Government Arts and Science College
Ratlam (M.P.) 457001

Internal Quality Assurance Cell
Govt. Arts & Science College, Ratlam (M.P.)

Phone: 07412 - 235149 E-mail: hegaaspgcrat@mp.gov.in, pgcolrtm@hotmail.com

For the session 2020-21 the syllabus have been adopted from Central Board of Studies, Bhopal and Vikram University, Ujjian for UG and PG respectively.

Principal

Govt. Arts and Science College

Ratlam (M.P.)

Principal
Govt. Arts & Science College
Ratlam (M.P.)

M. Sc. Botany (Semester System)

First Semester

Course PG 101: Biology & Diversity of Viruses, Bacteria and Fungi 85+ 15

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

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.

UNITIII: 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 and 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 (Semester System)
First Semester
Course PG 102: Biology & Diversity of Algae & Bryophytes 85+15

UNIT I: Algae – General characters, diversified habitats, thallus organization, criteria of classification (pigments, reserve food, 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, Charophyta 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 Sphagnales, 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.

M. Sc. Botany (Semester System)
First Semester
Course PG 103: Biology & Diversity of Pteridophytes & Gymnosperms

85+15

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: Pteridophyta: Morphology, anatomy reproduction and life history of
Psilopsida: Morphology, anatomy reproduction and life history of
Lycopsida: Morphology, anatomy reproduction and life history of
Sphenosida: Morphology, anatomy reproduction and life history of
Pteropsida

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: Gymnosperms:
General account of Cycadeoidales,
General account of Corditales,
General account of Cycadales.
General account of Ginkgoales.

UNIT V: Gymnosperms: Morphology, structure and reproduction of Coniferales,
Morphology, structure and reproduction of Ephedrales
Morphology, structure and reproduction of Welwitschiales
Morphology, structure and reproduction of Gnetales.
Inter relationships 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 (Semester System)
First Semester
Course PG 104: Plant Ecology 85+15

UNIT I: Ecology and Ecosystem- 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: Fate of matter in ecosystems and soil: 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 continuam; 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 & sypatric speciation; ecads and ecotypes

UNIT V: Population ecology -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.

Scheme of Practical Examination
M.Sc. I Sem. Botany (Practical – I)
(Based on PG 101 & 104)

Time 4 hrs. **Maximum Marks 50**

1.	Microbiology exercise.	-	05
2.	Study of Mycological Material.	-	10
3.	Major ecological exercise.	-	10
4.	Spotting (1-5)	-	10
5.	Viva - Voce	-	05
6.	Record & Sessional.	-	10

Total - 50

Scheme of Practical Examination
M.Sc. I Sem. Botany (Practical – II)
(Based on PG 102 & 103)

Time 4 hrs. Maximum Marks 50

1.	Study of Algal Material .	-	06
2.	Study of Bryophyta.	-	06
3.	Study of Pteridophyta material.	-	06
4.	Detailed Study of Gymnosperm Material.	-	07
5.	Spotting. (1-5)	-	10
6.	Viva.	-	05
7.	Record & Sessional.	-	10

Total	-	50

M. Sc. Botany (Semester System)
Second Semester
Course PG 201: Plant Development & Reproduction 85+ 15

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.

UNITIII: Vegetative propagations and sexual reproduction; flower as a modified shoot; flower development (A, B, C model) 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,
Embryo-genesis, monocot & dicot embryo development
Polyembryony, apomixis.
Dynamics of fruit growth; biochemistry and molecular biology of fruit maturation.

Suggested Readings

1. Bhojwani,S.S.and Bhatnagar,S.P.2000. The Embryology of Angiosperms(4th revised and enlarged edition). Vikas Publishing House,New Delhi.
2. Burgess.J.1985.An introduction to Plant Cell Development.Cambridge University Press,Cambridge.
3. Fageri,K.and Van der Pijl,L1979. The Principles of Pollination Ecology .Pergamon Press,Oxford.
4. Fahn, A 1 982.Plant Anatomy.(3rd edition).Pergamon Press,Oxford.
5. F osket, D .E.1994 .Plant Growth and Development. A Molecular Approach.Academic Press,San Diego.
6. Howell, S.H.1998. Molecular Genetics of Plant Development, Cambridge University Press, Cambridge.
7. Leins,P., Tucker,S.C.and Endress,P .K.1988.Aspects of Floral Development. J. Cramer, Germany.
8. Lyndon, R.F.1990.Plant Development. The Cellular Basis. Unin Hyman .London.
9. Murphy, T. M. and Thompson, W. E. 1988 Molecular Plant Development. Prentice Hall, New Jersey.
10. Proctor, M. and Yeo,P.1973.The Pollination of Flowers. William Collins Sons, London.
11. Raghvan, V .1997 .Molecular Embryology of Flowering Plants. Cambridge University Press, Cambridge.
12. RaghVan, V. 1999. Development Biology of Flowering P Jants. Springer-verlag.
13. Chandurkar P.J. Plant Anatomy.
14. Vashishitha P.C. Plant Anatomy.
15. Pandey B.P. Plant Anatomy.
16. Esau K. Plant Anatomy.

M. Sc. Botany (Semester System)
Second Semester
Course PG 202: Morphology & Taxonomy of Angiosperms

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 angiosperm classifications, phenetic versus phylogenetic systems, Benthem and Hooker's classification, Takhtajan's classification, Dahlgren's APJ system of classification, merits & demerits of above classifications, Taxonomic tools- herbarium and floras.

UNIT IV: Taxonomic studies of families - Magnoliaceae, Annonaceae, Papaveraceae, Capparidaceae, Caryophyllaceae , Meliaceae, Rosaceae, Myrtaceae, Cucurbitaceae.

UNIT V: Taxonomic studies of families – Rubiaceae, Apocynaceae, Convolvulaceae, Acanthaceae, Verbenaceae, Orchidaceae, Arecaceae, Poaceae

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 (Semester System
Second Semester 85+15
Course PG 203: Utilization & Conservation of Plant Resources

UNIT I: Major Biomes of the world-
Tropical, Temperate, Boreal and Seasonal forests,
Rain & Seasonal Forests,, Grasslands, Deserts;
Aquatic Ecosystems, wetland, 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 change 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 (Semester System)
Second Semester
Course PG 204: Cell Biology of Plants 85+15

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

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

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; special 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.

Scheme of Practical Examination
M.Sc. II Sem. Botany
(Based on PG 201 & 202)
Plant development and Reproduction
&
Morphology and Taxonomy of Angiosperm

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 Embryology/ Placentation	-	05
4.	Spotting 1 to 5	-	10
5.	Viva-Voce	-	05
6.	Sessional/Record	-	10

Total - 50

Scheme of Practical Examination
M.Sc. II Sem. Botany
(Based on PG 203 & 204)

Time – 4 Hrs **Max. Marks - 50**

1.	Exercise based on cell biology.	-	05
2.	Exercise based on Cytogenetics.	-	05
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	-	10
6.	Viva-Voce	-	05
7.	Sessional and Record	-	10

Total - 50

M. Sc. Botany (Semester System)
Third Semester
Course PG 301: Plant Physiology 85+15

UNIT I: Osmotic relation of plant cells-osmosis and diffusion,
Osmotic pressure, Wall pressure , turgor pressure,
DPD, water potential, Absorption of water, Ascent of sap
Transpiration, mechanism of water transport through xylem.

UNIT II: Phloem transport –Phloem transport, loading and unloading.
Passive and active solute transport. Signal transduction over view, receptor-proteins, phospholipids signaling, role of cyclic nucleotides
Calcium calmodulin cascade

UNITIII: plant growth regulator and elicitors- physiological effects and mechanism of action of auxins, gibberellins, cytokinins, ethylene, abscisic acid,
Brassinosteroids, polyamines
Jasmonic acid and salicylic acid.
Harmone receptors.

UNIT IV: Flowering process- Photoperiodism and its significance.
Endogenous clock and its regulation.
Floral induction and development
Phytochrome and cytocrome, their photochemical and biochemical properties
Vernalization

UNIT V- Stress physiology
Plant responses to biotic and abiotic stress,
Water deficit and drought resistance.
Salinity stress and resistance,
Concept of freezing, heat and oxidative stresses.

Suggested Laboratory Exercise based on P.G.301:

1. Radioisotope methodology, autoradiography, instrumentation (GM counter and scintillation counter) and principles involved
2. Priniciples of colorimetry,spectrophotometry, and florimetry/calorimetry.
3. Determine rate of transpiration by Ganong's potometer
4. Determine rate of respiration in germinating/young buds by Ganong's respirometer

M. Sc. Botany (Semester System)
Third Semester
Course PG 302: Plant Biochemistry and Metabolism

UNIT I: Fundamental Enzymology
Characters and classification of Enzymes. Factors affecting enzymetic activities.
Allosteric mechanism, Regulatory and active site, isoenzymes.
Mechanism of enzyme action
Michalis Menton equation and its significance.
Inhibition of enzymes- competitive ,noncompetitive and mixed inhibition.

UNIT II: Photochemistry and photosynthesis.
General concept, evolution of photosynthetic apparatus,
Photosynthetic pigments and photosystem,
Photo-oxidation of water, mechanism of electron and proton transport.
Carbon assimilation- calvin cycle, photorespiration and its significance, C4 cycle.
Factors affecting photosynthesis.

UNITIII: Respiration- general Concept.
Overview of plant respiration,
Glycolysis, TCA cycle
Electron transport system and ATP synthesis, Oxidative phosphorelation
Pentose phosphate Pathway.
Glyoxalate cycle, alternative oxidase system,
Structure and function of ATP.

UNIT IV: Lipid and Sulphate Metabolism
Structure and function of lipids.
Fatty acid biosynthesis and oxidation Ketone bodies.
Sulphate uptake, transport and assimilation.

UNIT V: Nitrogen Metabolism
Nitrogen metabolism over view
Nitrogen fixation mechanism
Nodule formation
Ammonium assimilation

Suggested Laboratory Exercise based on P.G. 302.

1. Effect of time and enzyme concentration on the rate of reaction of enzyme C e.g. acid phosphate, nitrate reductase.

2. Effect of substrate concentration on activity of any enzyme C(catalase, amylase).

3 Demonstration of the substrate inducibility of the enzyme nitrate reductase..

4. Determination of succinate dehydrogenase activity, its kinetics and sensitivity to inhibitors.

5. Separation of isoenzyme of esterase, peroxidases by native polyacrelamide gel electrophoresis.6- 6-6. To demonstrate photophosphorylation in intact chloroplast, resolve the phosphoproteins by SDS-PAGE and perform autoradiography desalting of proteins by gel filtration chromatography embaying Sephadex G-25.

7. Extraction of seed proteins depending upon the solubility.

8. Desalting of proteins by gel filtration chromatography employing Sephadex G-25.

9. Preparation of standard curve of protein and estimation of protein contents in extracts of plant material by Lowry's Bradford's method.

10. Fraction of proteins using gel filtration chromatography by Sephadex G-100 or Sephadex G-200.

Suggested readings-

1. Lodish,H.,Berk,A., Zipursky,S.L., Matsudaira,P., Baltimore,D. and Darnell,J.2000.Molecular cell biology (4th edition).W.H.,Freeman and Company, New York USA.
2. Moore, T.C.1989. Biochemistry and Physiology of Plant harmones (2ed.). Sp[ringer-Verlag, New York USA.
3. Nobel,P.S.1999.Physiochemical and environmental plant physiology(2ed). Academic press, San Diego, USA
4. Salisbury. F.,B., and Ross, C.W .1991. Plant physiology 4th edition. Wdsworth Publishing CO. California USA.
5. Taiz,I. and Zeiger,E.1998. Plant Physiology(2nd. Ed.).Sinauer Associates Inc.Publisher MS.
6. Dennis,D.T. and Terpin,D.H. Lefevere DD and Layzell D.V. 1997. Plant Metabolism.2ed. Longman England.
7. Buchanan,B.B.grulssem,W. and jones,R.L.2000. Biochemistry and Molecular Biology of Plants. American society of plants physiologists, Maryland USA.

M. Sc. Botany (Semester System)
Third Semester
Course PG 303: Genetics and Biostatics

UNIT I: Mendelian genetics, monohybrid, dihybrid crosses, gene interaction, co-dominance and lethal allele,
extranuclear inheritance, chloroplastic DNA and mitochondrial DNA.
Mechanism of genetic recombination
gene mapping in prokaryotes.

UNIT II: Genetics of eukaryotes- linkage phenomenon , detection of linkage through test cross genetics recombinations in eukaryotes.
Crossing over, mechanism of genetics recombinations .
hybrid DNA models, constructions of genetic maps using two point and three point test cross, tetrad analysis mitotic recombinations, genetic markers.

UNITIII: Gene mutation- spontaneous, induced, physical, chemical mutagenes, molecular basis of mutation. Importance of mutation, DNA damage and repair mechanism. Transposable genetic elements in prokaryotes and eukaryotes. Mutation by transposones..

UNIT IV: Nuclear DNA content, c-value paradox, cot curve and its significance, repetition and satellite DNA. *'in situ'* hybridization of satellite DNA. Introns and their significance. Multigene family and their evolution.

UNIT V: Measurement of central tendencies. Standard deviation, standard error
Probability rules, t-text, X^2 (chi-square) test,
correlation, regression analysis
Binomial distribution.

Suggested Laboratory Exercises based on cource 303-

1.Isolation of DNA and preparation of cot curve.

2.Demonstration of Mitosis/Meiosis(normal and abnormal).

3.Determination of Mitotic index in various plant materials.

4.Exereise based on probability rules.

5.Genetic exercise on Mendel's laws, Monohybrid and Dihybrid crosses.

6.Numerical exercise on gene interactions.

7.Numerical on chi square test, F-test and central tendencies.

8.Numerical exercise on genetical mapping in Eukaryotes.

9.Experiments on mutation.

10.Demonstration of aneuploidy, polyploidy etc.

Suggested Readings-

1. Atherly, A.G. Girton, J.R. and Mc Donald, J.E.1999. The Science of Genetics: SaPosts college publishing, Fort Worth, USA.
2. Burnham, C.R.1962. Discussions in Cytogenetics, Burgess publishing Co. Minnesota.
3. Busch. H. and Rothblum. L.1982. Volume X. The cell nucleus rDNA part A. Academic press.
4. Hartl, D.L. and Jones, E.W.1998. Genetics:Principles and Analysis(4th edition).Jones and Bartlett publishers, Massachusetts, USA.
5. Hattl, D.L.and Jones, E.W.2006. Genetics:Principles and Analysis(5th edition). Jones and Bartlett publishers, Massachusetts, USA.
6. Khush, G.S.1973. Cytogenetics of Aneuploids. Acedemic press, New York, London.
7. Lewis, B.2000 Gene7. Oxford University Press, New York, USA.
8. Lewis,R.1997. Human, Genetics:Concepts and Application(2nd edition). WCB McGraw, Hill, USA.
9. Russel, P.J.1998. Genetics(5th edition). The Benjamin/Cummings publishing company Inc.,USA.
10. Snusted, D.P. and Simmons, M.J. 2000. Principles of Genetics(2nd edition). Jhon Wiley and Sons Inc., USA.
11. Snusted, D.P. and Simmons, M.J.2006 Principles of Genetics(3rd edition). Jhon Wiley and Sons Inc.,USA.
12. Lewin, B.2006, Genes 7, Oxford University press, New York.

M. Sc. Botany (Semester System)
Third Semester
Course PG 303: Genetics and Biostatics

UNIT I: Mendelian genetics, monohybrid, dihybrid crosses, gene interaction, co-dominance and lethal allele,
extranuclear inheritance, chloroplastic DNA and mitochondrial DNA.
Mechanism of genetic recombination
gene mapping in prokaryotes.

UNIT II: Genetics of eukaryotes- linkage phenomenon , detection of linkage through test cross genetics recombinations in eukaryotes.
Crossing over, mechanism of genetics recombinations .
hybrid DNA models, constructions of genetic maps using two point and three point test cross, tetrad analysis mitotic recombinations, genetic markers.

UNITIII: Gene mutation- spontaneous, induced, physical, chemical mutagenes, molecular basis of mutation. Importance of mutation, DNA damage and repair mechanism. Transposable genetic elements in prokaryotes and eukaryotes. Mutation by transposones..

UNIT IV: Nuclear DNA content, c-value paradox, cot curve and its significance, repetition and satellite DNA. *'in situ'* hybridization of satellite DNA. Introns and their significance. Multigene family and their evolution.

UNIT V: Measurement of central tendencies. Standard deviation, standard error
Probability rules, t-text, X^2 (chi-square) test,
correlation, regression analysis
Binomial distribution.

Suggested Laboratory Exercises based on cource 303-

1.Isolation of DNA and preparation of cot curve.

2.Demonstration of Mitosis/Meiosis(normal and abnormal).

3.Determination of Mitotic index in various plant materials.

4.Exereise based on probability rules.

Scheme of Practical Examination

M.Sc. III Sem. Botany (Practical – I)

(Based on PG 301 & 302)

Time : 4 hrs.

1.	Exercise based on Physiology -	15
2.	Exercise based on Biochemistry -	10
3.	Spot 1 to 5 -	10
4.	Viva-Voce -	05
5.	Sessionals and Record -	10
	Total -	50

Scheme of Practical Examination

M.Sc. III Sem. Botany (Practical – II)

(Based on PG 303 & 304)

Time : 4 hrs.

1.	Exercise based on Cytology -	10
2.	Exercise based on Genetics -	05
3.	Exercise based on Molecular Biology -	10
4.	Spot 1 to 5 -	10
5.	Viva-Voce -	05
6.	Sessionals and Record -	10
	Total	50

M. Sc. Botany (Semester System)
Fourth Semester
Course PG 401: Plant Cell, Tissue and Organ Culture

UNIT I: Plant tissue culture-General introduction and Scope.
Concept of Totipotency and importance of totipotency in plant science.
Concept of cytodifferetiation and organogenesis.
Genral technique of plant tissue culture.
Callus and suspension culture.

UNIT II: Somatic embryogenesis.
Organ culture-meristem, anther and embryo culture-Principle, techniques and significance.

UNITIII: Protoplast culture-
Principle, technique of isolation of protoplast and its significance.
Viability testing of protoplast
Protoplast fusion- methods an importance
Hybrid selection and regeneration.
Somatic hybridization.

UNIT IV:
Monoclonal variation - Role of tissue culture in Agriculture.
Production of disease resistant plants, viral free plants.
Stress resistant plants, Herbicide resistant plants.

UNIT V:
Application of plant tissue culture-clonal propagation
Artificial seeds
Production of secondary metabolites/natural products.
Cryopreservation and Germplasm storage.

M. Sc. Botany (Semester System)
Fourth Semester

402: Biotechnology and Genetic Engineering.

UNIT I: Biotechnology- basic concept, principle and scope
Recombinant DNA technology.
Tools (Vectors and enzymes) and techniques.
cDNA and genomic library.

UNIT II: Agrobacterium mediated gene transfer
Transposon tagging direct gene transfer techniques
DNA finger printing.
Polymerase chain reaction.

UNITIII:
Strategies for development of transgenic plants
Transgenic plants –Ecological risk and ethical concern.
Intellectual property rights

UNIT IV: Genetic improvement of industrial microbes, Nitrogen fixers
Fermentation technology- Basic concept, characteristic of ideal ferment or,
Types of ferment or.
Up stream and downstream processing
Genomics-basic concept, types and strategies for genome analysis.

UNIT V: Protein profiling technology and its application.
Bioinformatics-Basic concept and its application in biological science.
Genomic projects-basic concept.
High through put sequencing
Microarrays.

M. Sc. Botany (Semester System)
Fourth Semester

403: Applied Mycology (Elective Paper -I)

UNIT I: General Characteristics of Fungi. Taxonomic Status and classification of Fungi. Harmful activates of fungi-fungi as plant pathogens. Fungal disease of human-being and animals. Fungi involved in degradation of goods and spoilage of foodstuffs.

UNIT II: Fungi s food- Detailed account of edible fungi with special reference to Agaricus, Pleurotus, Geastrum, Lycoperdon, and mushroom toxins. Cultivation of mushroom.
Yeast and single cell protein.

UNITIII:
Fungi as medicines.
Steroid bioconversion through fungi.
Production of vitamins. Riboflavin, vitamin A
Antibiotics
Medicinal value of Ergot.
Glycerol production.

UNIT IV: Fungi in industry.
Baking Brewery and Dairy industry.
Enzyme Production-Amylase, invertase, protease and cellulose.
Production of Organic acid, Fumaric acid, Gluconic acid, Kojic acid.

UNIT V: Principles of Fungal disease management.
Disease forecasting, Regulatory methods.
Physical and cultural measures of disease management chemical and biological control methods.
Fungi in agriculture – In improvement of soil fertility, Mycorrhiza.
Laboratory Exercise based on theory Syllabus.

M. Sc. Botany (Semester System)

Fourth Semester

Course PG 404: Elective Paper II
ETHNOBOTANY

UNIT I:
1. Definition, Concept, relevance and Scope of Ethno botany.
2. Sub disciplines of Ethno botany.
3. Indian work of Ethno botany.
4. Relation between Economic botany and Ethno botany.

UNIT II:
1. Sources of Data and methods of study of Ethno botany.
2. The origin and utility of some vernacular plant names.
3. Sacred groves: - Concept, classification, distributions of sacred groves in India, threats to sacred groves, significance.
4. Plants in Mythology.

UNITIII:
1. Wild edible plants used by ethnic people.
2. Ethno religious plants used by tribals.
3. Ethnobotany and its role in Conservation of native plant genetic resources.
4. Ethnobotanical plants used in different veterinary disease.

UNIT IV:
1. Ethnobotanical importance of Butea monosperma, Madhuca indica, Azadiracta Indica.
2. Ethnobotanical importance – Buchnania lanzan, Diospyros melanoxylon, Nyctanthes arbortristis.
3. Ethnobotanical plants used in fish poisoning, musical instruments.
4. Totem and Taboos and their role in Conservation.

UNIT V:
1. Study of common Ethnobotanical plants and their parts used in the treatment fever cough, bronchial Asthma, Tuberculosis.
2. Study of common ethnomedicinal plants used in the treatment of skin disease Leukoderma, Expulsion of worm, Leprosy.
3. Study of common ethnomedicinal plants used in dysentery , digestive problem , Abdominal disorder, jaundice, pipes.
4. Study of common Ethnomedicinal plants used in Rheumatism, Bone fracture, Heart disease, urino-genital problem.

M.Sc. IV Sem. Botany (Practical – II)

(Based on PG 403 & 404)

Time – 4 Hrs **Max. Marks - 50**

1.	Major Exercise based on Elective -I	-	08
2.	Minor Exercise based on Elective -I	-	04
3.	Major Exercise based on Elective -II	-	08
4.	Minor Exercise based on Elective -II	-	04
5.	Spot 1 to 5	-	10
6.	Viva-Voce	-	06
7.	Sessional and Record	-	10
	Total	-	**50**

M.Sc. IV Sem. Botany (Practical – I)

(Based on PG 401 & 402)

Time – 4 Hrs. **Max. Marks - 50**

1.	Exercise based on Tissue culture	- 10
2.	Practical based on Biotechnology	- 15
3.	Spot 1 to 5	- 10
4.	Viva-Voce	- 05
5.	Sessionals and Record	- 10
	Total	**- 50**