

**National Education Policy 2020 Inserted PG Programme  
on the basis of “Choice Based Credit System-C. B. C. S.”**

*M. Sc. in Botany*

**(Session 2022-23 onwards)**



**Approved by:**

*Board of Studies- Botany*

**Maharaja Suhel Dev State University,  
Azamgarh-276 128, Uttar Pradesh (INDIA)**



## Curriculum of M.Sc. Botany

MAHARAJA SUHEL DEV STATE UNIVERSITY, AZAMGARH (276001) U.P. INDIA

### CHOICE BASED CREDIT SYSTEM (CBCS)

Year	Semester	Code	Papers	Type	Credit	Semester credits		
I	Sem. 1	B040701T	Microbiology	Compulsory	04	20		
		B040702T	Bryophytes and Phycology	Compulsory	04			
		B040703T	Pteridophytes & Gymnosperms	Compulsory	04			
		B040704T	Cell Biology & Biomolecules	Compulsory	04			
		B040705P	Practical's (Laboratory Exercises corresponding to the Theory courses.)	Compulsory	04			
			Minor/ elective subject					
I	Sem.2	B040801T	Plant Anatomy & Developmental Biology	Compulsory	04	20		
		B040802T	Taxonomy of Angiosperms	Compulsory	04			
		Students have to select any two from the given four optional courses						
		B040803T	Mycology	Optional	04			
		B040804T	Genetics & Genomics	Optional	04			
		B040805T	Paleobotany & Palynology	Optional	04			
		B040806T	Plant Pathology	Optional	04			
		B040807P	Practical's (Laboratory Exercises corresponding to the Theory courses.)		04			
			Minor/ elective subject					
II	Sem. 3	B040901T	Plant Physiology and Biochemistry	Compulsory	04	20		
		B040902T	Plant Biotech & Biology	Compulsory	04			
		Students have to select any two from the given four optional courses						
		B040903T	Microbial Biotechnology	Optional	04			
		B040904T	Economic Botany	Optional	04			
		B040905T	Plant Resource Utilization & Conservation	Optional	04			
		B040906T	Soil Science & Phytogeography	Optional	04			
		B040907P	Practical's (Laboratory Exercises corresponding to the Theory courses.)		04			
		Students have to select any four from the given six optional courses						
II	Sem.4	B040101T	Computer Application and Bioinformatics	Optional	04	20		
		B040102T	Ecology & Evolution	Optional	04			
		B040103T	Forest Ecology	Optional	04			
		B040104T	Water Resource Management	Optional	04			
		B040105T	Environment Management & Technology	Optional	04			
		B040106T	Cytogenetics, Plant Breeding & Biostatistics	Optional	04			
		B040107P	Practical's (Laboratory Exercises corresponding to the Theory courses.)		04			

(T. Ahmad)  
Convener

(S.C. Srivastava)

15/11/22  
(Prof. Afsar Ali)  
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<b>M.Sc. First Year (Semester-I)</b>		
<b>Credits=04</b>	<b>Compulsory</b>	<b>Paper-I (Theory)</b>
	<b>Maximum Marks:75</b>	<b>Min Passing Marks:25</b>
<b>Sem-I; 1.1.</b>	<p><b><u>Microbiology</u></b></p> <ul style="list-style-type: none"> <li>• Introduction, classification of Bacteria, Morphology of Bacteria.</li> <li>• Microbial Genetics: Method of gene transfers, transformation, conjugation, Transduction and sex duction.</li> <li>• Structure and nature of Viruses; Detailed Morphological structure of Virus, viral enzymes, viriods, viruses and prions classification and phylogeny replication and Multiplication.</li> </ul>	
<b>Suggested Readings:</b>		
<ol style="list-style-type: none"> <li>1. Madigan MT, Martinko JM, Bender KS, Buckley DH, Stahl DA (2014) Brock Biology of Microorganisms, 14 th edition, Benjamin Cummings, New York.</li> <li>2. Stanier RY, Ingraham JL, Wheelis ML, Painter PR (1987) General Microbiology, 5 th edition, MacMillan, Press Ltd, New Jersey.</li> <li>3. Talaro KP, Chess B (2011) Foundations in Microbiology, 8 th edition, McGraw-Hill, New York.</li> <li>4. Willey JM, Sherwood L, Woolverton CJ (2013) Prescott's Microbiology, 9 th edition, McGraw-Hill, New York.</li> <li>5. Pelczar M.J., Chan E.C.S. and Krieg N.R. (2003) Microbiology. 5 th Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi.</li> </ol>		
<b>Credits=04</b>	<b>Compulsory</b>	<b>Paper-II(Theory)</b>
	<b>Maximum Marks:75</b>	<b>Min Passing Marks:25</b>
<b>Sem-I; 1.2.</b>	<p><b><u>Bryophytes &amp; Phycology</u></b></p> <ul style="list-style-type: none"> <li>• Criteria and recent trends in the classification of Bryophytes; origin and evolution of bryophytes; Ecological- significance and economic importance of Bryophytes.</li> <li>• Diversity in Bryophytes: Habit and habitat; developmental morphology and organization of gametophyte and sporophyte bodies.</li> <li>• Comparative study of morphology, anatomy, life history, classification &amp; phylogeny of the following groups (with special refrence to Indian forms): Takakiales, Calobryales, Monocleales, Sphearocarpales, Marchantiales, Jungermanniales, Anthocerotales, Sphagnales, Andreaeales and Bryales.</li> <li>• Algal habitat; Reserve food, thallus organization, pigments and evolutionary trends among algae.</li> <li>• Algal classification as per Smith, Fritsch , Cell organization, Thallus Types, reproduction heterocyst and interrelationships of Cyanophyta, Chlorophyta, Phaeophyta &amp; Rhodophyta.</li> </ul>	
<b>Suggested Readings</b>		
<ol style="list-style-type: none"> <li>1. Puri P (1980). Bryophytes. Atma Ram &amp; Sons, New Delhi.</li> <li>2. Kumar HD (1988). Introductory Phycology. Affiliated East-West Press Ltd., New Delhi.</li> <li>3. Morris J (1986). An Introduction to the Algae. Cambridge University Press, U.K.</li> <li>4. Round FE (1986) The Biology of Algae. Cambridge University Press, U.K.</li> <li>5. An Introduction To The Algae By Ian Morris</li> <li>6. The Algae By VJ.DJ Chapman</li> <li>7. THE Structure And Reproduction Of Algae By F.E Fritsch</li> <li>8. Phycology By Robert Edward Lee</li> <li>9. Algae An Introduction to The Phycology By Hoek Christiaan Van Den</li> <li>10. An Introduction To The Study Of Algae By V.J Chapman</li> <li>11. Algae Anatomy Biochemistry, And Biotechnology By Laurabarsanti, Paologualtieri</li> <li>12. Diversity Of Microbes And Cryptogams, Algae By O.P.Sharma</li> <li>13. An Introduction to Phycology by G.R. South , A.Whittick.</li> </ol>		
<b>Credits=04</b>	<b>Compulsory</b>	<b>Paper-III(Theory)</b>
	<b>Maximum Marks:75</b>	<b>Min Passing Marks:25</b>
<b>Sem-I; 1.3.</b>	<p><b><u>Pteridophytes &amp; Gymnosperms</u></b></p> <ul style="list-style-type: none"> <li>• Classification and origin of Pteridophytes; The vegetative sporophytes; Microphylls and</li> </ul>	

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 (T. Ahmad)  
 Convenor

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 (S.C. Srivastava)



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	<p>megaphylls; stellar theory: Telome theory: The fertile sporophytes: sporangia; position, ontogeny. Types, structure. Heterospory: Occurrence, cause and significance, The gametophytes: Germination of fern spores, development of fern prothallus; Comparative study of Psilopsida, Lycopsida, Sphenopsida and Pteropsida.</p> <ul style="list-style-type: none"> <li>• Classification of Gymnosperms up to the rank of orders. General account of the following groups with special reference to the genera indicated in brackets: Pteridospermatales (Calymmatotheca, Hoeninghausi), Glossopteridales, Caytoniales (Caytonia), Bennettiales (Williamsonia sp.), Pentoxylales, Corditales (Cordaites sp.)</li> <li>• General account of the following groups with special reference to the genera indicated in brackets: Gingoales (Ginkgo biloba), Coniferales: general anatomy, cone organization, life history and distribution, Ephedrales (Ephedra sp.) Gnetales (Gnetum sp.) and Welwitschiales (Welwitschia sp.)</li> </ul>		
<b>Suggested Readings:</b>			
<ol style="list-style-type: none"> <li>1. Bhatnagar SP, Moitra A (1996) Gymnosperms, New Age international Ltd Publication, New Delhi.</li> <li>2. Parihar NS (1973) An Introduction to Embryophyta, Vol I (Bryophyta) and Vol II (Pteridophyta), Central Book Department, Allahabad.</li> <li>3. Parihar NS (1996). The Biology and Morphology of Pteridophytes. Central Book Depot, Allahabad.</li> <li>4. Rashid A (2011) An Introduction to Pteridophyta, 2 nd edition, Pub Vikas Publishing House Pvt Ltd, Noida.</li> <li>5. Sambamurthy AVSS (2005) A Textbook of Bryophytes, Pteridophyte</li> <li>6. Sporne KR (1965). The Morphology of Gymnosperms. Hutchinson Univ. Library</li> <li>7. Sporne KR (1967) Morphology of Gymnosperms, BI Publication, New Delhi.</li> <li>8. Sporne KR 1991. The Morphology of Pteridophytes. B.I. Publ. Pvt. Ltd.</li> </ol>			
<b>Credits=04</b>	<b>Compulsory</b>		<b>Paper-IV(Theory)</b>
	<b>Maximum Marks:75</b>		<b>Min Passing Marks:25</b>
<b>Sem-I; 1.4.</b>	<b>Cell Biology &amp; Biomolecules</b>		
	<ul style="list-style-type: none"> <li>• Cytoskeleton: microtubules, Microfilaments and intermediate filaments. Interphase nucleus and nucleolus, Nuclear pore complex (NPC). Cell organelles: structure &amp; functions, endomembrane system: Plasmodesmata.</li> <li>• Cell division: cell cycle, mitosis and meiosis; Control of cell division: cyclins, Cdks, cell cycle check points, spindle organization and chromosomal movement, uncontrolled cell division, tumor, cancer, apoptosis and programmed cell death in plants. Cell signaling: cell surface receptors, G-protein, GPCRs, second messengers, membrane derived messengers, serine/threonine kinases and receptor tyrosine kinase (RTKs).</li> </ul>		
<b>Suggested Readings:</b>			
<ol style="list-style-type: none"> <li>1. Brown WV &amp; Berke MB (1974). Text Book of Cytology, Blackstains Sons &amp; Co.</li> <li>2. Brachet J &amp; Mirsky AE (1959). The Cell, Academic Press, Vols. 16D</li> <li>3. De Robertis EDP &amp; De Robertis EMF 8. (2001). Cell and Molecular Biology, Lippincott Williams &amp; Wilkins, Bombay.</li> <li>4. Wolfe SL (1993). Molecular and Cellular Biology, Wordsworth Publ. Co., California, USA.</li> <li>5. Sharma AK &amp; Sharma A (1980). Chromosome Techniques. Theory and Practice, Butterworth.</li> <li>6. Roy SC &amp; Kumar KDC (1977). Cell Biology, New Central Book Agency, Calcutta.</li> </ol>			
<b>Credits=04</b>			
<b>Sem-I; 1.5.</b>	<b>Minor/Elective subject</b>		
	<b>Credits=04</b>	<b>Compulsory</b>	<b>Paper-V( Practical-I)</b>
	<b>Maximum Marks:75</b>		<b>Min Passing Marks:25</b>
<b>Sem-I; 1.6.</b>	<b>Laboratory Exercises corresponding to the Theory courses.</b>		

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 Ti. Ahmad  
 (Convener)

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 (S.C. Srivastava)

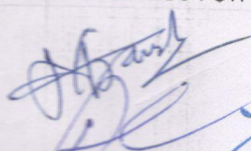


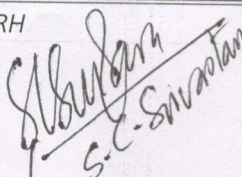
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### CHOICE BASED CREDIT SYSTEM (CBCS)

<b>M.Sc. First Year (Semester- II)</b>		
<b>Credits=04</b>	<b>Compulsory</b>	<b>Paper-I(Theory)</b>
<b>Maximum Marks:75</b>		<b>Min Passing Marks:25</b>
<b>Sem-II; 2.1.</b>	<p style="text-align: center;"><b><u>Plant Anatomy &amp; Developmental Biology</u></b></p> <ul style="list-style-type: none"> <li>• The cambium, its derivative tissues, differentiation of secondary phloem and Xylem.</li> <li>• Structure of woods in relation to its weight, strength, durability and taxonomic significance.</li> <li>• Anomalous secondary growth in roots and stems.</li> <li>• Cork cambium and its derivatives, function of cork and its uses, abscission layers.</li> <li>• Origin of Lateral and adventitious roots, root-stem transition.</li> <li>• Anatomy in relation to taxonomy &amp; embryology.</li> <li>• Development of Male &amp; Female Gametophytes; Microsporogenesis &amp; Megasporogenesis.</li> <li>• Fertilization and its control with special reference to incompatibility in flowering plant.</li> <li>• Endosperms &amp; its abnormalities, Embryo developments.</li> <li>• Apomixes Polyembryony and its induction.</li> </ul>	
<b>Suggested Readings:</b>		
<ol style="list-style-type: none"> <li>1. A Plant Anatomy by (Pande 1978)</li> <li>2. A principle and practices in plant morphology by ( Raghuvanshi &amp; Joshi 1971)</li> <li>3. A text book of botany by Julius Sachs</li> <li>4. Anatomy of Seed Plant By( Katherine Esau 1960)</li> <li>5. Anatomy of the Dicotyledons and Anatomy of the Monocotyledons by Metcalfe and Chalk 1979</li> <li>6. Bhojwani ss &amp; Bhatnagar SP (2000). Embryology of Angiosperms (4 th Revised and enlarged edition).</li> <li>7. Burgess J (1985). An Introduction to Plant Cell Development, Cambridge University Press, Oxford.</li> <li>8. Esau, K. (1993). Plant Anatomy, Wiley Eastern Ltd.</li> <li>9. Fahn A (1982). Plant Anatomy 3rd Edn, Pergamon Press, Oxford.</li> <li>10. Integrated plant anatomy by William C, Dickisons 2000</li> <li>11. Iqbal M (1994). Growth Patterns in Vascular Plants, Dioscorides Press, Portland, USA.</li> <li>12. Larson PR (1995). The Vascular Cambium, Springer Verlag, Heidelberg, Germany.</li> <li>13. Iqbal M (1990). The Vascular Cambium, R.S.P., Taunton, UK.</li> <li>14. Iqbal M (1995). The Cambial Derivatives, Gebruder Borntraeger, Stuttgart, Germany.</li> <li>15. Mahswari P (1950). An Introduction to Embryology of Angiosperms.</li> <li>16. Morphology and embryology of angiosperm by shukla and chandel</li> <li>17. Morphology of angiosperm by (Eames 1961)</li> <li>18. Physiological plant anatomy by Haberlandt</li> <li>19. Steeve TA &amp; Sussex IM (1989). Patterns in Plant Development, 2nd Edn, Cambridge University Press, Cambridge</li> <li>20. Taxonomy of vascular Plant by Laurence</li> </ol>		
<b>Sem-II; 2.2.</b>	<p style="text-align: center;"><b><u>Taxonomy of Angiosperms</u></b></p> <ul style="list-style-type: none"> <li>• Recent trends in taxonomy; Plant Identification: taxonomic key.</li> <li>• Brief comparative study of the following systems of classification; Engler &amp; Prantl, Hutchinson, Bentham &amp; Hooker and Takhtajan.</li> <li>• Taxonomic Features, systematic phylogeny and economic importance of families:</li> <li>• Dicotyledons: Ranunculaceae, Magnoliaceae, Capparidaceae, Caryophyllaceae, Asteraceae, Sterculiaceae, Rosaceae, Rutaceae, Anacardiaceae, Fabaceae, Myrtaceae, Combretaceae, Oleaceae, Asclepiadaceae, Boraginaceae, Scrophulariaceae, Bignoniaceae, Pedaliaceae, Acanthaceae, Verbaenaceae, Lamiaceae, Polygonaceae, Piperaceae, Euphorbiaceae, Moraceae.</li> <li>• Monocotyledons: Orchidaceae, Amaryllidaceae, Araceae &amp; Araceacea, Zingiberaceae, Cyperaceae, Poaceae</li> </ul>	
<b>Suggested Readings:</b>		
<ol style="list-style-type: none"> <li>21. Daniel, M. (2009). Taxonomy: Evolution at Work. Narosa Publishing House, New Delhi</li> <li>22. David, P.H. &amp; Heywood, V.H. (1963). Principles of Angiosperm Taxonomy: Oliver and Boyd, London.</li> <li>23. Jones, S.B. Jr. &amp; Luchinger, A.E. (1986). Plant Systematics. 2<sup>nd</sup> Ed. McGraw-Hill Book, New York.</li> </ol>		

  
 (Convenor)

  
 S.C. Sivanandan



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24. Judd, W.S., Campbell, C.S., Kellogg, E.A. & Stevens, P.F. (1999). Plant Systematics: A Phylogenetic Approach. Sinauer Associate, Ind. Sunderland, M.A., USA. 25. Naik, V.N. (1984). Taxonomy of Angiosperms. Tata McGraw-Hill, New Delhi. 26. Simpson, M.G. (2006). Plant Systematics. Elsevier Academic Press, New York. 27. Singh, Gurcharan (2007). Plant Systematics. Oxford & 1BH Publishing Co, New Delhi. 28. Stace, C.A. (1989). Plant Taxonomy and Biosystematics. 2 Ed. Edward Arnold, London.		
<b>Credits=04</b>	<b>Optional</b>	<b>Paper-III(Theory)</b>
<b>Maximum Marks:75</b>		<b>Min Passing Marks:25</b>
<b>Sem-II; 2.3.</b>	<b>Mycology</b> <ul style="list-style-type: none"> <li>• Outline classification as per Smith Ainsworth, Mims, Comparative account of Thallus structure and spore producing organs, interrelation life cycle pattern &amp; Phylogeny of Myxomycotina, Zygomycotina, Ascomycotina, Basidiomycotina and Deuteromycotina.</li> <li>• Mode of nutrition of fungi and their physical and chemical requirement for growth and reproduction, heterokaryosis, parasexuality, heterothallism, variation in fungi, hormonal control of sexual reproduction.</li> <li>• Economic importance of fungi</li> </ul>	
<b>Suggested Readings:</b>		
1. Alexopoulos CJ, Minus CW, Blackwell M (1996) Introductory Mycology, John Cambridge. 2. Carlile MJ, Watkinson SC, Booday GW (2001) The Fungi, Academic Press, 3. Deacon JW, Blackwell M (1997) Introduction to Modern Mycology, Oxford. 4. Maheshwari R (2012) Fungi: Experimental Methods in Biology, CRC Press, BocaRaton, Florida. 5. Webster J (1985). An Introduction to Fungi: by Cambridge Univ.Press 6. Webster J, Roland WS (2007) Introduction to Fungi, Cambridge University Press, 7. Webster John (1980) Introduction to fungi, Cambridge University Press, Wiley and Sons, Inc, New York.		
<b>Credits=04</b>	<b>Optional</b>	<b>Paper-IV(Theory)</b>
<b>Maximum Marks:75</b>		<b>Min Passing Marks:25</b>
<b>Sem-II; 2.4.</b>	<b>Genetics &amp; Genomics</b> <ul style="list-style-type: none"> <li>• Concept of gene, allele, multiple allele, pseudoallele, complementation test extensions of Mendalian principle: gene interaction, genomic imprinting, linkage &amp; crossing over, sex linked and sex influenced characters, linkage maps, genetic recombination in bacteria and fungi, mapping genes by interrupted mating.</li> <li>• Mutation and Mutagens.</li> <li>• Recombinant DNA techniques &amp; its application.</li> <li>• Tissue culture &amp; somatic hybridization.</li> </ul>	
<b>Suggested Readings</b>		
1. Strickburger M (1990). Genetics. MacMillan Publishing Company, New York. 2. Gardner J (1991). Principle of Genetics. John Wiley & Sons, New York. 3. Klug WS& Cummings MR (1997). Essential of Genetics. Prentice Hall Publishing Co., New Jersey. 4. Brown T (1989). Genetics: A Molecular Approach. Chapman & Hall, London. 5. Goodenough U (1984). Genetics. Sandir College Publishing, Philadelphia. 6. Lewin, B. (2007). Genes Vol. 9. Oxford University Press.		
<b>Credits=04</b>	<b>Optional</b>	<b>Paper-V(Theory)</b>
<b>Maximum Marks:75</b>		<b>Min Passing Marks:25</b>
<b>Sem-II; 2.5.</b>	<b>Paleobotany &amp; Palynology</b> <ul style="list-style-type: none"> <li>• Fossil history of Bryophytes, Pteridophytes and Gymnosperms: Principles of Paleobotany and geological time scale; Process of fossilization and types of fossils; Method of study of fossils and carbon dating technique.</li> <li>• General account of Bennettitales, Codaitales, Glossopteridales, Ginkgoales.</li> <li>• Pollen structure, Pollen Allergy, palaeopalynology, Aeropalynology, Forensic Palynology, Role in taxonomic evidence.</li> </ul>	
<b>Suggested Readings:</b>		
1. Stewart Wilson N, Paleobotany and Evolution of Plants. 2. S.R. Misha ,Text Book Of Paleobotany.		

*(P. Ahmad)*  
*COMUNAS*

*(S.C. Sinha)*



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3. Peter Goerge, Introduction to Paleobotany.		
4. G.Erdtman, Hand Book of Palynology: Morphology, taxonomy, ecology; an introduction to the study of Pollen grains & spores.		
5. K.Bhattacharya M.R. Majumdar & S.G. Bhattacharya, A text book of Palynology.		
6. P.K.K. Nair, Essential of Palynology.		
<b>Credits=04</b>	<b>Optional</b>	<b>Paper-VI(Theory)</b>
<b>Maximum Marks:75</b>		<b>Min Passing Marks:25</b>
<b>Sem-II; 2.6.</b>	<p style="text-align: center;"><b>Plant Pathology</b></p> <ul style="list-style-type: none"> <li>• Koch's Postulates, Disease symptoms, pathogen &amp; disease triangle.</li> <li>• Study of importance, symptoms, causal organism, disease cycle and control of following diseases of crop plants in Uttar Pradesh caused by fungi:</li> <li>• Rots diseases with special reference to fruit and stem end rot of papaya. Damping off of seedlings of crop plants. Downy mildews of cucurbits. Rust of wheat and Barley. Powdery mildew of pea. Smuts and Bunts: Covered smut of Barley; loose smut of wheat and Bunt of rice. Wilt of sugarcane. Leaf spots: leaf spot of turmeric; Leaf blight of wheat. Blast disease of rice and mango anthracnose. Galls and other abnormalities: stem gall of coriander leaf curl of Peach</li> <li>• Study of importance, symptoms, causal organism, disease cycle and control of following diseases of crop plants in Uttar Pradesh caused by bacteria, viruses, viroids, Phytoplasma and nematodes: Bacterial diseases: Citrus canker and Tundu disease of wheat. Viral diseases: Mosaics of tobacco, papaya, potato and tungro of rice. Phytoplasmal diseases: Grassy shoot of sugarcane. Nematode diseases: Ear cockle of wheat</li> <li>• Plant disease: Causal organism, symptoms and management diseases line white Rust, Citrus canker, YVM of Okra, Strip disease of Barley.</li> </ul>	
<b>Suggested Readings:</b>		
1. Agrios GN (2005) Plant Pathology, Academic Press, Burlington.		
2. John AL (1998) Plant Pathology and Plant Pathogens, Wiley-Blackwell, CRC Press, Publication, Boca Raton, USA.		
3. Dickinson CM (2003) Molecular Plant Pathology, Bios Scientific Publisher, Oxford.		
4. Robert N, Trigiano, Windham MT, Windham AS (2003) Plant Pathology: Concepts and Laboratory Exercises, CRC Press, Boca Raton, USA.		
6. Bridge PD, Clarkson JM (1998) Molecular Variability of Fungal Pathogens, CAB, International, Oxfordshire.		
7. Singh RS (2008) Plant Diseases, Oxford and IBH Publishing Co Pvt Ltd, New Delhi.		
8. Singh RS (2008) Principles of Plant Pathology, Oxford and IBH Publishing Co Pvt. Ltd, New Delhi.		
9. Dhingra OD, James B, Sinclair (1995) Basic Plant Pathology Methods, CRC		
10. Concise Encyclopedia of Plant Pathology by P. Vidhyasekaran		
<b>Credits=04</b>		
<b>Sem-II; 2.7.</b>	<b>Minor/Elective subject</b>	
<b>Credits=04</b>	<b>Compulsory</b>	<b>Paper-VII (Practical-II)</b>
<b>Maximum Marks:75</b>	<b>Min Passing Marks:25</b>	
<b>Sem-II; 2.8.</b>	<b>Laboratory Exercises corresponding to the Theory courses.</b>	

*(T. Ahmad)*  
*Coordinator*

*(S.C. Srivastava)*



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**CHOICE BASED CREDIT SYSTEM (CBCS)**

<b>M.Sc. Second Year ( Semester-III)</b>		
Credits=04	Compulsory	Paper-I(Theory)
	Maximum Marks:75	Min Passing Marks:25
<b>Sem-III; 3.1.</b>	<b>Plant Physiology &amp; Biochemistry</b> <ul style="list-style-type: none"> <li>• Phytochemistry &amp; Photosynthesis (C3, C4 regulation of Calvin cycle, Photorespiration, CAM Pathway</li> <li>• Water potential</li> <li>• Transport of water, solutes and translocation.</li> <li>• Uptake transport and translocation of water, ions, solutes from soil.</li> <li>• Respiration Glycolysis, TCA cycle, Pentose phosphate pathway, lipid metabolism.</li> <li>• Plant growth regulators, Auxins, Gibberrellins, cytokinins, Ethylene, ABA (abscissic acid), Brassinosteroids, Jasmonates, Salicylic acid.</li> <li>• Composition structure and function of carbohydrates, Lipids &amp; Proteins.</li> <li>• Enzymes and co enzymes, Allosteric enzymes, Ribozymes, Abzymes and enzyme regulation.</li> </ul>	
<b>Suggested Readings:</b>		
<ol style="list-style-type: none"> <li>1. Devlin RM &amp; Witham FH (1986). Plant Physiology. CBS Pubs. and Distributors, New Delhi.</li> <li>2. Hopkins WG (1995). Introduction to Plant Physiology, John Wiley &amp; Sons. Inc., New York, USA.</li> <li>3. Moore TC (1989). Biochemistry and Physiology of Plant Hormones. SpringerVerlag. New York, USA.</li> <li>4. Singhal et al. (1999). Concepts in Photobiology. Photosynthesis and Phytomorphogenesis, NarosaPub. House, N. Delhi.</li> <li>5. Taiz &amp; Zeigler (2006). Plant Physiology 4th Edn. Sinauer Associates Inc., Publishers, Sunderland</li> <li>6. Mengel K &amp; Kirkby EA (2001). Principles of Plant Nutrition. Kluwer Academic Press</li> <li>7. Salisbury FB &amp; Celon W (1986). Plant Physiology 3d Edn. CBS Publishers, New Delhi.</li> </ol> <p><b>Biochemistry</b></p> <ol style="list-style-type: none"> <li>1. Voet &amp; Voet (1995). Biochemistry 2nd Edn, John Wiley &amp; Sons, Inc., New York, USA.</li> <li>2. Nelson DL&amp; Cox MM (2000). Lehninger Principles of Biochemistry. Macmillan Worth Publishers, Madison Av., New York</li> <li>3. White Ret al. (1959). Principles of Biochemistry 2nd Edn, McGraw Hill Publications, NY</li> <li>4. Farago P&amp; Lagnado J (1972). Life in Action: An Introduction to Biochemistry. Heinemann Publ, London.</li> <li>5. Lehninger AL (1993). Principle of Biochemistry. CBS Publishers, New Delhi.</li> <li>6. Cooper, A (2004). Biophysical Chemistry. Royal Society of Chemistry, Cambridge Publication.</li> <li>7. Hames, BD, Hooper NM &amp; Houghton JD (1998). Instant Notes in Biochemistry. Viva Books, NewDelhi .</li> <li>8. Snyder LR (1968). Principles of Adsorption Chromatography: The Separation of Nonionic Organic Compund. Marcel Dekker Publ, New York.</li> <li>9. Wildon K&amp; Walker J (2000). Practical Biochemistry: Principles and Techniques 5th Edn, Cambridge University Press.</li> <li>10. Skoog, DA, Holler FJ &amp; Timothy N (1998). Principles of Instrumental Analysis 5th Edn. Sunders College Publishing.</li> <li>11. Wise DL (1991). Bioinstrumentation and Biosensors. Marcel Dekker, New York.</li> <li>12. Clark BT, Frost T&amp; Russell MA (1993). UV Spectroscopy: Techniques, Instrumentation, Data Handling. Chapman &amp; Hall</li> <li>13. Ewing, GW (1990). Analytical Instrumentation Handbook. Marcel Dekker, New York.</li> </ol>		
Credits=04	Compulsory	Paper-II(Theory)
	Maximum Marks:75	Min Passing Marks:25
<b>Sem-III; 3.2.</b>	<b>Plant Biotechnology &amp; Biology</b> <ul style="list-style-type: none"> <li>• Molecular markers and crop Improvement: Morphological, biochemical and molecular markers, non-PCR based marker (RFLP, Procedure, construction of RFLP and uses), PCR based markers (RAPD, DAF, AP-PCR, AFLP, SSR). molecular maps, structural and functional genomics in relation to crop improvement, DNA fingerprinting, marker assisted selection.</li> <li>• Genetic Engineering of Plants: Objectives, strategies and approaches; transformation methods: Agrobacterium mediated, biolistic approach, microinjection, electroporation and liposome mediated, selection of transformants and their molecular characterization.</li> <li>• Application: Production of herbicide resistant plants; engineering Plants for abiotic stress, senescence- tolerance and male sterility, environmental, social and legal implications. Production of genetically modified (GM) plants.</li> </ul>	

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**Curriculum of M.Sc. Botany**  
**MAHARAJA SUHEL DEV STATE UNIVERSITY, AZAMGARH (276001) U.P. INDIA**  
**CHOICE BASED CREDIT SYSTEM (CBCS)**

**Suggested Readings:**

1. Hill WE (2000). Genetic Engineering. Hardwood Academic Publishers, The Netherlands.
2. Brown T (1995). Gene Cloning. Chapman & Hall, London.
3. Ranjan R (1996). Transgenic Plant. Agro Botanica, Bikaner
4. Setlor J (1999). Genetic Engineering. Plenum Press, New York.
5. Tombs M (1990). Biotechnology and Genetic Engineering Reviews. Intercept, U.K.
6. Old RW & Primrose SB (1985). Principle of Gene Manipulation: An Introduction to Genetic Engineering, Blackwell
7. Alberts B, Bray D, Lewis J, Raf M, Roberts K & Watson JD (1989). Molecular Biology of the Cell, Garland Publishing inc., New York
8. Alcamo IE (1994). Fundamentals of Microbiology, The Benjamin/Cummings Publishing Co., New York.
9. Benjamin Lewin (2007). Genes IX, Prentice Hall.
10. Bilgrami KS & RK Sinha (1992). Essentials of Microbiology, CBS Publishers, Delhi.
11. Brachet J & Mirsky AE (1959). The Cell, Academic Press, Vols.
12. Brown WV & Berke MB (1974). Text Book of Cytology, Blackstains Sons & Co.
13. DeRobertis EDP & De Robertis EMF (2001). Cell and Molecular Biology, Lippincott Williams & Wilkins, Bombay.
14. Evans DA Sharp WR & Amirato PY (1986). Handbook of Plant Tissue Culture. Macmillan Publishing Company, New York.
15. Locke DM 1, (1974). Viruses: The Smallest Enemy, Crown Publishers, New York.
16. Lodish H, Berk A, Zipursky SL, Matsudaira P, Baltimore D & Darnell J (2000). Molecular Cell Biology. W.H. Freeman and Co., New York, USA.
17. Lodish H, Berk A, Zipursky SL, Matsudaira P, Baltimore D & Darnell J (2000). Molecular Cell Biology. W.H. Freeman and Co., New York, USA.
18. Turner PC, Mclennan AG, Bates AD & White MRH (2001). Instant Notes on Molecular Biology, Viva Books Pt. Ltd. 16.
19. Turner PC, Mclennan AG, Bates AD & White MRH (2001). Instant Notes on Molecular Biology, Viva Books Pvt. Ltd.
20. Wolfe SL (1993). Molecular and Cellular Biology, Wordsworth Publ. Co., California, USA.

**Credits=04**

**Optional**

**Paper-III(Theory)**

**Maximum Marks:75**

**Min Passing Marks:25**

**Sem-III; 3.3**

**Microbial Biotechnology**

- Microbes in the production of alcohol, beer, wine and vinegar.
- Commercial production of antibiotics, therapeutics vaccines, biopesticide,
- Microbes and bioremediation.

**Suggested Readings:**

1. Pelizar MJ, Chan ECS & Krig NR (1993). Microbiology, McGraw Hill Book Co., New York
2. Purohit SS (1998). Microbiology: Fundamentals and Applications, Agrobotanica, Bikaner
3. Razdan MK (1993). An Introduction of Plant Tissue Culture. Oxford & IBH, New Delhi.
4. Richard M, Twyman & Wisden W (1999). Advanced Molecular Biology, Viva Books Pvt. Ltd.
5. Roy SC & Kumar KDC (1977). Cell Biology, New Central Book Agency, Calcutta.
6. Sharma AK & Sharma A (1980). Chromosome Techniques. Theory and Practice, Butterworth.
7. Thorpe TA (1995). In Vitro Embryogenesis in Plant. Kluwer Publishers, Dordrecht.
8. Trever G, Faull J, Ketteridge S & Springham D (1995). Introductory Microbiology, Chapman & Hall, London

**Credits=04**

**Optional**

**Paper-IV(Theory)**

**Maximum Marks:75**

**Min Passing Marks:25**

**Sem-III; 3.4**

**Economic Botany**

- Spices and flavoring materials, vegetables, Gum and dye yielding plants, Latex yielding plants, Tea Coffee, rubber and insecticide yielding plants.
- Origin of cultivated plants; centre of origin criteria and various centre of origin criteria and various centre of origin. Origin and cultivation of wheat, rice, Maize, sugarcane, mustard and potato.

**Suggested Readings:**

1. Encyclopedia of Plant and Crop Science by Robert M. Editor (Goodman)

**Credits=04**

**Optional**

**Paper-V(Theory)**

**Maximum Marks:75**

**Min Passing Marks:25**

**Sem-III; 3.5.**

**Plant resource utilization & conservation**

- Plant biodiversity for man and their importance history, Botany, cultivation and processing of cereals (Wheat, Maize, Rice) legumes/Pulses, Fiber plants and their products.

*(T. Ahmad)*

*(S.C. Srivastava)*



## Curriculum of M.Sc. Botany

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### CHOICE BASED CREDIT SYSTEM (CBCS)

	<ul style="list-style-type: none"> <li>Medicinal plants, drugs and narcotics. Fumitories &amp; masticatories, Beverage yielding plants important wood and timber yielding plants, sugar and sugar yielding plants. Tropical &amp; subtropical fruits.</li> <li>Principles of conservation; in-situ and ex-situ conservation principles and practices NSC, Botanic gardens, BSI, NBPGR, ICAR, CSIR, DST and DBT &amp; germplasm conservation.</li> </ul>	
<b>Suggested Readings:</b>		
<ol style="list-style-type: none"> <li>1. Jain SK, Sinha BK &amp; Gupta RC (1991). Notable Plants in Ethnomedicine of India. Deep Publications, New Delhi.</li> <li>2. Chowdhery HJ &amp; Murti SK (2000). Plant Biodiversity and Conservation in India: An Overview. Bishen Singh, Mahendraçal Singh, Dehradun.</li> <li>3. Jain SK (1991). Contribution of Indian Ethnobotany. Scientific Publishers, Jodhpur.</li> <li>4. Singh VK &amp; Abrar MK (1990). Medicinal Plants and Folkories. Today &amp; Tomorrows Printers &amp; Publishers, New Delhi.</li> <li>5. Ghosh, Ak (2008). A Comprehensive Handbook on Biodiversity, TERI, New Delhi.</li> </ol>		
<b>Credits=04</b>	<b>Optional</b>	<b>Paper-VI(Theory)</b>
<b>Maximum Marks:75</b>		<b>Min Passing Marks:25</b>
<b>Sem-III; 3.6.</b>	<b>Soil Science &amp; Phytogeography</b>	
	<ul style="list-style-type: none"> <li>Soil: Its origin &amp; development, process of soil formatting and soil profile.</li> <li>Soil properties in relation to plant growth.</li> <li>Physical – texture, structure, density, porosity, permeability to air water and roots.</li> <li>Soil water energy concept of soil solution, soil water quantities &amp; their measurement</li> <li>Biological soil organisms their role in plants. Soil relationship.</li> <li>Soil erosion and conservation</li> <li>Plant geography: distribution process, endemic area hypothesis.</li> <li>Vegetational &amp; floristic region of India</li> </ul>	
<b>Suggested Readings:</b>		
1. N.C. Brady & R.R. Weil "The Nature and Properties of Soils".		
<b>Credits=04</b>	<b>Compulsory</b>	<b>Paper-VII (Practical-III)</b>
<b>Maximum Marks:75</b>		<b>Min Passing Marks:25</b>
<b>Sem-III; 3.7.</b>	<b>Laboratory Exercises corresponding to the Theory courses.</b>	

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*(F. Ahmad)  
Coordinator*

*(S. C. Srivastava)*

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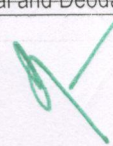


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M.Sc. Second Year (Semester-IV)		
Credits=04	Optional	Paper-I(Theory)
<b>Maximum Marks:75</b>		<b>Min Passing Marks:25</b>
<b>Sem-IV; 4.1.</b>	<b>Computer Application and Bioinformatics</b> <ul style="list-style-type: none"> <li>• Primary nucleotide sequence databases- EMBL, Gene bank, DDBJ.</li> <li>• Protein sequence data bases- Swissprot/TrEMBL,PIR</li> <li>• Sequence motif data bases- Pfam, PROSITE</li> </ul>	
<b>Suggested Readings:</b> <ol style="list-style-type: none"> <li>1. Computer Fundamental: B.Ram</li> <li>2. Fundamental of Information Technology: Leon &amp; Leon</li> <li>3. MS Office: BPB Publication</li> <li>4. A First course in Computers: sanjay Saxena</li> <li>5. Computer Networks, Acme Learning: Anurajan Mishra</li> <li>6. Gupta SP (1969). Statistical Methods, Sultan Chand &amp; Sons, New Delhi.</li> <li>7. Sundar Rao PSS &amp; Richard J (1999). An Introduction to Biostatistics. A Manual for Students in Health Sciences, Prentice Hall of India Pvt. Ltd., New Delhi.</li> <li>8. Rao S.S (1999) Networking Scenario in India New Lib-world 100(4) 160-68</li> <li>9. Schena, M.2003. Microarray Analysis John Wiley Publication New York.</li> <li>10. Prevsner, J.2005. Bioinformatics &amp; Functional Genomics John Wiley &amp; sons new jersey.</li> </ol>		
Credits=04	Optional	Paper-II(Theory)
<b>Maximum Marks:75</b>		<b>Min Passing Marks:25</b>
<b>Sem-IV; 4.2.</b>	<b>Ecology &amp; Evolution</b> <ul style="list-style-type: none"> <li>• Concept and Scope of Ecology; Collective, and Emergent properties, Habitat and niche: niche width and overlap, fundamental and realized niche, resource partitioning, character displacement.</li> <li>• Ecosystem Ecology: Concept of ecosystem, trophic structure, food chain energy flow, productivity and energy subsidy; global carbon cycle, Ecosystem services, restoration ecology, structure and function of some Indian ecosystems: terrestrial (forest, grassland) and aquatic (freshwater, marine and estuarine).</li> </ul>	
<b>Suggested Readings:</b> <ol style="list-style-type: none"> <li>1. Pierzynski GM, Sims JT &amp; Vance GF (2005). Soils and Environmental Quality. CRC, London.</li> <li>2. Perk M (2006). Soil and Water Contamination from Molecular to Catchment Scale. Taylor &amp; Francis. The Netherland.</li> <li>3. Coley D (2008). Energy &amp; Climate Change. John Wiley &amp; Sons,London.</li> <li>4. Itanez JG, Hernandez-Esparza M, Doria-Serano C, Fregoso-Infante A &amp; Singh MM (2007). Environmental Chemistry , Fundamentals. Springer.</li> <li>5. Suresh G (2007). Environmental Studies and Ethics. IK International, New Delhi.</li> <li>6. Odum EP &amp; Barrett GW (2005). Fundamentals of Ecology. V Edn, Thomson Asia, Pvt. Ltd.</li> <li>7. Chapman JL &amp; Reiss MJ (1995). Ecology Principles &amp; Applications. Cambridge University Press. 8. Brady, NC, The nature and properties of soils, Prentice, Hall of India Pvt. Ltd.</li> </ol>		
Credits=04	Optional	Paper-III(Theory)
<b>Maximum Marks:75</b>		<b>Min Passing Marks:25</b>
<b>Sem-IV; 4.3.</b>	<b>Forest Ecology</b> <ul style="list-style-type: none"> <li>• An outline of forest ecosystem</li> <li>• General ecological features of the main forest types of India.</li> <li>• Ecology of some important timber tree like Teak, Sal and Deodar.</li> </ul>	

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 T. Ahmad  
 (convenor)

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 S.C. Srivastava





**Curriculum of M.Sc. Botany**  
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	<ul style="list-style-type: none"> <li>• Regeneration of forests.</li> <li>• Importance of forests in maintenance of environment.</li> </ul>
<b>Suggested Readings:</b>	
<ol style="list-style-type: none"> <li>1. Odum EP &amp; Barrett GW (2005). Fundamentals of Ecology. V Edn, Thomson Asia, Pvt. Ltd.</li> <li>2. Chapman JL &amp; Reiss MJ (1995). Ecology Principles &amp; Applications. Cambridge University Press. 8. Brady, NC, The nature and properties of soils, Prentice, Hall of India Pvt. Ltd.</li> </ol>	
<b>Credits=04</b>	<b>Optional</b>
<b>Maximum Marks:75</b>	
<b>Paper-IV(Theory)</b>	
<b>Min Passing Marks:25</b>	
<b>Sem-IV; 4.4.</b>	<b>Water Resource Management</b> <ul style="list-style-type: none"> <li>• Quality of water, Physico-chemical properties of freshwater, water quality parameters and standards, water pollution and its sources, Ground water contamination, threats to surface water resources.</li> <li>• Water and plants, agriculture, water stress adaptations in Plants, Role of Plants in water Management, water Borne Diseases, eutrophication. Water management strategies, management of ground water, rain water harvesting, recharging of ground Water, Recycling of waste water.</li> </ul>
<b>Suggested Readings:</b>	
<ol style="list-style-type: none"> <li>1. Ghosh, Ak (2008). Simplifying Climate Change. TERI, New Delhi.</li> <li>2. Sampson, Garey P (2005). The WTO and Sustainable Development, TERI, New Delhi.</li> <li>3. Somayaji S&amp; Somayaji G (2009). Environmental Concerns and Sustainable Development. TERI, New Delhi.</li> <li>4. Saikia, Ranjane (2009). Making Sense of Climate Change. TERI, New Delhi.</li> <li>5. Lovejoy TE &amp; Hannah L (2005). Climate Change and Biodiversity, TERI, New Delhi.</li> </ol>	
<b>Credits=04</b>	<b>Optional</b>
<b>Maximum Marks:75</b>	
<b>Paper-V(Theory)</b>	
<b>Min Passing Marks:25</b>	
<b>Sem-IV; 4.5.</b>	<b>Environment management &amp; Technology</b> <ul style="list-style-type: none"> <li>• Control of environmental pollution: environmental monitoring( Bioindicators)</li> <li>• Water management of aquatic ecosystems and purification of water, sewage treatment.</li> <li>• Soil conservation, solid waste &amp; their disposal reclamation and cycling process.</li> <li>• Air: air quality management and air pollution control devices role of air pollution abatement</li> <li>• Radioactive waste treatment</li> <li>• Environmental legislation.</li> </ul>
<b>Suggested Readings:</b>	
<ol style="list-style-type: none"> <li>1. Magill, PL., Holden, ER. &amp; Ackley, C (1956). Air pollution Hand Book. MC Graw-Hill Book Co.</li> <li>2. Coley, D. (2008). Energy &amp; climate change, John Wiley &amp; Sons. London.</li> <li>3. Null, Air Pollution and plant life</li> <li>4. Saxena, MM. Environmental analysis water soil and air</li> <li>5. Fulekar, M. H. Environmental Biotechnology</li> <li>6. Sawicki, E. Handbook of environmental genotoxicology</li> <li>7. Lyons, J. J. Principles of air pollution meterology</li> <li>8. McCaul, J. Water Pollution</li> </ol>	
<b>Credits=04</b>	<b>Optional</b>
<b>Maximum Marks:75</b>	
<b>Paper-VI(Theory)</b>	
<b>Min Passing Marks:25</b>	
<b>Sem-IV; 4.6.</b>	<b>Cytogenetics Plant Breeding &amp; Biostatistics</b> <ul style="list-style-type: none"> <li>• Cell structure, cell division structure of chromosomes, nucleosomes concept, sex chromosomes, B chromosomes, special chromosomes</li> <li>• Mendelism, chromosome theory of heredity, linkage crossing over, and gene mapping, interaction of gene, quatitative inheritance, chromosomal aberration, polyploidy and their role</li> <li>• Principle and concept of plant. Breeding selection hybridization, acclimatization heterosis, sterility and incompatibility, chimera and graft hybrids, Breeding for disease, insect and</li> </ul>

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 (T. Ahmad.)  
 S.C. Srivastava