

DEPARTMENT OF BOTANY

COURSE CURRICULUM & MARKING SCHEME

M.Sc. BOTANY

Semester - III

SESSION : 2024-25



ESTD: 1958

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG, 491001 (C.G.)

(Former Name – Govt. Arts & Science College, Durg)

NAAC Accredited Grade A⁺, College with CPE - Phase III (UGC), STAR COLLEGE (DBT)

Phone : 0788-2212030

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SYLLABUS AND MARKING SCHEME FOR M.Sc. (BOTANY)

THIRD SEMESTER

Session: 2024-2025

Paper No.	Title of the Paper	Marks Allotted in Theory		Marks Allotted in Internal Assessment		Credits
		Max	Min	Max.	Min.	
I CC- MBO301	Plant Development and Plant Resources	80	16	20	04	05
II CC- MBO302	Plant Ecology	80	16	20	04	05
III CC- MBO303	Plant Biotechnology	80	16	20	04	05
IV CC- MBO304	Elective – I & II 1. Microbial Ecology 2. Ethnobotany	80	16	20	04	05
V	Lab Course I - based on paper I and II	100	33			04
VI	Lab Course II - based on paper III and IV	100	33			04
	Total	520		80		28

CC – Course Code

04 Theory papers - 320

04 Internal Assessments - 80

02 Practical - 200

Total Marks - 600

Note: 1. 20 marks = 01 credit in Theory Papers and 25 Marks = 01 Credit in Practical/Project work

M.Sc. (BOTANY) SCHEME 2024-2025 SEMESTER –III, LAB COURSE

LAB COURSE - 1 (4 Hrs)

Max. M.100




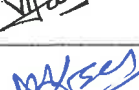


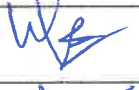


Part – I Practical based on Plant development and plant resources	25
Part – II Exercise based on Plant ecology	25
Part – III Spotting	15
Part – IV Field study	15
Part – V Viva- Voce	10
Part – VI Sessional	10

LAB COURSE-2 (4 Hrs)

Max. M.100

Part – I Exercise based on Plant Biotechnology	25
Part – II Exercise based on Microbial ecology/Ethnobotany {Elective – I}	25
Part – III Spotting	15
Part – V Assignment/ Field study	15
Part – IV Viva- Voce	10
Part – VI Sessional	10

Name and Signatures of Members Board of Studies

S. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Ranjana Shrivastava	
2.	Members	1. Dr. G. S. Thakur	
		2. Dr. Shriram Kunjam	
		3. Dr. Satish Kumar Sen	
		4. Dr. Vijay Laxmi Naidu	
		5. Mr. Motiram Sahu	
		6. Dr. Rajeshwari Prabha Lahare	
3.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	
		2. Dr. N.B. Singh (Govt. N. PG. Science College Raipur C.G.)	
4.	VC Nominated	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur	

	member	C.G.)	
5.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	<i>Manish</i>
6.	Ex Meritorious Student PG	Tanu Verma	<i>Tanu Verma</i>
7.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG. Autonomous College Durg C.G.)	<i>Divya</i>

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M.Sc. – BOTANY SEMESTER – III

SESSION – 2024-2025

PAPER – I (Course Code- MBO301)

PLANT DEVELOPMENT AND PLANT RESOURCES

Max. M. - 80

Min. M. - 16

UNIT-I

- **Introduction:** Unique features of plant development.
- **Seed germination and Seedling growth,** metabolism of nucleic acids, proteins and mobilization of food reserves hormonal control of seedling growth.
- **Seed dormancy,** overcoming of seed dormancy, Bud dormancy.
- **Root development:** Organization of root apical meristem (RAM), Vascular tissue differentiation of root, lateral roots, Root hairs, Root microbe interaction.

UNIT-II

- **Shoot Development:** Organization of shoot apical meristem (SAM). Control of tissue differentiation; especially Xylem and Phloem.
- **Secretory ducts and laticifers,**
- **Wood development** – Formation of annual ring, heart wood and sap wood, porous and non porous, autumn & spring wood, periderm, lenticels, tylosis,

UNIT-III

- **Leaf growth and differentiation:** Development; phyllotaxy; differentiation of epidermis (with special reference to stomata and trichome) and Mesophyll..
- **Senescence,** influences of hormones and environmental factors on senescence.
- **Flower development:** Genetics of Floral organ differentiation: Homeotic mutant in *Arabidopsis* and *Antirrhinum*.

UNIT-IV

- **Plant resources:** Introduction, cultivation and uses of
 - **Food / Fodder crops:** Wheat, Rice, Sugarcane, Berseem, Black gram & Bengal gram.
 - **Vegetable Oil Yielding Crops:** Groundnut and Soyabean.
 - **Fiber Crops:** Cotton and Jute.
 - **Timber And Fire Wood Plants:**
 - Sal, Teak, Shisham, Deodar, Pines,
 - Babul, Amaltas, Emlī, Bija, Jamun.
 - **Non Wood Forest Products (NWDPS):** Bamboos, Gums & Dyes (Sindoori, Heena).

Laboratory Exercise

- Study of alternate, opposite, opposite and superposed, opposite and decussate, spiral leaf arrangement.
 - Microscopic examination of V.S. of leaves (such as Nerium, Maize, Grass) to understand the internal structure of the leaf tissues, trichome and glands etc.
 - Study of epidermal peels of leaves of different plants; to study the structure of stomata and stomatal index.
 - Microscopic examination of root (monocot, dicot, aerial root {Banyan}, hygroscopic {Vanda root}, assimilatory root {Tinospora}).
 - Anatomy of stem (monocot and dicot). Study of stem modification.
- {Field Survey}**
- Listing of firewood and timber yielding trees of local origin. {Local name, Scientific name, Family, Properties}.
 - Study of live or herbarium specimens or other visual materials to become familiar with these resources.
 - Micro chemical tests for stored food material.

Recommended Books

- Fahn, A. 1982, Plant Anatomy. (3rd Edi.). Pergamon Press, Oxford.
- Tayal, M.S. Plant Anatomy, Rastogi Pub.
- Vashista, P.C. Plant Anatomy, S. Chand.
- Pandey, B.P., Plant Anatomy.
- Chandurkar, Plant Anatomy.
- Emes, J. Plant Anatomy.
- Bendre, A. and Kumar, 2004 A. Rastogi pub. Meerut, India.
- Santra, S.C., Chatterjee, T.P. and Das. 2005 A.P. College Botany Practical Vol. II New central pub. India.
- Botany of field crops, J.S. Nanda, P. K. Agarwal.
- Economic Botany in the tropics S. L. Kochhar.
- Hill's economic botany Dr. O.P, Sharma.

Outcome :-

- To understand about life cycle of major group of plants viz. Angiosperms.
- Learn Seed germination, root microbe interaction shoot development.
- Analyse types and development of Wood.
- To know about leaf, stomata and genetics of flower development.
- Learn and analyse useful products of plants and about non wood forest To Products like Bamboo, Gum, and Dyes.

Question Paper Format and Distribution of Marks for PG Semester Examination

Question paper format for the Post-Graduate Examination has been revised from the Session 2018-19. The revised format will be applicable for all the question papers of Semester I, II, III & IV. The following are the main points of the new format:




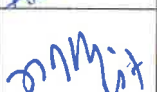


1. The question paper will be of **80 marks** (as before)
2. Questions will be asked Unit-wise in each question paper.
3. From each Unit, the questions will be asked as follows :
 - Q.1 Very short answer type question
(Answer in one or two sentences) **(02 Marks)**
 - Q.2 Very short answer type question
(Answer in one or two sentences) **(02 Marks)**
 - Q.3 Short answer type question (Answer in 200-250 words) **(04 Marks)**
 - Q.4 Long answer type questions (Answer in 400-450 words) **(12 Marks)**

Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
Very Short (2 Questions) (Maximum two sentences)	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks
Short (1 Question) 200- 250 words	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks
Long answer (1 Question) 400- 450 words	1 x 12 = 12 Marks	1 x 12 = 12 Marks	1 x 12 = 12 Marks	1 x 12 = 12 Marks

Note:

1. Question no. 1 and Question 2 will be compulsory.
2. Question no. 3 and 4 will consist of 2 optional questions of which one has to be attempted.
3. As mentioned above, two compulsory very short answer type questions (2+2 marks), one short answer type question with internal choice (4 marks) and one long answer type question with internal choice (12 marks) will be asked from each unit. Thus there will be questions of 20 marks from each unit and of total 80 marks from all the four units of the syllabus/syllabi.
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 - ii. Seminar (Power point presentation) in any one of the paper (20 marks)
 - iii. Assignment in each of the remaining papers (excluding the paper of Seminar. (20 marks)
 - iv. Average of marks obtained in internal test + seminar in any one paper and marks obtained in internal test + assignment in rest of the papers will be calculated and taken into consideration.

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M.Sc. – BOTANY SEMESTER – III

SESSION – 2024-2025

PAPER – II (Course Code- MBO302)

PLANT ECOLOGY I

Max. M. 80

Min. M. 16

UNIT-I

- **Ecosystem Organization:**
 - Law of Ecology , Structure – Structure of ecosystem (Abiotic, biotic components & ecological pyramids), Function of ecosystem (Productivity, food chain, food web, Nutrient cycles & Energy flow), Primary production (Methods of measurement, global pattern, controlling factors), Energy dynamics (tropic organization, energy flow pathways, ecological efficiencies).
 - Litter fall and decomposition (mechanism, substrate quality and climatic factors).
 - Global biogeochemical cycles of C, N, P and S mineral cycles (pathways and processes) in terrestrial and aquatic systems.

UNIT-II

- **Ecosystem Management:**
 - Concept (resistance and resilience), Ecological perturbations – Natural (flood, drought, fire, Volcano, landslide, earthquake, & cyclone) and anthropogenic (deforestation, desertification, usage of pesticide, insecticide, chemical fertilizers and plastics, water, air, soil, noise & nuclear pollutions and their impact on plants and ecosystems.
 - Ecology of plant invasion, environment impact assessment, ecosystem restorations.
- Sustainable development:** Concept, Strategies, Principle and threats of Sustainable development, Causes of unsustainability, Sustainable development-international & national efforts, Sustainability indicators.

UNIT-III

- **Vegetation and organization:**

Concepts of community and continuum, analysis of communities (analytical – quantitative (frequency, density, abundance, cover and basal area), qualitative (physiognomy, phenology, stratification, abundance, sociability, vitality & life forms), Synthetic characters (presence & constance, fiedality, dominance, interspecific associations, index of similarity, species diversity, diversity index).

 - Community coefficients, inter specific associations (Positive interaction & Negative interaction), ordination.
 - **Population Ecology:** Characteristics of a population, Population growth curves, Population regulation, Life history strategies (r and K selection), Concept of metapopulation – Demes and Dispersal, interdemic extinctions, age structured populations.

UNIT-IV

Vegetation development:

- Temporal changes (cyclic and non cyclic). Types of ecological succession – hydrosere and xerosere, mechanism of ecological succession (relay floristic and initial floristic composition, facilitation and tolerance), change in ecosystem properties during succession. Climax concept in succession – monocl意思 and polyclimax theory.
- **Habitat and Niche:** Concept of habitat and niche; niche width and overlap, fundamental and realized niche, resource partitioning, character displacement.

Laboratory Exercise

- To determine minimum size and number of quadrat required for reliable estimate of biomass in grassland.
- To compare protected and unprotected grassland using community coefficients (similarity indices).
- To determine relative density of the species in a woodland using point centred quarter method.
- To determine relative frequency of the species in a woodland using point centered quarter method.
- To estimate IVI of the species in a woodland using point centered quarter method.
- To calculate mean, variance, standard deviation, standard error, coefficient of variations and to use t test for comparing two means related to ecological data.
- To find out the relationship between two ecological variables using correlation and regression analysis.
- To find out important grassland species using chi square test.

Recommended Books

- Shukla, R.S. and Chandel P.S. A text book of Plant Ecology including Ethno Botany and Soil Science. S. Chand and Company LTD.
- Dash, M.C., Fundamentals of Ecology, Tata McGraw Hill Company LTD.
- Sharma, P.D., Ecology and Environment, Rastogi Pub.
- Sharma, P.D., Environmental Biology, Rastogi Pub.
- Ambasht, R.S., A text book of Plant Ecology, Dev Jyoti Press, Varanasi.
- Arora, M. P., Ecology, Himalaya Pub. House.
- Tansley, A.G., An introduction to Plant Ecology, Discovery pub. House.
- Kochhar P.L. Plant Ecology , Genetics and Evolution, Jalandher.
- Arora Mohan p. , Ecology , Himalaya Pub. House.
- Weaver John E., Clements, E., Plant Ecology, Tata McGreaw Hill Company LTD.
- Odum Eugene, P. Fundamentals of Ecology, W.B. Sauneds Company.
- Kumar, H. S. General Ecology, Vikas Pub. House.
- Mishra, K.C. Manual of Plant Ecology , 3rd Ed. Oxford Pub. Company.
- Rana, S.V.S., Environmental Studies, Rastogi Pub.
- Benjamin cummings Publication Company, California.
- Chapman, J.L. and Reiss, M.J. 1988. Ecology principles and applications, Cambridge University press, Cambridge, U.K.

9



Course Outcomes:-

- Through these units students understand ecosystem organization is the establishment of balanced, functional ecosystems that support diverse life forms and provide critical services to both the environment and human populations.
- Describe examples of the ways in which ecology requires the integration of different scientific disciplines.
- Distinguish between abiotic and biotic components of the environment.
- Recognize the relationship between abiotic and biotic components of the environment.
- Through the ecosystem management understand the highlight the holistic and integrated approach of ecosystem management, which considers ecological, social, and economic factors to promote the health and well-being of both natural systems and human communities.
- Students clearly understand between population & community ecology & their significant role in society.
- Through the Ecological succession” students observed process of change in the species structure of an ecological community over time. Within any community some species may become less abundant over some time interval, or they may even vanish from the ecosystem altogether.

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(Answer in one or two sentences) (02 Marks)
- Q.2 Very short answer type question
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- Q.3 Short answer type question (Answer in 200-250 words) (04 Marks)
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	from other Department	Autonomous College Durg C.G.)	
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M.Sc. – BOTANY SEMESTER – III

SESSION – 2024-2025

PAPER – III (Course Code- MBO303)

PLANT BIOTECHNOLOGY

Max. M. - 80

Min. M. - 16

Unit I

- **Plant cell and Tissue Culture:** General introduction, history, scope, concept of cellular differentiation, cellular totipotency, Organogenesis.
- **Plant Tissue Culture Media:** Types, constituents, Selection of media and media preparation.
- **Callus & Suspension Cultures:** Initiation and Maintenance of callus, Isolation and cloning of single cell, Single cell culture, suspension culture, cell viability test and application.
- **Clonal Propagation: (Micropropagation)** – Shoot tip culture, Apical meristem culture, production of virus free plant, somaclonal variations.

Unit II

- **Embryogenesis in Plant Tissue Culture:** Somatic embryogenesis, Embryo culture & embryo rescue, Artificial seed production.
- **Haploid Plant Generation:** Androgenesis, Anther and Pollen culture, ovary culture
- **Somatic Hybridization:** Methods of Protoplast isolation, and fusion. production of hybrid and cybrid plants, identification and selection of hybrid cell, regeneration of hybrid plants; possibilities, limitations and application.
- **Plant secondary metabolites Production:** secondary metabolites, Pathway and mechanisms, media composition, factors consideration for Production of secondary metabolites/natural products:

Unit III

- **Plant transformation technology:** Basis of tumor formation, Hairy root, Agrobacterium, Features of Ti & Ri plasmids, Use of Ti & Ri plasmids as vectors, Mechanism of DNA transfer.
- **Chloroplast transformation:** vectors for chloroplast transformation, chloroplast transformation method, advantages, limitation of chloroplast transformation.
- **Transgenic Plant Production:** Herbicide resistance. Insect resistance, Virus resistance: Disease resistance, Transgenic plants as bioreactors, biodegradable plastic, production of edible vaccine, therapeutic proteins. Transgenic plants for quality: Improved storage, longer life, male sterility.
- **Cryopreservation and germplasm storage:** Introduction, Principles of Cryopreservation, Cryopreservation Techniques, Germplasm Collection and Preparation, Cryopreservation Protocols, Quality Control and Monitoring, Applications of Cryopreservation



Unit – IV

- **Drug discovery and Designing:** Introduction, Historical Perspective, Drug Targets and Pharmacological Relevance, Drug Discovery Process, Drug Designing Approaches, Technologies and Tools in Drug Discovery, Challenges and Opportunities, Emerging Trends, Ethical and Regulatory Considerations in Drug Development
- **Pharmacology:** Introduction, Importance and applications, Pharmacokinetics, Pharmacodynamics, Drug Classes and Classification, Drug Development and Approval Process, Drug Safety and Adverse Effects, Pharmacotherapy, Pharmacogenomics, Drug Abuse and Addiction, Emerging Trends in Pharmacology, Ethical and Legal Issues in Pharmacology
- **Intellectual Property Rights:** Introduction to IPR, Types of IPR; Patents, Trademarks, Copyrights, Trade Secrets, Industrial Designs, Geographical Indications, International IPR Treaties, IPR in Biotechnology, Economic Impact of IPR, Challenges and Future Trends

Laboratory Exercise

- Sterilization of glassware, media, instruments, and Surface sterilization of plant material
- Preparation of Murashige and Skoog (MS) medium and various plant tissue culture media
- Induction of callus from various explants (e.g., leaf, stem, root)
- Clonal propagation through axillary bud proliferation and Induction and selection of somaclonal variants
- Isolation and Culture of protoplasts and regeneration of plants
- Induction of haploid plants through anther culture
- Techniques for cryopreservation of plant tissues
- Induction of secondary metabolite production in cultured cells
- Regeneration of complete plants from various explants and Hardening and acclimatization of regenerated plants
- Encapsulation of somatic embryos or shoot tips and Germination of synthetic seeds
- Meristem culture for virus-free plant production

Recommended Books

- Bhojwani, S. S., & Razdan, M. K. (1996). Plant tissue culture: Theory and practice (Revised ed.). Elsevier Science Publishers.
- Bhojwani, S. S. (1990). Plant tissue culture: Applications and limitations. Elsevier Science Publishers.
- Kumar, U. (2002). Methods in plant tissue culture (2nd ed.). Agrobios India.
- Prakash, M., & Arora, C. K. (2003). Cell and tissue culture. Anmol Publications.
- Jogdand, S. N. (n.d.). Industrial biotechnology. Himalaya Publishing House.
- Gupta, P. K. (2003). Elements of biotechnology. Rastogi Publications.
- Singh, B. D. (2005). Biotechnology. Kalyani Publications.

- Dubey, R. C. (n.d.). A textbook of biotechnology. S. Chand Publications.
- Jha, T., & Ghosh, B. (2006). Plant tissue culture: Basic and applied.
- Keshavachandra, R., & Peter, K. V. (2006). Plant biotechnology: Methods in tissue culture and gene transfer.
- Gamborg, O. L., & Phillips, G. C. (2005). Plant, cell, tissue and organ culture.
- Vasil, I. K., & Thorpe, T. A. (2005). Plant cell and tissue culture.
- Clark, A. J. (2013). Principles of Drug Design. Cambridge University Press.
- Choudhary, M. M. I., & Kumar, A. (2019). Drug Design: Principles and Applications. CRC Press.
- Charman, W. N., & Eckhardt, A. (2012). Introduction to Drug Discovery. CRC Press.
- Ahmed, M. (2015). Drug Discovery and Development. John Wiley & Sons.
- Nag, A. (2017). Computer-Aided Drug Design and Delivery Systems. CRC Press.
- Rang, H. P., Dale, M. M., Ritter, J. M., & Flower, R. J. (2021). Rang & Dale's Pharmacology. Elsevier.
- Katzung, B. G., Trevor, A. J., & Kruidering-Hall, M. (2018). Basic & Clinical Pharmacology. McGraw-Hill Education.
- Hitner, H., & Nagle, B. T. (2019). Pharmacology: An Introduction. McGraw-Hill Education.

Course Objectives

This course aims to provide a comprehensive understanding of plant biotechnology, covering topics such as plant cell and tissue culture, media preparation, callus and suspension cultures, clonal propagation, embryogenesis, somatic hybridization, secondary metabolite production, plant transformation technology, cryopreservation, germplasm storage, drug discovery, pharmacology, and intellectual property rights, equipping students with essential knowledge and skills in these areas.

Course Outcomes

By the end of this course, students will be able to:

- Explain the Fundamentals of Plant Tissue Culture: Describe the history, scope, and principles of plant cell and tissue culture, including cellular differentiation and totipotency.
- Prepare and Select Appropriate Media: Identify and prepare different types of plant tissue culture media, understanding their constituents and selection criteria.
- Develop Callus and Suspension Cultures: Initiate and maintain callus cultures, isolate and clone single cells, perform cell viability tests, and apply suspension culture techniques.
- Perform Clonal Propagation: Conduct micropropagation techniques such as shoot tip and apical meristem culture, produce virus-free plants, and recognize somaclonal variations.
- Apply Embryogenesis and Hybridization Techniques: Perform somatic embryogenesis, embryo culture, artificial seed production, protoplast isolation and fusion, and regenerate hybrid plants.

- Produce Plant Secondary Metabolites: Understand the pathways and factors influencing the production of plant secondary metabolites and natural products.
- Utilize Plant Transformation Technologies: Explain the basis of tumor formation, Agrobacterium-mediated transformation, and produce transgenic plants with traits like herbicide and disease resistance.
- Implement Cryopreservation Techniques: Understand and apply the principles and techniques of cryopreservation for germplasm storage, ensuring quality control and monitoring.
- Engage in Drug Discovery and Designing: Explain the drug discovery process, identify drug targets, and utilize various technologies and tools in drug designing.
- Understand Pharmacology Concepts: Describe the importance and applications of pharmacology, including pharmacokinetics, pharmacodynamics, and the drug development process.
- Apply Knowledge of Intellectual Property Rights: Understand different types of IPR, their relevance in biotechnology, and their economic and legal implications.

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- Q.4 Long answer type questions (Answer in 400-450 words) **(12 Marks)**



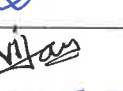
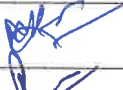

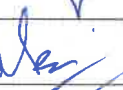


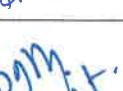

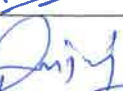
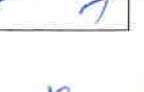
Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
Very Short (2 Questions) (Maximum two sentences)	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks
Short (1 Question) 200-250 words	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks
Long answer (1 Question) 400-450 words	1 x 12 = 12 Marks	1 x 12 = 12 Marks	1 x 12 = 12 Marks	1 x 12 = 12 Marks

Note:

1. Question no. 1 and Question 2 will be compulsory.

2. Question no. 3 and 4 will consist of 2 optional questions of which one has to be attempted.
3. As mentioned above, two compulsory very short answer type questions (2+2 marks), one short answer type question with internal choice (4 marks) and one long answer type question with internal choice (12 marks) will be asked from each unit.
Thus, there will be questions of 20 marks from each unit and of total 80 marks from all the four units of the syllabus/syllabi.
4. Internal Assessment Examination will be as follows:
- ix. Internal Test in each paper (20 marks)
 - x. Seminar (Power point presentation) in any one of the papers (20 marks)
 - xi. Assignment in each of the remaining papers (excluding the paper of Seminar. (20 marks)
 - xii. Average of marks obtained in internal test + seminar in any one paper and marks obtained in internal test + assignment in rest of the papers will be calculated and taken into consideration.

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M.Sc. – BOTANY SEMESTER – III

SESSION – 2024-2025

PAPER-IV {Elective-I} (Course Code- MBO304)

MICROBIAL ECOLOGY

M.M. - 80

Min. - 16


UNIT - I

- **Methods in Microbial Ecology:**
 - Methods of cleaning, sterilization (Disinfection, incineration, physical method and chemical method), media preparation (Liquid and solid).
 - Enrichment and isolation methods, pure culture techniques (Pour plate, Streak plate, serial dilution). Identification and quantification (Micrometry).
- **Instrumentation (Principle, Structure and Functions):**
 - Autoclave, Colony counter, Hot air oven, Incubator, Laminar air flow,
 - Microscopy {Light microscope, Bright field microscope, Dark-field microscope, Phase-Contrast microscope, Fluorescent microscope, Electron microscope (Transmission and Scanning), Spectrophotometry.

UNIT - II

Microbial Interaction

- **Clay-Humus-Microbe Interaction.**
- **Plant-Microbe Interaction:**
 - Interaction of above ground part - Destructive associations (diseases) - and beneficial association (symbiosis)
 - Interaction on below ground parts Destructive associations (diseases)
 - Beneficial association {Cyanobacterial (Cyanobacteria with Azolla and cycas)
 - Bacterial- associative symbiont, PGPR, Rhizobium, Actinomycetes, and
 - Fungal symbiosis - Mycorrhiza and their types).
- **Animal-Microbe Interaction:**
 - Destructive association; Neutralism (normal microbiota of human body),
 - Symbiotic association (ectosymbiosis of protozoa, bacteria and fungi with insects and birds, endosymbiosis of bacteria and fungi with birds and insects, ruminant symbiosis).
- **Microbe-Microbe interaction:** Symbiosis, Antagonism, Ammensalism, Competition, Parasitism and Predation.



UNIT – III

Extremophiles – Definition, Introduction, Application and Importance.

- (Acidophiles, Alkalophiles, Halophiles, Psychrophiles, Barophiles, Thermophiles and Hyperthermophiles),
- **Microbes in Human Welfare -**
- **Microorganisms in human nutrition**
- **Biofertilizers** : types, Significance and advantages – Nitrogen fixing, Phosphahte biofertilizer, Rhizobium, Azospirillum, Azotobactor, Cyanobacteria, Azolla, and Mycorrhiza
- **Organic Fertilizer** : Type, Advantages and Significance
- **Microbes in industries** : Production of ethanol, Acetone, Citric Acid, Antibiotics, Microbial Enzyme (Amylase, Protease, Lipase)
- **Microorganisms in agriculture : Bacteria** :- Arthrobacter, Clostridium
- **Actinomycetes** : Streptomycis,
- **Fungi** : Aspergillus, Mucor, AMF and PGPR
- **Protozoa** : Flagellates, Ciliates, and Amoebae, Nematodes

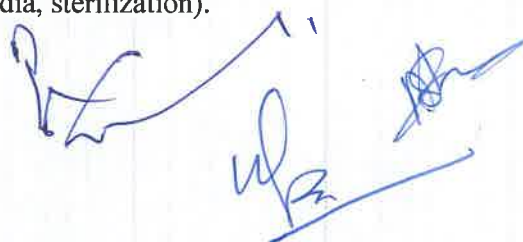
UNIT – IV

[Soil Microbiology]

- **Soil as a habitat for microorganisms:** Soil quality, Physico-chemical properties of soil (Organic matter; Soil, water & air; Soil microbes: algae, bacteria, actinomycetes, bacteriophages, protozoa, nematode and fungi).
- **Rhizosphere and rhizoplane microorganisms,**
- **Organic matter decomposition:**
 - Composition of litter (cellulose, hemi cellulose, lignin, water soluble components, ether and alcohol, soluble components and proteins)
 - Microorganisms associated with organic matter decomposition (cellulose decomposers, hemicellulose decomposers, lignin decomposers);
 - Factors affecting organic matter decomposition (litter quality, temperature, aeration, soil pH, inorganic chemicals, moisture);
- **Biogeochemical cycling:** Carbon cycle, Nitrogen cycle (nitrogen fixation, ammonification, nitrification, denitrification); Phosphorous cycle, Sulphur cycle.

Laboratory Exercise

- Methods in Microbial Ecology.
- Calibration of microscope: determination of dimensions of microorganisms (micrometry)
- Cultivation media for autotrophic and heterotrophic microorganisms (cleaning of glasswares, mineral media, complex media, solid media, sterilization).



- Isolation of microorganisms: spread plate/pour plate method/streaking on agar plates&preservation.
- Microscopic observation of root colonization by VAM fungi.
- Isolation of *Rhizobium* from soil/root nodules.
- Isolation and enumeration of rhizospheric microorganisms. Estimation of R:S ratio and assessment of Rhizospheric effect.
- Demonstration of bacterial antagonism.
- Isolation and enumeration of fungi from soil.
- Isolation of bacteria from soil.
- Demonstration/Isolation and identification of Cyanobacteria from soil.
- Soil Test.

Recommended Books

- A text book of Microbiology, R.C. Dubey and D.K. Maheshwari.
- Microbiology and Plant Pathology, P. D. Sharma.
- Microbiology. M. Pelczar, Chan and Krieg.
- A text book of Microbiology. R.M. Johri, Snehlata.
- Experiments in Microbiology, Plant Pathology and Biotechnology.

Outcome:-

- Know about genetic microbial technique for isolation of pure culture techniques.
- Master aseptic techniques and be able to perform routine culture effectively.
- Know various culture media and their applications and also understand means of sterilizations.
- Comprehend various methods for identification of unknown microorganisms. Demonstrate theory & practical skill of various instruments and microscopy.
- Understand the various microbial interaction specially mycorrhiza, root nodules. Conceptual basis for understanding the human body's normal micro flora.
- Understand various biogeochemical cycles. Students will be able to demonstrate concept of Bio-fertilizer, Bio-pesticides and their applications.

Question Paper Format and Distribution of Marks for PG Semester Examination

Question paper format for the Post-Graduate Examination has been revised from the Session 2018-19. The revised format will be applicable for all the question papers of Semester I, II,

III & IV. The following are the main points of the new format:

1. The question paper will be of **80 marks** (as before)
2. Questions will be asked Unit-wise in each question paper.
3. From each Unit, the questions will be asked as follows :

- Q.1 Very short answer type question
(Answer in one or two sentences) (02 Marks)
- Q.2 Very short answer type question
(Answer in one or two sentences) (02 Marks)
- Q.3 Short answer type question (Answer in 200-250 words) (04 Marks)
- Q.4 Long answer type questions (Answer in 400-450 words) (12 Marks)

Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
Very Short (2 Questions) (Maximum two sentences)	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks
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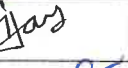








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M.Sc. – BOTANY SEMESTER – III

SESSION – 2024-2025

PAPER-IV {Elective-II} (Course Code- MBO304)

ETHNOBOTANY

M.M. – 80

Min. - 16

Unit I

Ethnobotany: Introduction, concept, scope and objectives. Ethnobotany as an interdisciplinary science. The relevance of ethnobotany in the present context. Major and minor ethnic groups or tribals of Chhattisgarh and their life styles. (Gond and Baiga)

Unit II

Role of ethnobotany in primary health care Programmes

Ethno botany in India retrospect's & prospects in India -

Plants used by the tribals-

- a) Food plants
- b) Intoxicants and beverages
- c) Resins, oils and miscellaneous uses
- d) Sacred plants

Unit III

Indigenous System of medicines in india.

Ethnobotany on Development and Conservation on bio resources.

Methodology of ethnobotanical studies : (a) Field work (B) Herbarium

(c) Ancient Literature (d) Archaeological findings (e) Temples and sacred places

Unit IV

Ethnobotanical study of following plants with special reference to their medicinal importance

- a) *Azadirachta indica* (Neem)
- (b) *Emblica officinalis* (Amla)
- (c) *Ricinus communis* (Andi)
- (d) *Madhuca indica* (Mahua)



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- (e) *Cassia fistula* (Amaltash)
- (f) *Ficus religiosa* (pipal)
- (g) *Oscimum sanctum* (Tulsi)
- (h) *Asparagus recemosus* (Satavar)
- (i) *Aloe vera* (Ghritkumari)
- (j) *Andrographispaniculata* (Bhuineem)

Laboratory Exercises-

- Description and identification of medicinal plants and its medicinal properties
- Preparation of medicinal plants herbarium and photograph
- Herbal preparation –
 - a. Extract of Tulsi leaves.
 - b. Ointment from Neem leaves
 - c. Ayurvedic Tooth powder
 - d. Amla Churna
 - e. Face pack preparation from various herbs
- To cultivate at least 2 medicinal plants in earthen pots.






Suggested Readings:

- Baker H. G. 1978. Plants and civilization (3rd Edition) C. A. Wadsworth, Belmont.
- Chandel, K. P. S., Shukla, G. & Sharma, N. 1996. Biodiversity in medicinal and Aromatic plants in India. Conservation & Utilization. National Bureau of Plant Genetic Resources, New Delhi.
- Ambasta S. P. (ed) (1986). The useful plants of India. Publication & information Directorate, CSIR, New Delhi. India.
- Anon, (1978). The tribes of Madhya Pradesh, Dept. of tribal Welfare, Govt. of M. P.
- Cotton, C.M., (1996). Ethnobotany, Principles and Applications, John Willey & Sons, Chichester, New York.

Outcome:

The study of ethno medicine is concerned with the study of the traditional medical system from the indigenous point of view. The ethno medical approach proves particularly useful for the study of indigenous therapeutic agents that enables to understand the healing practices according to indigenous explanatory models and its correlation to the modern medicine or allopathy. Ethno medicine will strengthen our understanding of the issues relating to tribal problems and development.

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