. Ik International Pvt Ltd.
22. Vashista, P.C. 2005. Gymnosperms.S. Chand & Co, New Delhi.

23. Vashista, P.C. 2005. Pteridophyta. Rev. ed. By Sinha & Anil, S. Chand & Co, New Delhi.
24. Saxena P and Pathak C. 2012. A Text Book of Pteridophyta., Wisdom Press, New Delhi.
25. Chamberlain, C.J. 1935. Gymnosperms structure and evolution, University of Chicago Press
26. Coulter, J.M. and Chamberlain, C.J. Morphology of Gymnosperms, Central Book Depot, Allahabad
27. Evans, A.J. 1936. Morphology of Vascular Plants (Lower groups) McGraw Hill Book Company, New York
28. Maheswari, P. and Vasil, V. Genetum CSIR (Monographs)
29. Parihar, N.S. 1996. Biology and Morphology of Pteridophytes, Central Book Depot, Allahabad
30. Sporne, K.R. 1962. The Morphology of Pteridophytes, Hutchinson University Library

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
M.Sc. – BOTANY, SEMESTER – I,
PAPER CODE: 103: PRINCIPLES OF CYTOLOGY AND CYTOGENETICS

UNIT – I

Ultra structure of plant cell – Cell wall and Plasma membrane

Ultrastructure of ---

- a) Amembranous cell organelles – nucleus, ribosomes
- b) Single membranous bound cell organelles – endomembrane system
- c) Double membrane bound cell organelles- nucleus, mitochondria, chloroplast ✓

UNIT – II

Structure of prokaryotic and Eukaryotic chromosomes

Chemical nature of chromatin, centromeres and telomeres

Special type of chromosomes – Lamp brush, Polytene and B- chromosome

Chromosome banding techniques – flow cytometry and control microscopy in karyotype analysis

Computerized karyotype analysis

UNIT—III

Chromosomal structural aberrations – Origin, meiosis and breeding behavior of duplications, deficiencies and inversions and interchanges; types of inversions. Robertsonian translocations; Basic concept of complex translocation heterozygotes

UNIT—IV

Numerical changes in chromosomes—Aneuploids and Euploids

Nuclear DNA content –cell cycles, regulations, check points, cyclins and cdks

Experimental control of cell divisions.

Amitosis.

SUGGESTED LABORATORY EXERCISES

1. Observation and identification of meiotic stages.
2. Preparation of karyotypes and construction of ideograms
3. Observation of slides/photographs showing structural and numerical aberrations and chromosome banding.

SUGGESTED READINGS & TEXT BOOKS

1. Singh RJ. 2014. Plant Cytogenetics. 2nd Edition. CRC Press, India
2. David M. Prescott. Cells. 1988. Jones and Bartlett Publ. Boston.
3. Gupta, P.K. 1995. Cytogenetics. Rastogi & Company, Meerut.
4. Pierce BA. 2013. Genetics: A Conceptual Approach. 5th Edition. W. H. Freeman, California.
5. Swanson, Merz and Young. Cytogenetics. Prentice Hall. India.
6. Sybenga, J. 1973. General Cytogenetics. North Hall and American Elsevier.
7. C. B. Powar. 1992. Cell Biology. Himalaya Publishers, New Delhi
8. Ajoy Paul. 2015. Text Book of Cell and Molecular Biology. Books and Allied Pvt, Ltd
9. De Robertis E.D.P and E.M.F. De Robertis. Cell and Molecular Biology 2001. CBS Publisher and Distributors.
10. Darnell, Lodish and Baltimore: Molecular Biology, Scientific American Books, New York
11. Bass H and Birchler J. 2011. Plant cytogenetics: Genome structure and chromosome Function Springer, New York

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
M.Sc. – BOTANY, SEMESTER – I,
PAPER CODE: 104 : FUNDAMENTAL CONCEPTS OF CELL AND MOLECULAR
BIOLOGY

UNIT – I

Composition and structure of Biomolecules; - Carbohydrates, lipids and proteins
(Ramachandran plot, domains, motifs and folds)
Nucleic acids, DNA structure and duplex model A, B & Z forms of DNA
Types of small RNA's, SiRNA, micro RNA and catalytic RNA.

UNIT – II

DNA replication – semi conservative, semi discontinuous and uni & bi directional mode of replication, RNA priming
Enzymes in DNA replication – helicases, SSB, topoisomerases and polymerases
Mechanism of DNA replication – rolling circle, theta mode of replication
Replication ends of chromosomes

UNIT—III

Transcription promoters and Activators.
transcriptions factors and mechanisms of transcription in prokaryotes and eukaryotes, Post-transcriptional modifications.
Translation: Structure of tRNA, Ribosomes as translation factory, genetic code, mechanism of translation, Initiation, elongation and termination
Post translational modifications

UNIT – IV

Regulation of gene expression in Prokaryotes. Basic models: Lac, Arabinose and Trypoperons.
Positive and Negative controls.
Regulation in Viruses: Lytic and Lysogenic cycle.
Regulation of gene expression in Eukaryotes. Britten Davidson model. Role of chromatin in gene expression. DNA methylation. Temporal and spatial regulation. Gene silencing

SUGGESTED LABORATORY EXERCISES

1. Isolation of DNA from Onion bulbs/Banana
2. Isolation of DNA using CTAB method
3. Biochemical Tests of Carbohydrates, Proteins and Fats in the plant cells
4. Assignments on problems related to DNA replication, Transcription, Translation and Gene Regulation
5. Electrophoresis of seed proteins
6. Staining techniques – Study of mitosis using acetocarmine.
7. Isolation of mitochondria and the activity of its marker enzyme, Succinate dehydrogenase (SDM).
8. Isolation of chloroplasts and photographs SDS – PAGE technique and photographs - profile of proteins to demonstrate (2) the two subunits of Rubisco.
9. Isolation of nuclei and identification of histones by SDS-PAGE technique.
10. Fluorescence staining with FDA for cell viability and wall staining with calcofluor.
11. Immunofluorescence technique –observation of cytoskeleton.
12. Demonstration Photographs of SEM and TEM.

SUGGESTED READINGS & TEXT BOOKS

1. Alberts, B, D. Bray, J. Lewis, M. Raff, K. Roberts and J.D.Watson. 2004. Molecular Biology of the Cell Garland Publishing, New York and London
2. Fritsch, E.F. and J. Sambrook. 1992. Molecular cloning: Laboratory Manual. Maniatis, Cold Spring Harbor Laboratory, New York).
3. George M. Malacinski & D. Freifelder 2005. Essentials of Molecular Biology.
4. Schecleif, R.F. and P.C. Wensik 1991. Practical Methods in Molecular Biology Springer-Verlag.
5. Walker, J. and W. Castra. 1992. Techniques in Molecular Biology. Goom Helns, London.
6. Buchaman B.B., Gruissem, W and Jones R.I. 2000. Biochemistry and Molecular Biology of plants: American Societies of plant physiologists, Maryland, U.S.A.
7. Gupta, P.K. 2002. Cell and Molecular Biology, 3rd Edition, Rastogi Publications, Shivaji Road, Meerut, India.
8. Glick, B.R. and Thompson J.E. 1992. Methods in Plant Molecular Biology and Biotechnology, CRC Press, Boc Raton Florida.
9. Lodish, B.A, Zipursky S.L, Matsdaira P, Baltimore D. and Darnell J. 2000. Molecular Cell Biology (4th edition). W.H. Freeman & co. New York, USA.
10. Lewin B, 2000. Genes VII Oxford University Press, New York.
11. Shaw, C.H. 1998. Plant Molecular Biology. A practical approach, IRL Press, Oxford.
12. R F Weaver 1999, Molecular Biology, WCB McGraw-Hill.
13. Raghavan V. 1997. Molecular Biology of Flowering plants. Cambridge University press, New York, USA.