

# **HEMCHAND YADAV VISHWAVIDYALAYA, DURG (C.G.)**

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## **SCHEME OF EXAMINATION & SYLLABUS of M.Sc. (Botany) Semester Exam UNDER FACULTY OF LIFE SCIENCE Session 2021-23**

**(Approved by Board of Studies)  
Effective from July 2021**

*[Handwritten signatures]*

## M.Sc. BOTANY

Semester	Paper	Title	External marks	Internal marks	Credit
First	I	Cytology	80	20	4
	II	Genetics	80	20	4
	III	Microbiology, Phycology and Mycology	80	20	4
	IV	Bryophyte, Pteridophyta and Gymnosperm	80	20	4
	LC - I	Lab Course-I (Based on paper I &III)	80	20	4
	LC - II	Lab Course-II (Based on paper II &IV)	80	20	4
Second	I	Taxonomy and diversity of plants	80	20	4
	II	Molecular Biology	80	20	4
	III	Plant physiology	80	20	4
	IV	Plant metabolism	80	20	4
	LC- I	Lab Course-I (Based on paper I &II)	80	20	4
	LC-II	Lab Course-II (Based on paper III &IV)	80	20	4
Third	I	Plant development and plant resources	80	20	4
	II	Plant Ecology– I (Ecosystem and vegetation ecology)	80	20	4
	III	Biotechnology I (Genetic engineering of plants & microbes)	80	20	4
	IV	<b>Elective paper-1</b> Molecular plant pathology-I <b>OR</b> <b>Elective paper-II</b> Limnology-I <b>OR</b> <b>Elective paper-III</b> Ethno botany I	80	20	4
	LC-I	Lab Course-I (Based on paper I &II)	80	20	4
	LC-II	Lab Course-II (Based on paper III &IV)	80	20	4

Fourth	I	Plant reproduction and plant resources utilization	80	20	4
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	II	Plant Ecology II (Pollution and biodiversity conservation)	80	20	4
	III	Biotechnology II ( Plant cell, tissue culture & organ culture)	80	20	4
	IV	<b>Elective paper-I</b> Molecular plant pathology-II <b>OR</b> <b>Elective paper-II</b> Limnology-II <b>OR</b> <b>Elective paper-III</b> Ethno botany II	80	20	4
	LC-I	Lab Course-I (Based on paper I &II)	80	20	4
	LC-II	Lab Course-II (Based on paper III &IV)	80	20	4

**Choice Based Credit System: Semester II Course Forestry seed Technology.**  
**Marks 100, Credit Points -03, Total Hours -50**

**Choice Based Credit System: Semester III Course Environmental Science.**  
**Marks 100, Credit Points -03, Total Hours -50**

- Each theory paper will have 5 questions of equal marks. First question will encompass all the five units without internal choice, whereas rest questions will be unit wise with internal choice.
- The respective teachers on each paper will ensure the internal evaluation by a class test and a seminar / poster presentation of 20 marks each and submit the foil and counter foil to the HOD by the end of the activity.



**PRACTICAL SCHEME,  
LAB COURSE-I  
M.Sc. IV SEMESTER (BOTANY)**

**Time-5 Hours**

**Maximum Marks 100**

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1.	Exercise based on Paper-I	25 Marks
2.	Exercise based on Paper-II	25 Marks
3.	Spotting	20 Marks
4.	Viva-voce	10 Marks
5.	Sessional (Internal Assessment)	20 Marks

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**Total- 100 Marks**

**PRACTICAL  
SCHEME, LAB  
COURSE-II  
M.Sc. IV SEMESTER (BOTANY)**

**Time-5 Hours**

**Maximum Marks 100**

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1.	Exercise based on Paper-III	25 Marks
2.	Exercise based on Paper-IV	25 Marks
3.	Spotting	20 Marks
4.	Viva-voce	10 Marks
5.	Sessional (Internal Assessment)	20 Marks

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**Total- 100 Marks**



**MESTER - IVPAPER -**  
**I**  
**PLANT REPRODUCTION AND UTILIZATION OF RESOURCES**  
**MAX.MARKS-80**  
**S**  
**E**

**Reproduction :** Vegetative reparation, Methods of propagation. Pollination, Pollination- mechanism and vector, Structure of pistil, Pollen stigma interaction, Sporophytic and gametophytic Self-incompatibility (Cytological, biochemical and molecular aspects), Fertilization, double fertilization, *in-vitro* fertilization.

**UNIT-II**

**Male gametophyte :** Structure of anther, Microsporogenesis, Role of tapetum, pollen development, male sterility, sperm dimorphism and hybrid seed production, Pollen germination, Pollen tube growth and guidance, Pollen storage, Pollen allergy, Pollen embryo sac.

**Female gametophyte :** Ovule development, Organization of embryo sac and Structure of embryo sac cells.

**UNIT-III**

**Seed and Fruit development:** Endosperm development during early, maturation and desiccation stages. Embryo genesis, Storage proteins of endosperm, Ultra structure and nuclear cytology, Cell lineage during late embryo development, Polyembryony, Apomixes, Embryo culture, Endospermic and non-endospermic seeds, Dynamics of fruit growth, biochemistry and biology of fruit maturation.

**UNIT-IV**

**Utilization of resources:** Plant used as avenue trees for shade, Pollution control and aesthetics, Innovation for meeting world food demands Origin of Agriculture. Green revolution; benefits and adverse consequences. Ethanobotanically important plants of Chhattisgarh. World centers of primary diversity of domesticated plants.

**SUGGESTED READINGS :**

- Bhojwani, SS. and Bhatnagar, S.P. 2000. The Embryology of Angiosperms (4 revised and enlarged edition) Vikas publication House, New Delhi.
- Fageri, K. and Vander Pijl, L. 1979. The Principles of Pollination Ecology Pergamon Press, Oxford.
- Proctor, And Yeo, P. 1973. The Pollination of Flowers. William Collins, London.
- Raghavan. V. 1997. Molecular Embryology of Flowering Plants. Cambridge University, Press, Cambridge.



- Raghavan, V. 1999 Developmental Biology of Flowering Plants. Springer-Verlag, New York.
- Raven, P.H. Evert, R.F. and Eichhorn, and S.E. 1992. Biology of plants (5 edition), Worth, New York.
- Sedgely, M. and Griffin, A.R. 1989. Sexual Reproduction of Tree Crops. Academic Press, London.
- Shivanna, K.R. and Sawhney, V.K. 1997. Pollen Biotechnology for crop Production and Improvement.
- Shivanna, K.R. and Rangaswamy, N.S. 1992. Pollen Biology : A Laboratory Manual. Springer-Verlag, Berlin.
- Shivanna, K.R. and Johri, B.M. 1985. The Angiosperm Pollen : Structure and Function. Wiley Eastern Ltd., New York.
- Chandel, K.P.S., Shukla, G. and Sharma N. 1996. Biodiversity in Medicinal and Aromatic Plants in India; Conservation and Utilization. National Bureau of Plant Genetic Resources, New Delhi.
- Chrispeels, M.J. and Sdava, D. 1977. Plants, Food and People. W.H. Freeman and CO., San Francisco.
- Council of Scientific and Industrial Research 1986. The Useful Plants of India. Publications and directorate, CSIR, New Delhi.
- Kochhar, S.L. 1998. Economic botany of the Tropics, 2<sup>nd</sup> edition. Macmillan India Ltd., Delhi.
- Thakur, R.S., Puri, H.S. and Hussain, A., 1989. Major Medicinal Plants of India. Central Institute of Medicinal and Aromatic Plants, CSIR, Lucknow.
- Swaminathan, M.S. and Kocchar, S.L. 1989. Plants and Society. Macmillan Pub. London.

#### **SUGGESTED LABORATORY / FIELD EXERCISES**

- Study of microsporogenesis and gametogenesis in sections of anthers.
- Examination of modes of anther dehiscence and collection of pollen grains for microscopic examination (*Maize, Grasses, Cannabis Sativa, Croton, Tradescantia, Brassica, Petunia, Solanum melongena* etc.)
- Tests for pollen viability and *in vitro* germination. Pollen germination using hanging drop and sitting drop cultures, suspension culture and surface culture.
- Estimating percentage and average pollen tube length *in vitro*.
- Role of transcription translation inhibitors on pollen germination and pollen tube growth.
- Pollen storage, Pollen-pistil interaction, self-incompatibility *in vitro* pollination.
- Study of ovule in cleared preparations, study of monosporic, bisporic and tetrasporic types of embryo sac development through examination of permanent, stained serial sections.
- Field study of several types of flower with different pollination mechanisms (wind pollination, thrips pollination, bee/butterfly pollination, bird pollination).
- Emasculation, bagging and hand pollination to study of pollen germination, seed set and fruit development using self compatible and obligate out crossing system. Study of cleistogamous flowers and. Their adaptations.
- Study of nuclear and cellular endosperm through dissections and staining.



- Isolation of zygotic, globular, heart shaped, torpedo stage and nature embryo from suitable seeds and polyembryony in citrus, jamun (*Syzygium cumini*) etc. by dissections.
- Study of endospermic and non-endospermic seed.
- Study of seed dormancy and methods to break dormancy.
- Medicinal and Aromatic plants; Depending on the geographical location College/University select five medicinal and aromatic plants each from a garden, crop field or from the wild only if they are abundantly available. *Papaver somniferum*, *Atropa belladonna*, *Catharanthus roseus*, *Adhatoda ceylanica*, *Allium sativum*, *Rauvolfia serpentina*, *Withania somnifera*, *Phyllanthus amarus*, *Andrographis paniculata*, *Aloe barbadense*, *Mentha arvensis*, *Rosa* sp. *Pogostemon cablin*, *Origanum vulgare*, *Vetivera zizanioides*, *Jasminum grandiflorum*, *Cymbopogon* sp., *Pandanus odoratissimus*.
- Study of live or herbarium specimens or other visual materials to become familiar with these resources.
- Vegetable oils; Mustard, Groundnut, Soya bean, Coconut, Sunflower and Castor.
- Gums, Resins, Tannins and Dyes; Perform simple tests for gums and resins. Prepare a water extract of vegetable tannins (*Acacia*, *Terminalia*, Mangroves, Tea, *Cassia* sp. *Myrobalans*) and dyes (*Turmeric*, *Bixa orellana*, *Indigo*, *Butea monosperma*, *Lawsonia intermis*) and perform tests to understand their chemical nature.

#### **SUGGESTED READINGS FOR LABORATORY EXERCISE:**

- Adriance, W. and Brison, R. Propagation of horticultural plants. Tata McGraw Hill pub. New Delhi.
- Sen. N. David, 1977. Environmental and seed germination of Indian plants. The chronica botanica co. New Delhi.
- Shivanna, K.R. and Rangaswamy, N.S. 1992 Pollen Biology : A Laboratory Manual. Springer-Verlag, Berlin.
- Shivanna, K.R., Johr, B.M. And Sastri, D.C. 1979. Development and physiology of angiosperm pollen. Today and tomorrows printers and pub. New Delhi.
- Vargheese, T.M. Experimental and applied embryology of angiosperms. Oxford & IBS pub. Co. New Delhi



**M.Sc. SEMESTER - IV**  
**PAPER - II**  
**POLLUTION AND BIODIVERSITY CONSERVATION**  
**MAX.MARKS-80**

**UNIT-I**

**CLIMATE, SOIL AND VEGETATION PATTERNS OF THE WORLD :**

Life zones, major biomes, major vegetation types and soil types of the world, barren land.

**UNIT-II**

**POLLUTION, CLIMATE CHANGE AND ECOSYSTEMS :**

Air, water and soil pollution:- kinds, sources, quality parameters, effects on plants and ecosystem. Green house gases (Carbon dioxide, methane, nitrous oxide, Chloro fluorocarbons: sources, trends and role), ozone layer, ozone hole, consequences of climate change) Carbon dioxide fertilization, global warming, sea level rise, UV radiation).

**UNIT-III**

**BIOLOGICAL DIVERSITY :-** Concepts and levels, status in India, Utilization and concerns, role of biodiversity in ecosystem functions and stability, speciation and extinction, IUCN categories of threat, distribution and global patterns, terrestrial biodiversity hot spots, inventory.

World centers of primary diversity of domesticated plants; The Indo Burmese center, plant introductions and secondary centers.

**UNIT-IV**

**CONSERVATION STRATEGIES**

Principles of conservation, extinctions, environmental status of plants based on International union for conservation of Nature.

In situ conservation, International efforts and Indian initiatives, protected areas in India- sanctuaries, national parks, biosphere reserves, Wetlands, Mangroves and coral reefs for conservation of wild biodiversity.

Ex situ conservation : Principles and practices, botanical gardens, field gene bank, seed banks, in vitro repositories, cryo banks, general account of the activities of Botanical survey of India (BSI), National Bureau of plant genetic resources (NBPGR), Indian council of Agriculture research (ICAR), Council of scientific and Industrial research (CSIR), and the department of Biotechnology (DBT) for conservation and non formal conservation efforts.





## REFERENCE BOOKS :

- Threshow, M1985. Air pollution and plant life, Wiley interscience.
- Mason C.F. 1991. Biology of fresh water pollution, Longman.
- Hill, M.K. 1997. Understanding Environmental pollution, Cambridge University press.
- Anonymous, 1987. National gene bank, Indian heritage on plant genetic resources, National bureau of plant genetic resources.
- Directory of Indian wet lands, 1993 WWF India and AWB, Kualalumpur.
- Frankel, O.H., Brown, A.H.D. and Burdon, J.J. 1995. The conservation of Plant biodiversity, Cambridge University press, Cambridge, U.K.
- Kothari, A. 1997. Understanding Biodiversity: Life sustainability and Equity, Orient Longman.
- Nair, M.N.B. 1998. Sustainable management of non wood forest products, Faculty of forestry, University Putra Malaysia.
- Paroda, R.S. and Arora R.K. 1991. Plant resources conservation and management, IPGRIP USA Campus, New Delhi.
- Heywood, V.H. and Watson, R.T.1995. Global biodiversity assessment, Cambridge University press Cambridge, U.K.
- Brady, N.C. 1990. The nature and properties of soils, MacMilan.
- Chandel, K.P.S., Shukla, G. and Sharma, N., 1996. biodiversity in medicinal and aromatic plants in India, conservation and utilization. National bureau of plant genetic resources, New Delhi.
- Falk, D.A. Olwell, M Millan, C. 1996. Restoring biodiversity, Island press, Columbia, USA.
- Gaston, K.J. Biodiversity: a biology of numbers and differences, Blackwell science Ltd. Oxford, U.K.
- Heywood, V. 1995 Global biodiversity assessment. United nations environment programme, Cambridge University Press, Cambridge, U.K.
- Heywood, V.H. and Wyse Jakon, P.S. 1991. Tropical botanical gardens, their role in conservation and development, Academic press San. Diego.
- Walter, K.S. and Gillett H.J. 1998. 1997 IUCN Red list of threatened plants.
- IUCN The World conservation union, IUCN, Gland, Switzerland and Cambridge, U.K.

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## **LIST OF PRACTICALS :**

1. To prepare ombrothermic diagram for different sites on the basis of given data set and to comment on climate.
2. To determine soil moisture content, porosity and bulk density of soil collected from varying depths at different locations.
3. To determine the water holding capacity of soils collected from different locations.
4. To determine percent organic carbon and organic matter in the soils of cropland, grassland and forests.
5. To estimate rate of carbon dioxide evolution from different soils using soda lime or alkali absorption method.
6. To determine gross and net phytoplankton productivity by light and dark bottle method.
7. To estimate the dissolved oxygen content in eutrophic and oligotrophic water samples by azide modification method.
8. To estimate chlorophyll content in sulphur dioxide fumigated and unfumigated plant leaves.
9. To study environmental impact of a given developmental activity using checklist as a EIA method.
10. To determine diversity indices (Shannon Wiener, concentration of dominance, species richness, equability and B diversity).
11. Field survey of a part of town or city to make the students aware of the diversity of plants in urban ecosystems.

## **REFERENCE BOOKS FOR LABORATORY EXERCISE:**

Magurran, A.E. 1988. Ecological diversity and its measurement, Chapman and Hall. London.  
APHA-AWWA-WPCF Standard methods for the examination of water and waste water, American public health association, Washington, D.C.  
Krebs, C.J. Ecological methodology, Harper and Row, New York, USA.  
Pielou, E.C. 1984. The interpretation of ecological data, Wiley, New York.  
Moore, P.W. and Chapman, S.B. 1986. Methods in plant Ecology. Blackwell scientific publications.



**M.Sc. SEMESTER - IV  
PAPER – III  
BIOTECHNOLOGY-II**

**PLANT CELL, TISSUE CULTURE AND ORGAN CULTURE**

**MAX.MARKS-80**

**UNIT-I**

**PLANTS CELLS AND TISSUE CULTURE:** General introduction, history, scope, concept of cellular differentiation, cellular totipotency.

**TISSUE CULTURE MEDIA:** Introduction, Media constituents, Media selection, Media preparation.

**CELL CULTURE:** Introduction isolation of single cells. Suspension cultures, Culture of Single cell, Plant cell reactors, Applications of cell culture.

**CLONAL PROPAGATION** - Auxiliary bud proliferation, Meristem and shoot tip culture, bud culture.

**ORGANOGENESIS AND ADVENTIVE EMBRYOGENESIS :** Fundamental aspects of morphogenesis; organogenesis via callus formation, direct adventitious organ formation.

**UNIT-II**

**SOMATIC EMBRYOGENESIS AND ANDROGENESIS :** Mechanisms, techniques and utility.

**SOMATIC HYBRIDIZATION :** Methods of Protoplast isolation, Spontaneous and induced methods of protoplasm fusion, identification and selection of hybrid cells. Regeneration of hybrid plants. Verification and Characterization of somatic hybrids, Cybrids, possibilities, achievements and limitations of protoplast research.

**UNIT-III**

**CRYOPRESERVATION AND GERMPLASM STORAGE:** Raising sterile tissue cultures, Addition of cryoprotectants and pretreatment, freezing, storage, thawing, determination of survival viability. Plant growth and generation, verification, encapsulation and dehydration. Slow growth method, Applications.

**INTELLECTUAL PROPERTY RIGHTS :** Possible ecological risks and ethical concerns.

**UNIT-IV**

**APPLICATION OF PLANT TISSUE CULTURE :** Artificial seeds, Production of hybrids and soma clones.

**PRODUCTION OF SECONDARY METABOLITES / NATURAL PRODUCTS :** Morphological and chemical differentiations, Medium composition for secondary product formation. Growth production patterns, Environmental factors. Selection of cell lines producing high amounts of a useful metabolite, Problems associated with secondary metabolite production Immobilized cell system.

**TRANSGENICS IN CROP IMPROVEMENT:** Transgenic for Resistance to biotic and abiotic stresses, Transgenes for quality modification, Terminator seed technology. Chloroplast transformation and its utility.



**Suggested Reading:**

1. Bhojwani, S.S. and Razdan, M.K. 1996. Plant Tissue Culture: Theory and Practice (revised edition). Elsevier Science Publishers, New York, U.S.A.
2. Bhojwani, S.S. 1990, Plant Tissue Culture; Application and Limitations. Elsevier Science Publishers, New York, USA.
3. Collins, H.A. and Edwards, S., 1998. Plants cell Culture Bio Scientific Publishers, Oxford UK.
4. Jain, S.M. Sopory, S.K. and Veilleux, R.E. 1996. In Vitro Haplod Productin in Higher Plants, Vois. Fundamental Aspects and Methods Kluwer Academic Publishers. Dordrecht. The Netherlands.
5. Kartha, K.K. 1985. Cryopreservation of Plants Cells and Organs. CRC Press, Boca Raton, Florida, USA.
6. Raghavan, V. 1986. Embryogenesis, in Angiosperms: A Development an Experimental Study Cambridge University Press, New York, USA.
7. Vasil, Ikssshorpe, T.A. 1994. Plant Cell and Tissue Culture, Kluwer ACADEMIC publishers, The Netherlands.

**Suggested Laboratory Exercise:**

1. Isolation protoplast from various plant tissues and testing their viability.
2. Effect of physical (e.g. temperature) and chemical (e.g. osmoticum) factors on protoplast yield.
3. Demonstration of protoplast fusion employing PEG.
4. Organogenesis and somatic embryogenesis using appropriates explants and preparations of artificial seed.
5. Demonstration of and oogenesis in Datura.
6. Electroporation of protoplasts and checking of transient expression of the reporter gene.
7. Co-cultivation of the plant material (e.g. leaf discs) with Agrobacterium and study GUS activity histochemically.

**Suggested Reading (for laboratory exercise) :**

1. Butenko, R.G. 2000. Plant Cell Culture, University Press of pacific.
2. Ckollin, H.A. and Edwards, S. 1998. Plant Cell Culture. Bios Scientific Published, Oxford, UK.
3. Dixon, R.A. (Ed.) 1987. Plant Cell Culture: A Practical Approach. IRL Press, Oxford.
4. George, F.F., 1993, plant propagation by tissue Culture. Part 2. The Technology, 2<sup>nd</sup> Exegetics Ltd. Edington, UK.
5. Hall, R.D.; (E.D.) 1999. Plant Cell Culture Protocols, Humana Press, Inc., New Jersey, USA.
6. Smith, R.H. 2000, Plant Tissue Culture: Technique and Experiments. Academic Press, New York.



**M.Sc. SEMESTER - IV**  
**PAPER - IV**  
**ELECTIVE PAPER-- MOLECULAR PLANT PATHOLOGY**  
**MAX.MARKS-80**

**UNIT-I**

1. **Epidemiology and disease forecasting:** form of epidemics, factors responsible for the establishment of an epidemic, disease forecasting.
2. **General principles of plant disease control :** General account; Prophylactic. Chemical (including fungicides, systemic fungicides, fumigants, antibiotics, growth regulators etc.) and biological control; Breeding for disease resistance varieties of host plants, Plant quarantine.

**UNIT-II**

1. **Defense Mechanism-** Defense of host against pathogen, Structural defense; Physiological defense, Biochemical defense-role of phenolic compounds; Phytoalexins Defense through hyper-sensitive reactions.
2. **Resistance and susceptibility:** General account, types of resistance, vertical and horizontal resistance; breeding for disease resistance.

**UNIT-III**

1. **Wilt disease:** General account, symptoms of wilt disease, Mechanism of wilting.
2. **Diseases due to fungi:** Rusts, smuts, Downy mildews powdery mildew diseases, Wilts, Leaf blight, Ergots, Tikka, necrosis, Rots-red rot of sugarcane, Damping off and warts diseases of economically important plants.
3. **Diseases due to Bacteria:** Bacterial blight of Rice, Tundu disease, citrus canker, Crown galls of stone fruits, Angular leaf spots.

**UNIT-IV**

1. **Diseases due to Viruses:** Mosaic of tobacco, Potato and tomato, Leaf curl of tomato & papaya, Yellow vein mosaic of Bhindi, Bunchy top of banana, Grassy shoot disease of sugarcane.
2. **Diseases due to Mycoplasma :** Sandal spike, Little leaf of Brinjal, Grassy shoot disease, Sesamum, phyllody, Citrus greening.
3. **Diseases due to Nematodes:** General characteristics of plants nematodes, Root knot, Malaya disease of Barley, wheat, Citrus nematodes, Ear cockle of wheat.



### SUGGEST READINGS:

1. Plant Pathology - J.C. Walkar
2. Fungi and plant diseases - B.B. Mundkar
3. Plant Pathology – G.N. Agrios
4. Plant Pathology - Wheeler
5. Plant Pathology (Vol.1-3) – Horsfall & Dimon
6. A text book of Modern Plant Pathology – K.S. Bilgrami and H. S.Dubey
7. Plant Pathology – R.S.singh
8. An introduction to Principles of Plant pathology - R.S.singh
9. Plant Disease of Crop plants in India – N.G. Rangaswamy.
10. Plant Pathology problems and progress- Honfall
11. Essentials of Plant Pathology- V.N. Pathak
12. Plant Pathology – Butter and Jones.
13. Plant Pathology- R.S. Malhotra
14. Crop plant Disease Colender- IARI-India.
15. Physiology of Fungus- – K.S. Bilgrami and H. S.Dubey
16. Micro-organisms in laboratory – G.P. Agarwal and S.K. Hasija.
17. Physiology of fungi – V.G.Lily and H.L.. Barnet.
18. Illustrated Genera of Imperfecti fungi- H.L.. Barnet and.B.B. Hunter.
19. Microbiology and Plant Pathology- P.D.Sharma
20. Plant Pathology- P.D.Sharma
21. Microbiology – P.D.Sharma
22. The Fungi – G. Sumbali
23. Fungicides and crop protection- H.G.Mewitt
24. Fungal diseases of plants- B.M. Duggar
25. Plant Pathology – P.C. Trivedi
26. Plant Pathology – G.P. Gupta
27. Virus and Plant diseases S.R.Mishra
28. Bacterial Diseases- V. Kumar
29. Biotechnology and Plant Pathology- V.K.Jain
30. Laboratory manual of Plant Pathology- D.K.Jha.
31. Modern technology of Plant Pathology- V.Suri.



**M.Sc. SEMESTER - IV**  
**PAPER - IV**  
**ELECTIVE PAPER-- MOLECULAR PLANT PATHOLOGY**  
**LAB COURSE II**

**Suggested laboratory/Field Exercises**

1. Collection and preservation of diseased plants parts through field visit.
2. Study of stages for the demonstration of Koch's postulate for identification of pathogenicity of an organism.
3. Study of fungal diseases of important crop and vegetable plants- Study of symptoms and host parasite interactions through field visit/museum specimens/photographs.
4. Symptomatological study of important Bacterial/viral/Mycoplasmal diseases of economically important plants.
5. Special features of some plant pathogens through slide preparation/permanent slides.
6. Plant Pathological Methods.
  - Isolation of fungal pathogens/microorganisms from leaves
  - Isolation of fungal pathogens/microorganisms from rhizosphere
  - Isolation of fungal pathogens/microorganisms from air by exposure plant techniques

**Suggested Reading (For Laboratory Exercises):**

College Botany Practical Vol. II - SC Santra, TP Chatterjee, AP Das  
Experiments in Microbiology/Plant Pathology, Tissue culture and Microbial  
Biotechnology-Vth Edition by KR Aneja.

Practical Microbiology-DR RC Dubey and DR DK Maheshwari



**M.Sc. SEMESTER – IV (Botany)**  
**PAPER – IV**  
**ELECTIVE PAPER-- LIMNOLOGY-II**

**MAX.MARKS-80**

**UNIT-1**

1.Study of Biota

- (a) Phytoplankton flora-classification of phytoplankton, special distribution of phytoplankton, seasonal distribution and species composition of phytoplankton. Algal blooms effects of salinity and climatic stresses on the distribution of phytoplankton, Phytobenthos-classification.
- (b) Phytoplankton and their inter-relationship with Zooplanktons.
- (c) Aquatic insects, birds and their environmental significance.

**UNIT-II**

- 1. Lake Flora-Higher Plants. Categories of aquatic higher plants, zonation of rooted higher plants, some peculiarities of aquatic higher plants.
- 2. Lake Bacteria-occurrence, characteristics and importance.
- 3. Ecological classification of aquatic higher aquatic plants and their significance.
- 4. Biotic relationship and interaction among organisms. Symbiosis, competition among algae, Parasitism of algae, predation of algae, impact of human being on algae.

**UNIT-III**

- 1. Concept of Productivity: Seasonal variation, Primary productivity in freshwater lakes, Estimation of Primary Productivity.
- 2. Bio indicators-Aquatic flora and fauna in relation to water quality in an aquatic environment.
- 3. Use and misuse of inland waters.
- 4. Methods of water quality testing BOD and COD.

**UNIT-IV**

- 1. Sewage-Definition, composition and its treatment.
- 2. Pollution by Domestic and Agriculture sewage, Industrial effluent.
- 3. Causes of pollution of Aquatic Resources, their management and conservation.
- 4. Resource Conservation-Aquatic pollution, control, legislation, regulation on discharge of industrial effluents and domestic wastes in rivers and reservoirs.





**Suggested Readings:**

Anathakrishnan : Bioresources Ecology Goldman: Limnology  
Odum: Ecology  
Pawlosuske : Physico-chemical methods for water Limnology Wetzel :  
Chemical and biological methods for water pollution studies  
Trivedi&Goyal : Chemical and biological methods for water pollution  
studies Welch: Limnology Vols.I-II  
Perkins: Ecology  
Arora : Fundamentals of environmental biology Ghoshe : Toxicology  
Sood : Toxicology

**Suggested laboratory Exercise**

1. Sampling of phytoplankton and their qualitative and quantitative analysis.
2. Sampling of periphytes and macrophytes, and their qualitative and quantitative analysis.
3. Sampling of Zooplankton and their qualitative and quantitative analysis.
4. Primary production: Experiment-in-situ by light and dark bottle method.
5. Short-term productivity experiments for the understanding of diel variation in aquatic ecosystems.
6. Analysis of sediments for benthic fauna and flora.



### **Suggested Reading:**

1. Adoni, A.D. et al. 1985. Workbook on Limnology. Pratibha Pub. Sagar 216 p.
2. APHA 1981. Standard Methods for the Examination of Water and Waste water. American Public Health Association, Washington.
3. Arber, A. 1920. Water Plants. Cambridge University Press.
4. Barnes, A.K. and K.H. Mann, 1980. Fundamentals of Aquatic Ecosystems. Blackwell Scientific Publication, Oxford.
5. Brown, A.L. 1971. Ecology of Fresh Water. Heinemann, London, 129 p. nd
6. Cole G.A., 1979. Text book of Limnology. 2
7. De, A.K., 1989. Environmental Chemistry. Wiley Eastern Limited, New Delhi.
8. Goldman, C.R. and A.J. Horne, 1983. Limnology. McGraw Hill Inc. Tokyo, 464 p.
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## M.Sc. IV SEMESTER

### PAPER –IV

#### ELECTIVE COURSE – ETHNO BOTANY

MAXIMUM MARKS : 80

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##### Unit - I

- Plant Conservation by Tribes & role of Joint Forest Management Programme in Plant Conservation specially People's Protected Area
- Ethnobotany and its role in domestication and conservation of native plant and genetic resources.
- The protection of plant varieties and Intellectual Properties Rights.
- General account of conservation of medicinal plants.
- General role of Aromatic plants.

##### Unit-II

- General ideas of various system of medicine using plants.
- Basic knowledge of Ayurvedic, Homeopathic, Allopathic system of medicine.
- General idea of active principles of Plants.
- Herbal Cosmetics.
- General account of toxic plants and Harmful effect of plants on human society with special reference to allergic plants of Chhattisgarh.

##### Unit –III

- Endemic plants of Chhattisgarh.
- Endangered plants of Chhattisgarh.
- Techniques of cultivation and marketing of Aromatic plants –Podina, Lemon grass Kasturibhindi, Palmarosa.
- Techniques of cultivation ,marketing and importance of mushroom
- Techniques of cultivation, extraction of juice and importance of wheat grass.

##### Unit-IV

- Ethnobotanical study of the following plants with special reference to their medicinal importance-
  1. *Allium sativum* (Lahsun)
  2. *Aegle marmelos* (Bel)
  3. *Terminallia arjuna* (Arjun)
  4. *T. bellerica* (Bahera)
  5. *T. chebula* (Harra)
  6. *Calendula officianallis* (Calendula)
  7. *Thuja occidentalis* (Vidhya)
  8. *Datura alba* (Datura)
  9. *Argemone maxicana* (Pili kateli)
  10. *Ephedra* sps. ( Ephedra).



### Suggested Readings :-

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### **Suggested Laboratory Exercises:-**

#### **Ethnobotany**

2. Description and identification of medicinal plants and its medical properties.
3. Extraction of phytochemicals from various medicinal plants.
4. Preparation medicinal plants herbarium and photographs.
5. Herbal preparation –
  - a. Preparation of digestive powder.
  - b. Mouth freshener of Ajwain.
  - c. Beverage of Tulsi,Bel,Tikhur,Mango.
  - d. Ayurvedic tea preparation.
  - e. Tablet of amla vati.
  - f. Murabba of Awla/Bel.
  - g. Herbal dye
  - h. Shitopladi powder.
6. Identification and study of Ethnobotanical importance of some plants of Raipur.  
To cultivate at least two medicinal plant in earthen

