DR A P J ABDUL KALAM UNIVERSITY , INDORE

Scheme of Examination
M.Sc. Botany
Semester-I

(Non Grading)

S.No	Sub. Code	Sub. Name	Theory Marks				Practical Marks		Total Marks
			End Sem.		Mid Sem./ Assignment Average of two				
			Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	
1.	MSB101T	Biology & Diversity of Viruses, Bacteria and Fungi	85	28	15	05	-	-	100
2.	MSB102T	Biology & Diversity of Algae & Bryophytes	85	28	15	05	-	-	100
3.	MSB103T	Biology & Diversity of Pteridophytes & Gymnosperms	85	28	15	05	-	-	100
4.	MSB104T	Plant Ecology	85	28	15	05	-	-	100
5.	MSB105P	Practical Ist	-	-	-	-	50	17	50
6.	MSB106P	Practical IInd	-	-	-	-	50	17	50
Total									**500**

DR A P J ABDUL KALAM UNIVERSITY , INDORE

M.Sc. Botany

Syllabus

I SEMESTER

Paper 1 Biology & Diversity of Viruses, Bacteria and Fungi

UNIT- I Viruses:- Characteristics and ultrastructurte of virions, isolation and purification of viruses; chemical nature of viruses; replication and transmission of viruses; economic importance.

UNIT- II Archaebacteria and Eubacteria: - General account of archaebacteria, eubacteria: general characters, ultrastructure, nutrition, classification, reproduction and economic importance; General account of Actinomycetes. *Mycoplasma* : Salient features, cell structure, reproduction, transmission, plant and animal diseases and their control measures. Cyanobacteria: salient features, ultrastructure, reproduction and biological importance.

UNIT-III Mycology: General characters,substrate relationship of fungi, cell ultrastructure,thallus organization, mode of nutrition (saprotphytic,, parasitic, symbiotic), reproduction.Economic importance of fungi.

UNIT- IV Mycology- classification (Alexopoulous, Ainswarth), recent trends in classification, heterothallism, general account of Mastigomycotina, Zygomycotina.

UNIT-V Mycology: Diagnostic features and general account of Ascomycotina, Basidiomycotina, and Deuteromycotina. parasexuality diseases in plants and Humans; mycorrhiza, symbiosis and Fungi as biocontrol agent.

Suggested Readings

1. Alexopoulus, C.J. Mims, C. W. and Blackwel, M; 1996: Introductory coO' Mycology,Jbon Wjley & Sons Inc.
2. Clifton, A; 1958: Introduction to Bacteria, Mcgraw- Hills Book Co.New Delhi.
3. Madigan, M T. Martinko, J. M and Parker Jack; I 997: Brock Biology Of Microorganisms, (8th edition) Prentice Hall, N,J. U.S.A
4. Mandahar, C. L.; 1978: Introduction to Plant Viruses. Chand & Co.Ltd. Delhi.
5. Mehrotra, RS. and Aneja, RS.; 1998: An Introduction to Mycology. New Age Intermediate Press.
6. Rangaswamy, G. and Mahadevan, A; 1999: Diseases of Crop Plants in Indja (4th edjtjon).PrentjceHaJl ofInilia Ltd. New Delbj.
7. Webster, J.; 1985: Introduction to Fungi Cambridge University Press.
8. Dubey, R C. & Maheshwari, D. K.; 2005: A Text Book of Microbiology, S. Chand Publisher, New Delhi

M.Sc. Botany Syllabus

I SEMESTER

Paper 2 Biology & Diversity of Algae & Bryophytes

UNIT I: Algae – General characters, diversified habitats, thallus organization, criteria of classification (pigments, reserve foods, flagella) economic importance, (as food, feed, industry, algal blooms and biofertilizer), salient features of Protochlorophyta.

UNIT II: Algae: Salient features, classification, reproduction and economic importance of Chlorophyta, Charaphyta and Xanthophyta.

UNITIII: Algae: Salient features, classification, reproduction and economic importance of Bacillariophyta, Phaeophyta and Rhodophyta.

UNIT IV: Bryophyta: General characters, classification, vegetative propagation and sexual reproduction of bryophytes, Life cycle and alternation of generation. Economic importance of bryophytes. General account of Spherocarpales, Marchantiales and Jungermeniales.

UNIT V: Bryophyta: General account of Anthocerotales, Funariales, Sphagnales, Andraeales and Polytrichales.

Suggested Readings

1. Smith G. M.~ Cryptogamic Botany VoL I(2nd edition)~ TataMcGraw-Hill Publishing Company Ltd. Bombay -New Delhi.
2. Kumar H. D. 1988: Introductory Phycology. Affiliated East-West Press Ltd. New Delhi.
3. Parihar~ N.S. 1991: Bryophyta. Central Book Depot. Allahabad.
4. Brower~ 1926: Primitive Land Plants~ Cambridge At the University Press.
5. Kashyap~ 1972 Liver worts of Western Himalayas and Punjab. Research co Publication.
6. Smith, G. M.~ Cryptogamic Botany VoL I (2nd edition)~ TataMc Graw -Hill Publishing Company~ Bombay -New Delhi.
7. Puri P. 1980~ Bryophyta -Morphology, Growth & Differentiation. Atmaram & Sons, Delhi.
8. Chopra & Kumar~ 1988: Biology of Bryophyta; Wiley Eastern Ltd.
9. Ram Udar; 1970: An Introduction to Bryophyta; Shashidhar Malviya Prakashan
10. Watson; 1968: Structure and life of Bryophyta; Hutchinson & Co. Ltd.

DR A P J ABDUL KALAM UNIVERSITY , INDORE

M.Sc. Botany Syllabus

I SEMESTER

Paper 3 Biology & Diversity of Pteridophytes & Gymnosperms

UNIT I: Pteridophyta: General characters, morphology, anatomy and life history of Pteridophyta. Classification, Evolution of stele, heterospory and origin of seed habit. Basic idea about paleobotany,. General account of Psilopsida.

UNIT II: Lycopsida: Morphology, anatomy, reproduction and life history. Sphenosida: Morphology, anatomy, reproduction and life history Pteropsida : Morphology, anatomy, reproduction and life history

UNIT III: Gymnosperms: General Characters - Morphology, anatomy, reproduction and life history of gymnosperms. classification (Pant and Raizada; Bierhort), economic importance of gymnosperms. General account of Pteridospermales.

UNIT IV: General account of Cycadeoidales, General account of Cordaitales, General account of Cycadales General account of Ginkgoales.

UNIT V: Morphology,structure and reproduction of Coniferales, Morphology, structure and reproduction of Ephedrales Morphology, structure and reproduction of Welwitschiales Morphology,structure and reproduction of Gnetales. Interrelationships of Gnetopsida. Evolution of gymnosperms.

Suggested Readings

1. Bhatnagar, S.P. and Moitra, A; 1996: Gymnosperms. New Age International Pvt. Ltd., New Delhi.
2. Singh H.; 1978: Embryology of Gymnosperms, Encyclopedia of Plant Anatomy X. Gebruder Bortraeger, Berlin.
3. Sporne K R; 1991: The Morphology of Gymnosperms; Hutchinson Univ. Library; London.
4. Foster A S. & Gifford E. M; Comparative morphology of vascular Plants; Vakils, Feffer, & Simons Private Ltd. Bombay.
5. Chamberlain; Gymnosperms -Structure & Evolution; CBS Publishers & Distributors Delhi.
6. Shukla A C. & Mishra S. P.; Essentials of Paleobotany; Vikas Publishing House Pvt. Ltd. Delhi-Bombay-:6angalore-Calcutta-Kanpur .
7 Campbell; 1939: The evolution of land plants; Stanford University.
8. Sporne, K.R. 1991. The Morphology of Pteridophytes.

M.Sc. Botany
Syllabus

I SEMESTER

Paper 4 Plant Ecology

UNIT I: Ecology and Ecosystem- definition, Trophic organization and structure, Food chains & webs; energy flow pathways, Ecological efficiencies consumption, assimilation and production; Primary production -Methods of measurement of primary production, Global patterns, Limiting factors.

UNIT II: Fateofmatter inecosystemsandsoil:Recycling pathway, Relationship between energy flow and recycling pathways; Nutrient exchange and cycling; Global biogeochemical cycles of C, N, P and S; Physical, chemical and biological characteristics of soil.

UNITIII: Ecosystem development and stability: Temporal changes cyclic and non cyclic; Succession processes & types; Mechanism of succession facilitation, Tolerance and inhibition models; Concept of climax community. Ecological perturbation natural and anthropogenic, Ecosystem restoration.

UNIT IV: Community organization: Concepts of community and continuum; Analysis of community analytical and synthetic characters, Community coefficients. Indices of diversity, interspecific association negative and positive Inter action concept of ecological niche; Concepts of biodiversity; evolution and differentiation of species. allopatric & sympatric speciation; ecads and ecotypes

UNIT V: Population -Population & Environment; Population ecology, density & distribution, Natality, Mortality, Survivorship curves, Age structure & pyramids, Fecundity schedules, Life tables; Population growth . Exponential and logistic curves; Intra specific competition and self regulation; r-and k-strategies.

Suggested Readings

1. Smith. R.L. 1996. Ecology and Field Biology. Harper Collins. New York.
2. Muller-Dombois. D. and Ellenberg. H.1974. Aims and Methods 01 Vegetation Ecology, Wiley, New York
3. Begon. M.. Harper, J.L. and Townsend, C.R. 1996. Ecology. Blackwell Science. Cambridge.
4. Ludwig. J. and Reynolds. J.F. 1988. Statistical Ecology. John Wiley & Sons.
5. Odum. E.P. 1971. Fundamentals of Ecology. Saunders, Philadelphia.
6. Odum, E.P. 1983. Basic Ecology. Saunders, Philadelphia.
7. Barbour, M.G., Burk, J.H. and Pitts, W.O. 1987. Terrestrial Plant Ecology. Cummings Publication Company, California.
8. Kormondy, E.J. 1996. Concepts of Ecology. Prentice-Hall of India Pvt. Ltd., New Delhi.
9. Chapman, J.L. and Reiss, M.J. 1988. Ecology: Principles and Applications. t::ambridge University Press, Cambridge, U.K.
10. Moldan, B. and Billharz, S. 1997. Sustainability Indicators. John Wiley & Sons, New York.

DR A P J ABDUL KALAM UNIVERSITY , INDORE

M.Sc. Botany Syllabus
I SEMESTER PRACTICAL – 1

Practical Based on Theory Paper 1 & 2

Time – 4 Hrs **Max. Marks - 75**

1.	Microbiology exercise.	-	10
2.	Study of Mycological Material.	-	10
3.	Study of Algae Material	-	10
4.	Study of Bryophyta.	-	05
4.	Spot (1-5)	-	05
5.	Viva - Voce	-	05
6.	Record & Sessional.	-	00

Total - 50

M.Sc. Botany Syllabus

I SEMESTER PRACTICAL – 2

Practical Based on Theory Paper 3 & 4

Time – 4 Hrs **Max. Marks - 50**

1.	Study of Pteridophyta material.	-	10
2.	Detailed Study of Gymnosperm Material.	-	10
3.	Major ecological exercise.	-	10
4.	Minor ecological exercise.	-	05
5.	Spotting. (1-5)	-	05
6.	Viva.	-	05
7.	Record & Sessional.	-	05
	Total	-	50

Dr. A.P.J. Abdul Kalam University, Indore

Scheme of Examination

M.Sc. Botany

Semester-II

S.No	Sub. Code	Sub. Name	Theory Marks				Practical Marks		Total Marks
			End Sem.		Mid Sem./ Assignment Average of two				
			Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	
7.	MSB201T	Plant Development & Reproduction	85	28	15	05	-	-	100
8.	MSB202T	Morphology & Taxonomy of Angiosperms	85	28	15	05	-	-	100
9.	MSB203T	Utilization & Conservation of Plant Resources	85	28	15	05	-	-	100
10.	MSB204T	Cell Biology of Plants	85	28	15	05	-	-	100
11.	MSB205P	Practical Ist	-	-	-	-	50	17	50
12.	MSB206P	Practical IInd	-	-	-	-	50	17	50
Total									**500**

M.Sc. Botany Syllabus

II SEMESTER

Paper Ist

Plant Development & Reproduction

UNIT-I Unique features of plant development; Organization of root and shoot apical meristems Leaf- leaf growth and differentiation. Root-stem organization, Nodal anatomy.

UNIT-II Cell fates and lineages, tissue differentiation specially xylem and phloem, Secretary ducts and laticifiers. Secondary growth. Primary and secondary anomalies. Wood development in relation to environmental factors.

UNIT-III Vegetative propagations and sexual reproduction; flower is a modified shoot ; flower development (A,B,C models) and genetics of floral-organ differentiation; Homeotic mutants in *Arabidopsis* and *Antirrhinum*; Structure of anthers, microsporogenesis, role of tapetum, Pollen development and gene expression.Male sterility.

UNIT-IV Structure of Pistil, ovule development, mega-sporogenesis and mega-gametogenesis; monosporic, bisporic and tetrasporic embryo sacs. Pollination, mechanism and vectors. Pollen tube greet and guidance, pollen stigma interaction.Parthenocarpy.

UNIT-V Sporophytic and gametophytic self-incompatibility. double fertilization and triple fusion, endosperm development, embryogenesis, monocot & dicot embryo development polyembryony, apomixes. dynamics of fruit growth ; biochemistry and molecular biology of fruit maturation.

Suggested Readings

8 Bhojwani,S.S.and Bhatnagar,S.P.2000. The Embryology of Angiosperms(4th revised and enlarged edition). Vikas Publishing House,New Delhi.

9 Burgess.J.1985.An introduction to Plant Cell Development.Cambridge University Press,Cambridge.

10 Fageri,K.and Van der Pijl,L1979. The Principles of Pollination Ecology .Pergamon Press,Oxford.

11 Fahn, A 1 982.Plant Anatomy.(3rd edition).Pergamon Press,Oxford.

12 F osket, D .E.1994 .Plant Growth and Development. A Molecular Approach.Academic Press,San Diego.

11. Howell, S.H.1998. Molecular Genetics of Plant Development, Cambridge University Press, Cambridge.
12. Leins,P., Tucker,S.C.and Endress,P .K.1988.Aspects of Floral Development. J. Cramer, Germany.
13. Lyndon, R.F.1990.Plant Development. The Cellular Basis. Unin Hyman .London.
14. Murphy, T. M. and Thompson, W. E. 1988 Molecular Plant Development. Prentice Hall, New Jersey.
15. Proctor, M. and Yeo,P.1973.The Pollination of Flowers. William Collins Sons, London.
16. Raghvan, V .1997 .Molecular Embryology of Flowering Plants. Cambridge University Press, Cambridge.
17. RaghVan, V. 1999. Development Biology of Flowering P Jants. Springer-verlag.
18. Chandurkar P.J. Plant Anatomy.
19. Vashishitha P.C. Plant Anatomy.
20. Pandey B.P. Plant Anatomy.
21. Esau K. Plant Anatomy.

M.Sc. Botany Syllabus

II SEMESTER

Paper IInd

Morphology & Taxonomy of Angiosperms

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UNIT I: Morphology of stamens, Morphology of carpels, carpel evolution, Morphology of inferior ovary; Placentation types and their origin.

UNIT II: The species concept: taxonomic hierarchy, Binomial nomenclature & ICBN. Modern trends in taxonomy- morphology, anatomy, palynology, embryology, cytology, phytochemistry in relation to taxonomy, serological, biochemical and molecular techniques.

UNITIII: Systems of angiospermic classifications - phenetic versus phylogenetic systems, Benthem and Hooker's classification,Takhtazan's classification, Dahlgren's APG system of classification, merits & demerits of above classifications,Taxonomic tools- herbarium and floras.

UNIT IV: Taxonomy, floral structure and phylogeny of –

a- Ranales
b- Geraniales
c- Caryophyllales
d- Rosales
e- Asterales

UNIT V: Taxonomy, floral structure and phylogeny of –

a- Lamiales
b- Euphorbiales
c- Alismatales
d- Arecales
e- Orchidales

Suggested Readings

1. Heywood & Moore, D.M; 1984: CWTent concept *in* Plant Taxonomy Academic Press.
2. Banson, L.B.; 1957: Plant Classification, Health & Co. Boston.
3. Davis, P.R & Heywood, V.H 1973: Principles of Angiosperms and Taxonomy, Robert E.

4. Kreiger Pub. *Co.* New *York,* USA
5. Eames, AI.; 1961: Morphology of Angiosperms, Mc-Graw Hill, New York.
6. Jeffery, C.; 1968: An Introduction to Plant Taxonomy J. & H. Churchill Limited.
7. Lawrence, G .H.M.; 1951: Taxonomy of Vascular Plants Macmillan, New York.
8. Naik V. N.; 1984: Taxonomy of Angiosperms. Tata Mc-Graw Hill Pub. Co. Ltd. New Delhi.
9. Porter, L.L.; 1959: Taxonomy of Flowering Plants. San Francisco. Radfor~ *AE.* Dickinson,
10. W.C. MasseyJ.R and. Ben. C.R: 1974: VQ~llar Plant SYstematics, Harper & Row, New York
11. Core E.L.; Plant Taxonomy.
12. Heywood V.H.: Plant Taxonomy
13. Nath R. : Plant Taxonomy.
14. Clive A. Stace : Taxonomy.
15. Houpt. A.W. Plant Morphology
16. Bold H.C. Plant Morphology
17. Biol H.C. Plant Morphology

M.Sc. Botany Syllabus

II SEMESTER

Paper IIIrd

Utilization & Conservation of Plant Resources

UNIT I: Major Biomes of the world- Tropical, Temprate Boreal and Seasonal forests, rain & Seasonal Forests,, Grasslands, Deserts; AquaticEcosystems, wetlands, Lake ,Pond,River, Stream, , Estuarine, Marine habitats.

UNIT II: Organization of Resources- utilization of Resources from forest,Grassland and aquatic habitat ; Food forage, Fodder, Timber & Non-wood forest products; Threats to quality & quantity of Resources due to overexploitation.

UNITIII: Conservation of resources: Classifications of resources; Principles of conservation; *In-situ* conservation, sanctuaries, National parks, Biosphere reserves for wildlife conservation; Habitat conservation practices of conservation for forests, ranges, soil and water; Ex-situ conservation- Botanical gardens, field gene banks, seed banks, cryo-banks.

UNIT IV: Pollution & Climate Change: Air, Water and Soil pollution, Kinds, Sources, Quality parameters, Effects on structure & function of ecosystems; Management of pollution; Bioremediation; Climate changes sources, Trends & role of greenhouse gases, Effect of global warming on climate, Ecosystem processes & Biodiversity; Ozone layer & Ozone hole.

UNIT V: Resource monitoring: Remote sensing concepts & Tools, Satellite remote sensing basics sensors, Visual & digital interpretation, EMR bands and their applications; Indian remote sensing programme; thematic mapping of resources Application of remote sensing in Ecology & Forestry.GIS

Suggested Readings

1. Moldan, B. and Billharz, S. 1997. Sustainability Indicators. John Wiley & Sons, New York.
2. Treshow. M. 1985. Air Pollution and Plant Life. Wiley Interscience.
3. Heywood, V.H. and Watson. R.T. 1995. Global Biodiversity Assessment. Cambridge University Press.

4. Mason, C.F. 1991. Biology of Freshwater Pollution. Longman. ’
5. Hill. M.K. 1997. Understanding Environmental Pollution. Cambridge University Press.
6. Brady, N.C. 1990. The Nature and Properties of Soils. MacMillan.
7. Kothari, A 1997. Understanding Biodiversity: Life’Sustainability and Equity. Orient Longman.
8. Kohli, R., Arya, K.S., Singh, P.H. and Dhillon, H.S. 1994. Tree Directory of Chandigarh.Lovedale Educational, New Delhi.
9. Nair, M.N.B. et. al (Eds) 1998. Sustainable Management of Non-wood Forest Products.
10. Faculty of Forestry, Universiti Putra Malaysia. 434004 PM Serdong, Selangor, Malaysia.
11. Paroda, R.S. and Arora, R.K. 1991. Plant Genetic Resources Conservation and Management. IPGRI (Publication) S0uth Asia Office, C/o NBPGR, Pusa Campus, New Delhi.
12. Pjmentel, D. and Hall, C.W. (eds) 1989. Food.and Natural Resources. Academic Press, London-New York. .

M.Sc. Botany Syllabus

II SEMESTER

Paper IVth
Cell Biology of Plants

UNIT I: Structural organization of the plant cell; specialized plant cell types. Biogenesis, structure and functions of cell wall. Cytoskeleton: organization and role ofmicrotubules and microfilaments. Chemical composition of cell wall.

UNIT II: Plasma membrane: structure, models and functions; sites for ATPases; ion carriers,channels and pumps; receptors. Structure of plasmodesmata, role in movement of molecules; comparison with gap junctions. vacuoles: tonoplast membrane,

UNITIII: Cholorplast: structure, genome organization, gene expression, nucleo-chloroplastic interactions; mitochondira: structure, genome organization, biogenesis. Plant ATPases, trasporters, as storage organelle. Other cell organelles: golgi apparatus, lysosomes, endoplasmic reticulum.

UNIT IV: Nucleus: structure. Cell cycle: control mechanisms; role of cyclins and cyclindependent kinases; mechanisms of programmed cell death. Chromosome structure and packaging of DNA; euchromatin and heterochromatin; karyotype analysis and evolution; banding patterns; specialized types of chromosomes.

UNIT V: Origin, meiosis and breeding behaviour of duplication, deficiency, inversion and translocation heterzygotes; origin, occurrence, production and meiosis of haploids,aneuploids and euploids; Origin and production of autopolyploids. Allopolyploids; types, genome constitution and analysis.

Suggested Readings

1. Lewin, B. 2000, Genes VIL Oxford University Press, New York.
2. Alberts, B., Bray, D., Lewis, J., Ratf, M., Roberts, K., and Watson, J.D. Molecular Biology of the Cell. Garland Publishing:Inc., New York.
3. Wolfe, S.L. 1993. Molecular and Cellular Biology, Wadsworth Publishing Co., California, USA
4. Rost, T. et: aI. 1998.PIant Biology, Wadsworth Publishing Co., California, U.S.A
5. Krishanmurthy K V. 2000 Methods in Cell Wall Cytochemistry, CRC Press, Boca Raton,Florida U.S.A
6. Buchanan, B.B. Groissem, W. and Jones, RL. 2000. Biochemistry And Molecular Biology of
7. Plants. American Society of Plant Physiologists, Maryland, USA
8. De, D.N. 2000: Plant Cell Vacuoles: An Introduction. CSIRO Publication, ColliJ18W~Australia.

M.Sc. Botany Syllabus

II SEMESTER PRACTICAL – Ist

Practical Based on Theory Paper Ist & IInd

Time – 4 Hrs **Max. Marks - 50**

1.	Major exercise based on Anatomy.	-	10
2.	Major exercise based on Taxonomy.	-	10
3.	Minor exercise based on Taxonomy.	-	10
4.	Minor exercise based on Embryology/Placentation	-	05
5.	Spot 1 to 5	-	05
6.	Viva-Voce	-	05
7.	Sessional/Record	-	05

Total - 50

M.Sc. Botany Syllabus

II SEMESTER PRACTICAL – IInd

Practical Based on Theory Paper IIIrd & IVth

Time – 4 Hrs **Max. Marks - 50**

1.	Exercise based on cell biology.	-	10
2.	Exercise based on Cytogenetics.	-	10
3.	Morphology, anatomy and Economic Important of any (Food/Forage/Fibre oil Yielding)	-	10
4.	Report of Field Survey Prescribed in Syllabus.	-	05
5.	Spotting 1 to 5	-	05
6.	Viva-Voce	-	05
7.	Sessional and Record	-	05

Total - 50

Dr. A.P.J. Abdul Kalam University, Indore

Scheme of Examination
M.Sc. Botany
Semester-III

(Non Grading)

S.No	Sub. Code	Sub. Name	Theory Marks				Practical Marks		Total Marks
			End Sem.		Mid Sem./ Assignment Average of two				
			Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	
1.	MSB301T	Plant Physiology	85	28	15	05	-	-	100
2.	MSB302T	Plant Biochemistry & Metabolism	85	28	15	05	-	-	100
3.	MSB303T	Cytogenetics & Genetics	85	28	15	05	-	-	100
4.	MSB304T	Molecular Biology of Plants	85	28	15	05	-	-	100
5.	MSB305P	Practical I – based on Course PG 301 & 302	-	-	-	-	50	17	50
6.	MSB306P	Practical II – based on Course PG 303 & 104	-	-	-	-	50	17	50
Total									**500**

M.Sc. Botany Syllabus

III SEMESTER

Plant Physiology (MSB301T)

UNIT I:

Principles of thermodynamics, free energy and chemical poetential, redox reactions, structure and functions of ATP, Plant water relations, mechanisms of water transport through xylem, root-microbe interactions in facilitating nutrient uptake. Membrane transport proteins.

UNIT II:

Phloem transport; phloem loading and unloading, passive and active solute transport. Signal transduction; overview, receptors andg proteins, phospholipids singaling, role of cyclic nucleotides, calcium-calmodulin cascade. Specific signaling mechanisms, for example, two-component sensor regulator system in bacteria and plants. Sucrose-sensing mechanism.

UNIT III:

Plant growth regulators and elicitors: Physiological effects andmechanism of action of auxins, gibberellins, cytokinins, ethylene, abscisic acid, brassinosteroids, polyamines, jasmonic acid, and salicylic acid. Hormone receptors, singal transduction and gene expression.

UNIT IV:

Flowering process: photoperiodism and its significance, endogenous clock and its regulation. Floral induction and development. Phytochromes and cryptochromes, their photochemical and biochemical properties. Molecular mechanism of action of photomorphogenetic receptors, signaling and gene expression. Role of vernalization.

UNIT V:

Stress physiology: Plant responses to biotic and abiotic stress. Water deficit and drought resistance. Salinity stress and resistance. Concepts of freezing, heat and oxidative stresses.

Suggested readings

- Hopkins, W.G. 1995. Introduction to Plant Physiology. John Wiley & ,Sons, Inc., New York, USA.
- Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell, J.
- 2000.Molecular cell Biology (fourth edition). W.H. ,Freeman and Company, New York USA.

- Moore, T.C. 1989. Biochemistry and Physiology of Plant Hormones (second edition).
- Springer -Verlag, New York. USA.
- Nobel, P.S. 1999. Physiochemical and Environmental Plant Physiology (second edition).
- Academic Press, San Diego, USA.
- Salisbury FB and Ross CW 1991 Plant Physiology IV edition Wdsworth Publishing co.
- California usa.
- Taiz l and Zeiger E1998 Pant Pysiology II Edition. Sinauer Associates Inc. Publisher MS.
- Dennis DT and Terpin DH Lefevere DD and Layzell DV 1997 Plant Metabolism II Ed.
- Longman England.

M.Sc. Botany Syllabus

III SEMESTER

Plant Biochemistry & Metabolism (MSB302T)

UNIT I:
Fundamentals of enzymology: general aspects, allosteric mechanism, regulatory and actice sites, isozymes, kinetics of enzymatic catalysis, Michaelis- Menten equation and its significance, Mechanism of enzyme action.

UNIT II:
Photochemistry and photosynthesis: General concepts and historical background, evolution of photosynthetic apparatus, photosynthetic pigments and light – harvesting complexes. Photooxidation of water, mechanism of electron and proton transport, Carbon assimilation; Calvin cycle, photorespiration and its significance, C4-cycle, CAM pathway, physiological and ecological considerations. Biosynthesis of starch and sucrose.

UNITIII:
Respiration and lipid metabolism: Overview of plant respiration, glycolysis, TCA cycle, electron transport and ATP synthesis. Oxidative pentose phosphate pathway, glyoxylate cycle, alternative oxidase system.

UNIT IV:
Structure and functions of lipids, fatty acid biosynthesis, synthesis of membrane lipids, structural lipids and storage lipids and their catabolism. Sulphate uptake, transport and assimilation.

UNIT V:
Nitrogen fixation, nitrogen and sulphur metabolism: Overview, biological nitrogen fixation, nodule formation and nod factors. Mechanism of uptake and reduction, ammonium assimilation.

Suggested readings

- Hopkins, W.G. 1995. Introduction to Plant Physiology. John Wiley & ,Sons, Inc., New York, USA.
- Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell, J.
- 2000.Molecular cell Biology (fourth edition). W.H. ,Freeman and Company, New York USA.
- Moore, T.C. 1989. Biochemistry and Physiology of Plant Hormones (second edition).
- Springer -Verlag, New York. USA.

- Nobel, P.S. 1999. Physiochemical and Environmental Plant Physiology (second edition).
- Academic Press, San Diego, USA.
- Salisbury FB and Ross CW 1991 Plant Physiology IV edition Wdsworth Publishing co.
- California usa.
- Taiz l and Zeiger E1998 Pant Pysiology II Edition. Sinauer Associates Inc. Publisher MS.
- Dennis DT and Terpin DH Lefevere DD and Layzell DV 1997 Plant Metabolism II Ed.
- Longman England.

M.Sc. Botany Syllabus

III SEMESTER

Genetics & Cytogenetics (MSB303T)

UNIT I:
Genetics of prokaryotes and eukaryotic organelles; genetic recombination in phage; mapping the bacteriophage genome; genetic transformation, conjugation and transduction in bacteria. Genetics of mitochondria and chloroplasts; cytoplasmic male sterility.

UNIT II:
Genetic recombination and genetic mapping; Recombination, independent assortment and crossing-over, molecular mechanism of recombinatio. Chromosome mapping, linkage groups, genetic markers, construction of molecular maps, somatic cell genetics- an alternative approach to gene mapping.

UNITIII:
Mutations: spontaneous and induced mutations, physical and chemical mutagens, molecular basis of gene mutations. Transposable elements in prokaryotes and eukaryotes. Mutations induced by transposons, site-directed mutagenesis. DNA damage and repair mechanisms.

UNIT IV:
Cytogenetics of aneuploids and structural heterozygotes, effect of aneuploidy on phenotype in plants, transmission of monosomics and trisomics and their use in chromosome mapping of diploid and polyploidy species. Complex translocation heterozygotes. Robertsonian translocations. B-A translocations.

UNIT V:
Molecular Cytogenetics; Nuclear DNA content, c-value paradox, *cot* curve and its significance, restriction mapping – concept and techniques, multigene families and their evolution. Transfer of whole genome, examples from wheat and *Brassica;* genetic basis of inbreeding and heterosis; exploitation of hybrid vigour.

Suggested Readings

- Alberts, B. Bray, D. Lewis, J. Raff: M. Roberts, K. and Watson,J. D. 1989 Molecular Biology of the Cell (2nd edition). Garland Publishing Inc., New York. U. S. A.
- Atherly, AG. Girton, J.R and Mc Donald, J.E. 1999. The Science of Genetics: Saunders College Publishing, Fort Worth, U.S.A.

- Burnham, C.R 1962. Discussions in Cytogenetics, Burgess Publishing Co. Minnesota. Busch. H. and Rothblum. L. 1982. Volume X. The Cell Nucleus rDNA Part A. Academic Press.
- Hartl, D.L. and Jones, E. W. 1998. Genetics: Principles and Analysis (4th edition). Jones & Bartlett Publishers, Massachusetts, USA
- Khush, G.S. 1973. Cytogenetics of Aneuploids. Acedemic Press, New York, London.
- Karp, G. 1999 Cells and Molecular Biology: Concepts and Experiments John Wiley & Sons, Inc. U. S.A
- Lewin: B. 2000 Gene VII. Oxford University Press, New York, U.S.A
- Lewis, R. 1997. Human Genetics: Concepts and Applications. (2nd edition). WCB McGraw Hill, U.S.A
- Malacinski, G. M. and Freifelder, D. 1998. Essentials of Molecular Biology *(3M* edition). Jones and Barlett Publishers, Inc. London.
- Russel, P.J. 1998. Genetics (5th edition). The Benjamin / Cummings Publishing Company Inc., U. S. A
- Snustead, D. P. and Simmons, M. J. 2000. Principles of Genetics (2nd edition). Jhon Wiley & Sons Inc., U.S.A

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III SEMESTER

Molecular Biology of Plants (MSB304T)

Unit I:
DNA structure; A, B and Z forms; replication; damage and repair; transcription; plant promoters and transcription factors; splicing; messenger RNA transport; ribosomal RNA biosynthesis.

Unit II:
Gene structure and expression; genetic fine structure; cis-trans test; fine structure analysis of eukaryotes; introns and their significance; RNA splicing; regulation of gene expression in prokaryotes and eukaryotes.

Unit III:
Ribsosomes: structure and site of protein synthesis; mechanism of translation, initiation, elongation and termination; structure and role of transfer RNA; protein sorting; targeting of proteins to organelles.

Unit IV:
Cell cycle and apoptosis, control mechanisms; role of cyclins and cyclin dependent kinases; retinoblastoma and E2F proteins; cytokinesis and cell plate formation; mechanism of programmed cell death.

Unit V:
Immunotechniques, In situ hybridization – concepts and techniques, physical mapping of genes on chromosomes. In situ hybridization to locate transcript in cell types; FISH; Flow cytometry and confocal microscopy.

Suggested Readings

- Lewin, B. 2000, Genes Vll, Oxford University Press, New York.
- Alberts, B., Bray, D., Lewis, J., Raff, M., Roberts, *K.,* and Watson, J.D. 1999.Molecular Biology of the Cell. Garland Publishing:Inc., New York.
- Wolfe, S.L. 1993. Molecular and Cellular Biology, WadsworthPublishing Co., California, USA. Rost, T. et al. 1 998.Plant Biology, Wadsworth Publishing Co.,California, U.S.A
- Krishanmurthy K. V. 2000 Methods in Cell Wall Cytochemistry, CRCPress, Boca Raton, Florida U.S.A Buchanan, B.B. Gruissem, W. and Jones, RL. 2000. Biochemistry And Molecular Biology of Plants. American Society of Plant Physiologists, Maryland, USA

- De, D.N. 2000 Plant Cell Vacuoles: An Introduction.CSIRO Publication, Collingwood, Australia. Kleinsmith, L.J. and Kish, V.M. 1995. Principles of Cell and Molecular Biology (2nd Edition). Harper Collins College Publishers, New York, USA
- Lodish H. Bert, A,zipursky, S.L.,Matsudaira, p.,Baltimore, D. and Darnell, J. 2000.Molecular Cell Biology, W.H.Freeman and Co., NewYork, U.S.A
- Pollard, T. S. and EaJ-nshaw, W. C. 2002 Cell Biology. Saunders,Philadelphia, U.S.A Twyman, R. M. 2003. Advanced Molecular Biology. Viva BooksPrivate Ltd. New Delhi.

Dr. A.P.J. Abdul Kalam University, Indore

Scheme of Examination
M.Sc. Botany
Semester-IV

(Non Grading)

S.No	Sub. Code	Sub. Name	Theory Marks				Practical Marks		Total Marks
			End Sem.		Mid Sem./ Assignment Average of two				
			Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	
1.	MSB401T	Plant Cell, Tissue & Organ Culture	85	28	15	05	-	-	100
2.	MSB402T	Biotechnology & Genetic Engineering	85	28	15	05	-	-	100
3.	MSB403T	**Elective I***	85	28	15	05	-	-	100
		Plant Pathology							
		Industrial Microbiology							
4.	MSB404T	**Elective II***	85	28	15	05	-	-	100
		Plant Society							
		Pollution Ecology							
5.	MSB405P	Practical I – based on Course PG 401 & 402	-	-	-	-	50	17	50
6.	MSB406P	Practical II – based on Course PG 403 & 404	-	-	-	-	50	17	50
7.	MSB407P	Project work	-	-	-	-	100	33	100
Total									**600**

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IV SEMESTER

Plant Cell, Tissue & Organ Culture (MSB401T)

UNIT I:
Plant cell and tissue culture: general introduction, history, scope, concept of cellular differentiation and totipotency.

UNIT II:
Techniques of tissue culture. Organ culture – meristem, anther and embryo. In vitro fertilization.

UNITIII:
Organogenesis and adventive embryogenesis; fundamental aspects of morphogenesis, somatic embryogenesis and androgenesis. Mechanisms, techniques and utility.

UNIT IV:
Somatic hybridization, protoplast isolation, fusion and culture, hybrid selection and regeneration; possibilities and achievements and limitations of protoplast research.

UNIT V:
Application of plant tissue culture; clonal propagation; artificial seeds; production of hybrids, somaclones and somaclonal variation; production of secondary metabolites/ natural products; cryopreservation and germplasm storage.

Suggested Reading

- Butenko, R.G. 2000. Plant Cell Culture. University Press of Pacific.
- Collin, H.A. and Edwards, S. 1998. Plant Cell Culture. Bios Scientific Publishers, Oxford, UK.
- Dixon, R.A. (Ed.) 1987. Plant Cell Culture: A Practical Approach. IRL Press, Oxford.
- Gelvin, S.B. and Schilperoort, R.A. (Eds), 1994. Plant Molecular Biology Manual, 2nd edition, Kluwer Academic Publishers, Dordrecht, The Netherlands.
- George, E.F. 1993. Plant Propagation by Tissue Culture. Part 1. The Technology, 2nd edition.Exeg.etics Ltd., Edington, UK.
- George, E.F. 1993. Plant Propagation by Tissue Culture. Part 2. In Practice, 2nd edition.
- Exegetics Ltd., Edington UK.

- Glick, B.R. and Thompson, J.E. 1993. Methods in Plant Molecular Biology and Biotechnology. GRC Press, Boca Raton, Florida.
- Glover, D.M. and Hames, B.D. (Eds), 1995. DNA Cloning 1 : A Practical Approach; Core
- Techniques, 2nd edition. PAS, IRL Press at Oxford University Press, Oxford.

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IV SEMESTER

Biotechnology & Genetic Engineering (MSB402T)

UNIT I:
Biotechnology and Genetic Engineering: basic concepts, principles and scope. Intellectual Property Rights – possible ecological risks and ethical concerns.

UNIT II:
Recombinant DNA technology; gene cloning – principles and techniques; construction of genomic/ cDNA libraries; choice of vectors; DNA synthesis and sequencing, polymerase chain reaction. DNA fingerprinting

UNITIII:
Genetic engineering of plants, aims, strategies for development of transgenics (with suitable examples); *Agrobacterium* – the natural genetic engineer; T-DNA and transposon mediated gene tagging; chloroplast transformation and its utility.

UNIT IV:
Microbial genetic manipulation; bacterial transformation; selection of recombinants and transformants; genetic improvements of industrial microbes and nitrogen fixers; fermentation technology.

UNIT V:
Genomics and Proteomics; genetic and physical mapping of genes; molecular markers for introgression of useful traits; artificial chromosomes; high throughput sequencing; genome projects; bioinformatics; functional genomics; microarrays; protein profiling and its significance.

Suggested Reading

- Gelvin, S.B. and Schilperoort, R.A. (Eds), 1994. Plant Molecular Biology Manual, 2nd edition, Kluwer Academic Publishers, Dordrecht, The Netherlands.
- Glick, B.R. and Thompson, J.E. 1993. Methods in Plant Molecular Biology and Biotechnology. GRC Press, Boca Raton, Florida.
- Glover, D.M. and Hames, B.D. (Eds), 1995. DNA Cloning 1 : A Practical Approach; Core Techniques, 2nd edition. PAS, IRL Press at Oxford University Press, Oxford.
- Brown, T.A. 1999. Genomes. John Wiley & sons, Singapore

- Callow, J.A., Ford-Lloyd, B.V. and Newbury, H.J. 1997. Biotechnology and Plant Genetic Resources: Conservation and Use. CAB International, Oxon, UK.
- Jolles, O. and Jornvall, H. (eds.) 2000. Proteomics in Functional Genomics. Birkhauser Verlag, Basel, Switzerland.
- Primrose, S.B. 1995. Principles of Genome Analysis. Blackwell Science Ltd., Oxford, U

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IV SEMESTER

(MSB403T)

M. Sc. Botany (Semester System)

List of suggested Project work/Dissertation work

The following is the list of the proposed areas of dissertation/ project work. The concerned university and college may encourage the students to undertake project work in collaboration with industrial and research organizations.

- Plant Biodiversity Assessment
- Conservation of Endangered Species
- Inventroization of Unexplored Areas and Hotspots
- Pollution Monitoring
- Survey of Less-known Economic Plants of India
- Chromosome Analysis and Indexing of Indian Flora
- Bioremediation of Xenobiotics
- Exploitation of Secondary Metabolites
- Extraction of Allelochemicals
- Tissue Culture of Economic Plants
- Assessment of Pollution Toxicity by Bioassay
- Microbial proteins
- Enzymes
- Cosmetic Products from microbes and plants
- Nutraceuticals from microbes and plants
- Pharmaceutical Products
- Ethnobotany
- Chemotaxonomy
- Cladistics
- Protein Profiling
- DNA Fingerprinting
- Microarrays
- FISH (Fluorescent In Situ Hybridization)
- Mutation
- Plant Hormones and Growth promoters
- Bioinformatics

- Application of PCR
- Somatic Hybridization
- Biofertilizers and Bioinoculants
- Transgenics
- Exploitation of Rhizospheric microbes including mycorrhizae
- Recycling of domestic, municipal and industrial wastes
- Vermicomposting and Biomethanation
- Environmental Monitoring
- Assessment of Pollution in different habitats