M.Phil. - PLANT BIOLOGY & PLANT BIOTECHNOLOGY

S. No	Paper	Code	Title of Paper	Hrs/week Theory/	Marks Internal	Marks External	Credits
			SEMESTER I				
1.	Paper I	MPPB1	Research Methodology	**4**	**25**	**75**	**6**
2.	Paper II	MPPBA1 MPPBA2	Taxonomy and Biology of Algae (or) Taxonomy and Biology of Fungi	**4**	**25**	**75**	**6**
3.	Paper III	MPPBE1 MPPBE2	Algal Biotechnology (or) Fungal Biotechnology	**4**	**25**	**75**	**6**
			SEMESTER II				
4.		MPPBAPR	Research work for dissertation	**-**	**20**	Periodical Presentation - 50 Dissertation - 10**0** Viva Voce **–** **50** **Total 200**	18

S.D.N.B. VAISHNAV COLLEGE FOR WOMEN (AUTONOMOUS),

CHENNAI – 44

M.Phil. - PLANT BIOLOGY & PLANT BIOTECHNOLOGY

S. No.	Paper	Title of paper
	SEMESTER I	
1.	Paper I MPPB1	Research Methodology
2.	Paper II MPPBA1 or MPPBA2	Taxonomy and Biology of Algae (or) Taxonomy and Biology of Fungi
3.	Paper III MPPBE1 (or) MPPBE2	Algal Biotechnology (or) Fungal Biotechnology
	SEMESTER II	
4.	MPPBAPR	Research work for dissertation

PATTERN OF QUESTION PAPER

Time : 3 hrs Max Marks: 75

SECTION – A
(5 x 15 = 75)

Answer any five Questions out of Seven
(Questions must cover all the units)

1.
2.
3.
4.
5.
6.
7.

M. Phil – DEPARTMENT OF PLANT BIOLOGY & PLANT BIOTECHNOLOGY

PAPER I - RESEARCH METHODOLOGY

SEMESTER I **Theory: 4 /Wk**
Paper-I **Code: MPPB1**
Credits: 6

UNIT I

Principles of Microscopy (Light, Fluorescent, Phase Contrast, Scanning and Transmission, Electron Microscopy) – Confocal Laser Scanning Microscopy – Photomicrography, Principles of Microtomy.

UNIT II

Principles and Applications of:

a) Chromatography— TLC, HPLC, Gel filtration, Ion Exchange and Affinity chromatography, Ultrafiltration.
b) Spectrophotometery—UV-Visible spectrophotometer, FT – IR, NMR, GC-MS.
c) Autoradiography and Liquid Scintillation Counter.

UNIT-III

Buffers, pH and use of pH meter. General Principles of Electrophoresis: Native-PAGE, SDS-PAGE, Agarose gel electrophoresis, 2D-Electrophoresis, Iso electric focusing and Gel Documentation. Antibody production (Mono and polyclonal) detection of molecules using ELISA, Western blot and Immunoprecipitation. Principles and techniques of Southern and Northern hybridization. Principles, types and applications of PCR. DNA finger-printing-RFLP, RAPD and AFLP. DNA sequencing and Microarray technique.

UNIT IV

Intellectual Property Rights (IPR): Patenting—Patents, Trade secrets, Copyrights, Trademark. Plant genetic resources (PGR), General Agreement on Tariffs and Trade (GATT), and Trade Related Intellectual Property (TRIP). Biosafety levels.

UNIT V

Measures of Mean, Median and Mode: Standard Deviation and Standard Error. Regression and Correlation coefficient analysis; Student's t-test; Analysis of Variance (ANOVA); Chi-Square test. Experimental design, Literature collection, components, Format of thesis and dissertation. Preparation of Research report – Thesis/ dissertation - Manuscript/ research article – monograph/ review.

SUGGESTED REFERENCES

1. Wayne W. Daniel. 2000. Biostatistics: A foundation for Analysis in the Health Sciences. Wiley Series in Probability and Statistics.
2. Prem S. Mann. 2004. Introductory Statistics. Fifth Edition. John Wiley and Sons

(ASIA) Pvt. Ltd.
3. S. C. Rastogi, N. Mendiratta, and P. Rastogi. Bioinformatics Methods and Applications Genomics, Proteomics, and Drug Discovery.
4. Atwood, T. K. and Parry-Smith, D. J . 2009. Introduction to Bioinformatics.
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6. Joseph Sambrook & David W.Russell. Molecular Cloning – A laboratory Manual (Third Edition). Cold Spring Harbor laboratory Press, Cold Spring Habor, New York.
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8. Charles N. Relly, Donals.T.Saweyer, Robert E. Krieger Huntington. Experiments of Instrumental methods, A Laboratory Manual. New York.
9. Hoburt, H.Willard, Lynme L. Meritt, J. R. John Dean. Instrumental Methods of Analysis, East West Press Private Limited.
10. Gelvin. Plant Molecular Biology, A Laboratory Manual. Kluwer Academic Press.
11. Norman T.S. Bailey. Statistical Methods in Biology. Cambridge University Press, UK .
12. Shaleesha A. Stanley. 2003. Bioethics. Wisdom Educational Service, India.
13. De Robertis & De Robertis. 1988. Cell and Molecular Biology. 8th edition. Narosa Pub. House.
14. Friedelder, D. 1937. Microbial genetics. Jones and Barlett Publishers.
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16. Frostrom,J. W. and M. T. Clegg. 1980. Principles of genetics. Second Edition. WH Freeman and Co.
17. Goodenough, V and R. P. Levine. 1974. Genetics. Holt, Rinehart and Winston.
18. Lewin, B. 1994. Genes V. Oxford University Press.
19. Sobti, R. C. and Gobe. 1991. Eukaryotic chromosomes. Narosa Publishing House.
20. Smith - Keary, P. 1991. Molecular Genetics. Macmillan Pub. Co. Ltd. London.
21. Steward, M. W. 1984. Antibodies: Their structure and function. Chapman and Hall Ltd.
22. Strickberger, M. W.1990. Genetics. Third Edition. Macmillan Publishing Company.
23. Suzuki, D. T. *et al.* 1986. An introduction to genetic analysis. Third Edition. W.H. Freeman & Co.
24. Watson, J. D. *et al.* 1987. Molecular Biology of the Gene. Fourth Edition. The Benjamin Cummings Pub. Co.
25. Brown, T. A. 2001. Gene Cloning and DNA Analysis, 4^{th} edition, Black Well Science.
26. Cibelli, J. R. P., Lanza, K. H. S., Campbellel and M. D. West. 2002. Principles of Cloning, Academic Press.

27. Date, J.W. and M.V. Schantz, 2002. From genes and genomes. John Wiley and Sons Ltd.
29. Old., R.W. and Primrose, S.B. 1998. An introduction to genetic engineering, Principles of gene manipulation, Blackwell Science, Germany.
30. Primrose, S., R. Twyman and B. Old. 2001. Principles of gene manipulation, Blackwell Science Ltd., USA.
31. Watson, J.D., M. Jilman,J. Witkowski and M. Zoller., 2001. Recombinant DNA, Scientific American Books, USA.

M. Phil – DEPARTMENT OF PLANT BIOLOGY & PLANT BIOTECHNOLOGY

PAPER II – TAXONOMY AND BIOLOGY OF ALGAE

SEMESTER I **Theory: 4 /Wk**
Paper-II **Code: MPPBA1**

Unit I

General account of Algal taxonomy – ICBN – important principles and rules – rule of priority – type concept- binomials – citation

Unit II

General account on the structures and reproduction of algae belonging to Chlorophyceae, Xanthophyceae, Crysophyceae, Phaeophyceae, Rhodophyceae, Dinophyceae, Cryptophyceae, Eustigmatophyceae,Bacillariophyceae and Cyanophyceae

Unit III

Microalgae used as biofertilizers – nitrogen fixing forms – free living and symbiotic nitrogen fixers – mass cultivation of BGA in field- importance and choice of carrier material – immobilization technique

Unit IV

Economic importance of micro and macroalgae – mass cultivation of micro and macroalgae (macroalgae -*Gracilaria, Porphyra , Laminaria*) and (microalgae – *Dunaliella, Haematococcus*)

Unit V

Seaweed liquid fertilizer and its potential in agriculture – Genetics of algae- strain improvement, protoplast fusion technique in macroalgae.

SUGGESTED REFERENCES

1. Becker, S. W. 1994. Micro Algae Biotechnology and Microbiology. Cambridge University Press.
2. Dodge J.D. The fine structure of Algal cells. Academic press.

3. James E. Graham, Lee W. Wilcox, Linda E. Graham. 2008. Algae. Benjamin Cummings.

4. B.R. Vashishta, A.K. Singh and V.P. Singh.2014. Algae

5. Ignacimuthu, S. 1996. Basic Biotechnology. Tata McGraw Hill Publishing Limited. New Delhi.

6. Power, M., Van der Meer, J., Tchelat, R. 1998. Molecular based methods can contribute to assessments of toxological risks and bioremediation strategies. J. Microbiol. Methods, 32: 107 – 119.

7. Tridevi, P. C. 2001. Algal Biotechnology. Point Publisher, Jaipur, India.

8. Venkatraman, G. S. 1972. Algal Biofertilizers and rice cultivation. Today and Tomorrows Printers and Publishers, New Delhi.

9. Zajic, J. E. 1970. Properties and Products of Algae. Plenum Press, New York.

10. Bold, H.C. and Wynne, M.J. 1976. Introduction to Algae structure and reproduction. Prentice-hall.

11. Fritsch, F.E. 1935 and 1945. Structure and reproduction in Algae Vol. I& II, Cambridge University press.

12. Marris, I. 1967. An introduction to the Algae Hatchinson University Lab.

13. Presott, G.W. 1970. How to know freshwater Algae W.C. Braun & Co.

14. Round, F.E. 1966. The Biology of Algae Edward Arnold.

15. Dodge, J.D. The fine structure of Algal cells. Academic press.

16. Chapman, F.G. and Chapman, D.J. 1973. The Algae. McMillan & Co.

17. Desikachary, T.V. 1972. Taxonomy and Biology of Blue Green Algae. University of Madras.

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20. Smith and Wittick. 1987. An introduction of Algae. Blackwell Publication.

21. Vanden Hoek, C., Mann, D.G., and Jahns, H.M. 2009. Algae- An introduction to Phycology.

22. Vashishta, B.R., Sinha, A.K., and Singh V.P. 2010. Algae. Revised Edition.

23. McCandless, E.L. 1981. Polysaccharides of seaweeds. In The *Biology of seaweeds*, ed. C.S. Lobban and M.J. Wynne, pp. 559-88. Blackwell, Oxford.

24. Hausmann, K and Patterson, D.J. 1984 Contractile vacuole complexes in algae. In *Compartments in algal cell and their interaction*, ed. W. Wiessner, D.G. Robinson and R.C. Starr, Springer-Verlag, Berlin.

M. Phil – DEPARTMENT OF PLANT BIOLOGY & PLANT BIOTECHNOLOGY

PAPER II – TAXONOMY AND BIOLOGY OF FUNGI

SEMESTER I **Theory: 4 /Wk**
Paper-II **Code: MPPBA2**

UNIT I

History of mycology, International rules of nomenclature. Ultrastructure, Taxonomic criteria.

UNIT II

Myconanotechnology – Environment, Agriculture and Forestry. Physiology of Fungi – Fungal enzymes, fungal metabolites.

UNIT III

Ecology of fungi – with special reference to soil fungi, Litter fungi, Entomogenous fungi, Predaceous fungi and Coprophilus fungi in partnership with other organism.

UNIT IV

Fungi – food, Food products and medicine – Production of alcohol, Organic acids, Antibiotics (Antibodies).

UNIT V

Mushroom cultivation – Application – Byproducts. Mycorrhizal application – Symbiosis.

SUGGESTED REFERENCES

1. Fungal Contamination in Public Buildings: A Guide to Recognition and Managament (Canadian guideline: Health Canada).

2. Guidelines on Assessment and Remediation of Fundi in Indooor Environments. New York City Department of Health.
3. Manual of Clinical Microbiology (excellent for bacteria). 6th ed. Patrick Murray (ed.), Americal Society for Microbiology Press, 1995.
4. Burnett, J. H. 1976. Fundamentals of Mycology, Arnold London.
5. James R. Norris, David J. Read, A. K. Varma. 1991. Methods in Microbiology Vol 23, Academic Press.
6. Webster, J. 1988. The Fungi, C. V. P. Cambridge.
7. Day, P. K. 1974. Genetics of host parasite interactions, S. Chand & Co.,
8. Baher, K. F. & R. J. Cook. 1974. Biological control of plant pathogens, S. Chand & Co., Limited.
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10. S. E. Smith, David J. Read. 2008. Mycorrhizal symbiosis, Academic Press.
11. John Laker Harley. 1969. The biology of Mycorrhiza. Leonard Hill.
12. Breitnebach, J., F. Kranzlin. 1981 – 2005. *Fungi of Switzerland*, Vol. 1 – 6, Mykologia, Lucerne, Switzerland.
13. Stephenson, Steven L. *The Kingdom Of Fungi: The Biology of Mushrooms*, Molds and Lichens. Timber Press, Portland, OR, 2010.
14. Ulloa, Miguel, Hanlin, Richard, Illustrated Dictionary of Mycology. APS Press, St. Paul, MN, 2000.
15. Watling, Roy. *Fungi.* Smithsonian Institution Press, 2003.

M. Phil – DEPARTMENT OF PLANT BIOLOGY & PLANT BIOTECHNOLOGY

PAPER III – ALGAL BIOTECHNOLOGY

SEMESTER I **Theory: 4 /Wk**
Paper-III **Code: MPPBE1**

UNIT I

Scope and objectives of algal biotechnology, algal Biomass: Culture of algae: freshwater algae - BBM and Zarrouk's, marine algae - Provasoli's and F/2 Guillard's medium. Mass cultivation of Microalgae (*Spirulina* and *Dunaliella*); Macroalgae (*Gracillaria* and *Kappaphycus*).

UNIT II

Genetic Engineering of Algae: Recombinant DNA technology in algae (Cyanobacteria and Green algae). Applications of Genetic Engineering in algae, Molecular farming.

UNIT III

Biofuels: Biodiesel, Bio-hydrogen production, Biofertilizers : Liquid seaweed fertilizer and BGA as Biofertilizer.

UNIT IV

Algal Polysaccharides (Agar Agar, Carageenan and Alginic acid), Sugar alcohols – Sorbitol, Mannitol, food and fodder, Secondary metabolites, Algae in Pharmaceutical and Neutraceutical Industries.

UNIT V

Eutrophication and Pollution: Algae as indicator of pollution (Saprobian Index), and Toxic algae and phycoremediation.

SUGGESTED REFERENCES

1. Becker, S. W. 1994. Micro Algae Biotechnology and Microbiology. Cambridge University Press.
2. Ignacimuthu, S. 1996. Basic Biotechnology. Tata McGraw Hill Publishing Limited. New Delhi.
3. Power, M., Van der Meer, J., Tchelat, R. 1998. Molecular based methods can contribute to assessments of toxological risks and bioremediation strategies. J. Microbiol. Methods, 32: 107 – 119.
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5. Venkatraman, G. S. 1972. Algal Biofertilizers and rice cultivation. Today and Tomorrows Printers and Publishers, New Delhi.
6. Zajic, J. E. 1970. Properties and Products of Algae. Plenum Press, New York.
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M. Phil – DEPARTMENT OF PLANT BIOLOGY & PLANT BIOTECHNOLOGY

PAPER III – FUNGAL BIOTECHNOLOGY

SEMESTER I **Theory: 4 /Wk**
Paper-III **Code: MPPBE2**

UNIT I

AEROMYCOLOGY: History of Aeromycology, Aerial environment; Microbial propagules in air, Air sampling techniques. Isolation, identification and maintenance of airborne fungi. Seasonal and diurnal periodicities of air spora. Aerobiology in relation to plant pathology. Aeroallergens.

UNIT II

PHYLLOPLANE FUNGI: Sample collection, Preparation of media, Processing of collected samples. Isolation, identification and maintenance of Phylloplane fungi. Antagonism . Use of phylloplane fungi as biocontrol agents. Fungi colonizing leaf litter.

UNIT III

ENDOPHYTIC FUNGI: Sample collection, Preparation of media, Processing of collected samples. Isolation, identification and maintenance of Endophytic fungi. Screening of endophytic fungi for the production of bioactive compounds. Analysis and Application of bioactive compounds.

UNIT IV

SOIL MYCOFLORA: Soil environment, components of soil, diversity and abundance of dominant soil microorganisms; Methods of isolation of soil mycoflora; Soil organic matter decomposition; Transformations of carbon, nitrogen, sulphur and iron in soil. Mycorrhizal Association: Ectomycorrhiza, Endomycorrhiza, and Ectendomycorrhiza.

UNIT V

APPLICATIONS OF FUNGI: Medicinal aspects of fungi – antimicrobials, anticancer and other diseases. Enzymes from Fungi, Organic acids from Fungi, Mushroom cultivation, nutrition values and processing, Single cell protein (yeast), Environmental Applications of fungi.

REFERENCES SUGGESTED

1. Philip Herries Gregory. 1976. Outdoor Aerobiology. Oxford University Press.
2. Bioaerosols: Assessment and Control, ACGIH. 1999. (Publication #3180). AXHIH. Org.
3. Biological Containmants in Indoor Environments, ASTM STP 1071.
4. Field Guide for the Determination of Biological Contaminants in Environmental Samples, AIHA.
5. Fungal Contamination in Public Buildings: A Guide to Recognition and Managament (Canadian guideline: Health Canada).
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11. Baher, K. F. & R. J. Cook. 1974. Biological control of plant pathogens, S. Chand & Co., Limited.
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16. Stephenson, Steven L. *The Kingdom Of Fungi: The Biology of Mushrooms*, Molds and Lichens. Timber Press, Portland, OR, 2010
17. Ulloa, Miguel, Hanlin, Richard, Illustrated Dictionary of Mycology. APS Press, St. Paul, MN, 2000.
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