

DEPARTMENT OF BOTANY
DOCTOR HARISINGH GOUR VISHWAVIDYALAYA, SAGAR (M.P.)
(A CENTRAL UNIVERSITY)

Syllabus 2022-2023

Class	Subject	Semester	Paper	Course Code	Nature of the Course	Course Title	Marks	Credit
M.Sc.	Botany	I	I	BOT-DSM-111	Discipline Specific Major-1	Biodiversity of Microbes & Lower Cryptogams (T)	100	04
Course Objectives: The objective of the course is to understand the basic concept of lower plants such as Microbes Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperm Learning Outcomes of the course: Upon the completion of the course the students: 1. To understand the basic concept of microbes their structure and their economic importance. 2. To understand the basic information about the viruses and their distribution. General characteristics and their economic importance. 3. To understand the basic information about the fungi, their classification, ecological significance and economic importance. 4. To understand the basic characteristic of Algae and their classification, industrial and economics importance. 5. To understand the basic characteristic Ecological and economic importance of Bryophytes and Pteridophytes. Contents								

Unit		Hours
1	Microbes: General account; ultra-structure, nutrition and reproduction; biology and economic importance of Bacteria cyanobacteria - salient features and biological importance.	10
2	Viruses: Characteristics and ultra-structure of virions; isolation and purification of viruses; chemical nature, replication, transmission of viruses; economic importance.	10
3	Mycology: General characters of fungi; substrate relationship in fungi; nutrition (saprobic, biotrophic, symbiotic); reproduction (vegetative, asexual, sexual); heterothallism; heterokaryosis, parasexuality; recent trends in classification. general account of Mastigomycotina, Zygomycotina, Ascomycotina Basidiomycotina, Deuteromycotina; fungi in industry, medicine and as food; fungal diseases in plants and humans; Mycorrhizae; fungi	8
4	Phycology: Algae in diversified habitats thallus organization; reproduction Classification of algae. Salient features of Protochlorophyta, Chlorophyta, Charophyta, Xanthophyta. Bacillariophyta, Phaeophyta, Rhodophyta; algal blooms, algal biofertilizers; algae as food, feed and uses in industries; economic importance.	17
5	Bryophyta: Morphology, structure, reproduction and life history; distribution; classification; general account of Marchantiales, Jungermanniales, Anthocerotales, Sphagnum, Funariales and Polytrichales; economic and ecological importance Pteridophyta: Morphology, anatomy and reproduction; classification; evolution of stele; heterospory and origin of seed habit. General account of fossil pteridophyta; Psilopsida, Lycopsida, Sphenopsida and Pteropsida.	15

DEPARTMENT OF BOTANY
DOCTOR HARISINGH GOUR VISHWAVIDYALAYA, SAGAR (M.P.)
(A CENTRAL UNIVERSITY)

Syllabus 2022-2023

Class	Subject	Semester	Paper	Course Code	Nature of the Course	Course Title	Marks	Credit
M.Sc.	Botany	I	Practical	BOT-DSM -112	Discipline Specific Major-1	Biodiversity of Microbes & Lower Cryptogams (Practical)	100	02

Suggested Laboratory Exercises

1. Gram's staining of bacteria.
2. Morphological study of locally available disease plant materials.
3. Identification of fungal cultures: *Rhizopus*, *Mucor*, *Aspergillus*, *Penicillium*, *Chaetomium*, *Helminthosporium*, *Curvularia*, *Fusarium*, *Colletotrichum*, *Alternaria*, *Phytophthora* and Water Molds.
4. Sterilization methods, preparation of media and stains.
5. Symptomology of some diseased specimens: White rust, downy mildew, powdery mildew, smuts, rusts. tikka disease of groundnut, ring rot of pan, red rot of sugarcane, whip smut of sugarcane, wilts, bacterial blight of paddy, citrus canker, tobacco mosaic virus, little leaf of brinjal, sesame phyllody, mango malformation.
6. Morphological study of representative member of Algae: *Microcystis*, *Chaetomorpha*, *Enteromorpha*, *Hydrodictyon*, *Ulva*, *Pithophora*, *Stigeoclonium*, *Draparnaldiopsis*, *Microdictyon*, *Bryopsis*, *Ectocarpus*, *Caulerpa*, *Coleochaete*, *Cladophora*, *Zygnema*, *Iyengera*, *Sphacelaria*, *Dictyota*, *Nitella*, *Chara*, *Nostoc*, *Spirulina*, *Anabena* and etc.
7. Morphological study of representative member of Bryophytes and Pteridophytes: *Marchantia*, *Anthoceros*, *Polytrichum*, *Psilotum*, *Lycopodium*, *Selaginella*, *Equisetum*, *Ophioglossum*, *Isoetes*, *Lygodium*, *Regnellidium* and *Marsilia*.
8. Study of morphology, anatomy and reproductive structures of bryophytes

Essential Readings :-

9. Introductory Mycology - Alexopoulos, C.J., Mims, C.W. and Blackwell, M. John Wiley & Sons. Inc. U.S.A. 2012
10. An introduction to Fungi. - Dubey, H.C. Vikas Publishing House, New Delhi. 2012.
11. Plant Pathology - Sharma, P.D. Vivek Rastogi for Rastogi & Co., Meerut. 1995.

12. The fungi. - Mehrotra, B.S.. Today and Tomorrow's Printers and Publishers, New Delhi. 1992
13. An introduction to Mycology – Mehrotra, R.S., Aneja, K.R. Wiley Eastern Limited, New Delhi 1990Kumar, H.D. 1992 Introductory Phycology - East west press New Delhi –
14. Chapman V. J. and . Chapman D.J. 1973 The Algae Macmillan publishers
15. Lee, R.E 2013 Phycology,. IV edition Cambridge University Press, London
16. Parihar, N.S. 1999: An Introduction to Embryophyta Vol-I & II, Bryophyta and Pteridophytes Central Book Depot. Allhabad
17. Rashid, A 1998 An Introduction to BryophytaVikas publication House, Pvt, New Delhi
18. Andrews H.N. 1961 Studies in Palaeobotany, John Wiley and Sons, New York
19. The text book of Microbiology - Ananthanarayan, R. JayaramPaniker C.K., Orient Longman Limited, Hyderabad (A.P.) India

Additional Readings :-

20. Microbiology - Pelczar M., Chan E.C.S. and Krieg, N.R.Tata Mc Grew Hill Publishing Co. Ltd. New Delhi (1996).
21. Introduction to Fungi - Webster, J., Cambridge University Press, London. 1970..
22. Morphology and Taxonomy of fungi – Bessy E.A., Scientific Pub. Jodhpur 2015.
23. Microbiology : Fundamentals and Applications – Purohit, S.S., Agro Bios. Jodhpur 2002

DEPARTMENT OF BOTANY
DOCTOR HARISINGH GOUR VISHWAVIDYALAYA, SAGAR (M.P.)
(A CENTRAL UNIVERSITY)

Syllabus 2022-2023

Class	Subject	Semester	Paper	Course Code	Nature of Course	Course Title	Marks	Credit
M.Sc.	Botany	I	II	BOT-DSM-113	Discipline Specific Major-2	Ecology and Environment	100	04

Course Objectives:
The objective of the course is to understand the applied aspects of ecology. It includes the critical comprehension of environmental pollution, biodiversity conservation and climate change. An understanding of environmental impact assessment and ecosystem restoration methods.

The objective of the course is to understand the applied aspects of ecology. It includes the critical comprehension of environmental pollution, biodiversity conservation and climate change. An understanding of environmental impact assessment and ecosystem restoration methods.

Learning Outcomes of the course:

Upon the completion of the course the students will be able to:

Unit I: Understand the cause, impact and control of pollution.

Unit II: Learn the methods to assess the biodiversity of an ecosystem.

Unit III: Learn the concept of biodiversity levels, significance and conservation.

Unit IV: Perceive the gamut of climate change, its impacts globally and its mitigation.

Unit V:Analyse the ecosystem stability, degradation and restoration.

Unit	Contents	Hours
1	Ecology: Concept and definitions, kinds of ecosystem, Ecological pyramids, Food chain and Food web, Ecosystem processes. Ecosystem functions: Energy flow, biogeochemical cycles, primary and secondary productivity.	12
2	Vegetation organization and Development: Concept of community and continuum, analysis of community (analytical and synthetic characters) community coefficients, inter specific associations, concept of ecological niche. Temporal changes (cyclic and non-cyclic), Ecological succession.	12
3	Ecosystem stability: concept (resistance and resilience), ecological perturbation and their impact on plants and ecosystems. Ecosystem Management: Concept, sustainable development, Sustainability indicators, ecosystem restoration.	12
4	Biodiversity and conservation: Levels of biodiversity, Distribution and regional patterns; Hypotheses for global patterns of distribution; Hot Spots of Biodiversity, Biodiversity Conservation; IUCN categories, strategies for conservation.	12
5	Climate change: Greenhouse gases, global warming; Ozone layer and Ozone hole consequences of climate change.	12

DEPARTMENT OF BOTANY
DOCTOR HARISINGH GOUR VISHWAVIDYALAYA, SAGAR (M.P.)
(A CENTRAL UNIVERSITY)

Syllabus 2022-2023

Class	Subject	Semester	Paper	Course Code	Nature of Course	Course Title	Marks	Credit
M.Sc.	Botany	I	Practical	BOT-DSM -114	Discipline Specific Major-2	Ecology and Environment	100	02

Suggested Laboratory Exercises:

1. Study of minimal size of the quadrat by Species- Area Curve method for studying the forest and grassland vegetation.
2. To determine minimal number of quadrats by Species –Area Curve method in forest and grassland.
3. Sampling of the grassland vegetation by quadrat method for determining the density, frequency and basal cover of different species.
4. To determine diversity indices (Shannon-Wiener, concentration of dominance, species richness, equitability and B-diversity) for protected and unprotected grassland stands.
5. To estimate IVI of the species in a woodland using point centred quarter method.
6. To determine gross and net phytoplankton productivity by light and dark bottle method.
7. To determine soil moisture content, porosity and bulk density of soils collected for varying depths at different locations.
8. To determine the water holding capacity of soils collected from different locations.
9. To determine percent organic carbon and organic matter in the soils of cropland, grassland and forest.
10. To estimate the dissolved oxygen content in fresh waters by azide modified of Winkler's method.

HARISINGH GOUR VISHWAVIDYALAYA, SAGAR (M.P.)
(A CENTRAL UNIVERSITY)

Syllabus 2022-2023

Essential Readings:

1. J.S. Singh, S.P. Singh and S.R. Gupta : Ecology, Environment and Resource conservation, Anamaya Pub New Delhi (2008)
2. D. Miller-Dombois and H. Ellenberg: Aims and methods of vegetation ecology. Wiley N.Y. (1974)
3. E.P. Odum: Basic ecology W.B. Saunders, Philadelphia, (1983)
4. R.L. Smith: Ecology and Field Biology, Harper Collins College Pub. Inc. New York... (1996)
5. Curtis, J.T. and G. Cottom Plant Ecology Work Book : Laboratory Field Reference Manual Burgess Publishing Co. Minnesota. (1956).
6. Daubenmire, R.F. Plant Communities. A text book of Plant syecology. Harper and Row New York. 300p. (1968)
7. Mishra R. Ecology work Book. Oxford and IBH Publishing Co. New Delhi. Pp 235. (1968)

Additional Readings:-

1. Oosting, M.J. : An Introduction to Plant Ecology, end edition W.H. Freeman. San Franisco, London (1956)
2. Piper, C.S. : Soil and Plant analysis (1966 reprint) Hans publisher, Bombay (1936)
3. Weaver, J.E. and E.F. clements. Plants Ecology. McGraw Hill Book Co, New York and London (1938)
4. Whittaker, R.H., Communities and Ecosystems, 2nd edition Mac Millan Publishing Co. New York (1975)

Syllabus 2022-23

Class	Subject	Semester	Paper	Course Code	Nature of Course	Course Title	Marks	Credit
M.Sc.	Botany	I	III	BOT-MDM-115	Multi Disciplinary Major-3	Cytogenetics	100	04
Course Objectives: The objective of this course is to train students about the basic concept of cytology, genetics and its importance in studies of life sciences. It includes the basic understanding of cytoplasmic organelles, membrane transports, cell division, Mendelian principles of heredity, gene interaction, DNA structure, replications and role of mutation in crop improvements. Learning Outcomes of the course : Upon the completion of the course the students will be able to: Unit I: Understand the basic concepts of prokaryotic and eukaryotic cell organisation, different cell organelles and membrane transport. Unit II: Understand the process of cell division, different stages of meiosis and mitosis, apoptosis and role of cyclin in cell division. Unit III: Understand the Mendelian concept of heredity, gene interactions, multiple allelism, polygenic inheritance, chromosomal theory of inheritance, linkage, crossing over, extra-chromosomal inheritance and population genetics. Unit IV: Understand the structure of DNA, its replications in prokaryotes and eukaryotes, special types of								

	chromosomes. Unit V: Understand the mechanism of mutation and its types, role of polyploids and haploids in crop improvements and mechanism of transposition.	
Unit	Contents	Hours
1	General Introduction: Historical background of cytology; Prokaryotic and Eukaryotic cell organization, structure and function of cell wall and plasma membrane. Membrane transport (Active and passive mechanism), Cell organelles, Cytoskeleton,	12
2	Cell Cycle: Mitosis, Meiosis, role of cyclins in cell division, Apoptosis.	10
3	Introduction of Genetics: Overview. Pre-Mendelian theory concerning Heredity and Evolution; Mendelian concept of Heredity. Extension of Mendelism: Gene Interactions, Multiple Allelism, Polygenic Inheritance. Chromosomal Theory of Inheritance, Sex-Linkage, Linkage, Crossing over, Chromosomal Mapping. Extra-chromosomal Inheritance. Population Genetics.	18
4	DNA structure and Replication: DNA as genetic material, Structure and different types of DNA, Topology, Chromatin, Nucleosome model, Heterochromatin and Euchromatin, Special type of chromosomes (Lampbrush and polytenechromosome). DNA replication in prokaryotes, different proteins and enzymes involved.	10
5	Mutation: DNA damage and repair, Mutation, Type of Mutation, Mechanism of mutation, Polyploids and haploids in crop improvements, Transposable Genetic elements, Mechanism of Transposition.	10

DEPARTMENT OF BOTANY
DOCTOR HARISINGH GOUR VISHWAVIDYALAYA, SAGAR (M.P.)
(A CENTRAL UNIVERSITY)

Syllabus 2022-23

Class	Subject	Semester	Paper	Course Code	Nature of Course	Course Title	Marks	Credit
M.Sc.	Botany	I	Practical	BOT-MDM-116	Multi Disciplinary Major-3	Cytogenetics	100	02

Suggested Laboratory Exercises:

1. Familiarizing students with lab equipment.
2. Study of different type of chromosomes
3. Study of different stages of mitotic cell division in suitable material
4. Study of meiotic cell division in Pollen mother cells.
5. Studying pea plant as tool for investigating Law of Inheritance: i) Mendel's Law of segregation ii) Law of Independent Assortment.
6. Chi-square test.
7. Isolation of DNA from different sources.

Essential Readings :

- (1) P.K. Gupta : Cytology, Genetics and Molecular Biology; (2009). Rastogi Publications
- (2) Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Reberts, Peter Walter: Molecular biology of cell. Garland Science, a member of the Taylor and Francis group – New York.
- (3) Lewin B Genes (1997) Oxford University Press, New York, USA
- (4) Karp, G (1996) Cell and Molecular Biology. JhonWileys and Sons London , U.K.
- (5) Hartl, D.L. Jones, E.W (1998) Genetics Principles and Analysis IV edition Jones and Bartlett Publishers Boston, USA.

Additional Readings

- (1) C.B. Pawar : Cell biology. Himalaya Publishing house – New Delhi.

- (2) W.S. Klug & M.R. Cummings (2004).: Benjamin Cummings: Essential of Genetics; 5th Edition
- (3) S.C. Rastogi: Cell Biology . (2015).New Age International Publisher, N. Delhi 3rd Edi.
- (4) V.K. Agarwal and Dr. P.S. Verma: (2015). Cell biology. S. Chand Publishing house New Delhi
- (5) P.S. Verma& V.K. Agarwal(2005).: Cell Biology, Genetics, Molecular biology, Evolution & Ecology. (S. Chand and Company Ltd.
- (6) Rathoure, A.K. &Shrivastava, M.(2015): Cell Biology and Genetics. Daya Publishing House, New Delhi.
- (7) Hyde (2016): Genetics and Molecular Biology: With Fundamentals of Biostatics. Mcgraw Hill, New Delhi.
- (8) Singh, R.J.(2016): Plant Cytogenetics.CRC Press, Taylor & Francis Group, New York.
- (9) Singh, B.S.& Singh, M.P.(2015): Cytogenetics. SSPH Publications, New Delhi.

DEPARTMENT OF BOTANY
DOCTOR HARISINGH GOUR VISHWAVIDYALAYA, SAGAR (M.P.)
(A CENTRAL UNIVERSITY)

Syllabus 2022-2023

Class	Subject	Semester	Paper	Course Code	Nature of Course	Course Title	Marks	Credit
M.Sc.	Botany	I	IV	BOT AEC-117	Ability Enhancement Course	Ethnobotany and Indigenous Knowledge (T)	100	04
	Objective: The present objective of the course is to acquaint the students with the ethno-biological significance of plants and help them develop their skills for plant identification and value addition. Learning outcomes of the course: • The students studying the course will be able to understand the need to conserve floristic and cultural diversity of the region. • Will be able to understand rescue and document Ethnobotanicals for sustainable use of plant resources. • Will be able to understand the need for development of new drugs for safe and more rational use of herbal preparations. • Will be able to understand recognition of intellectual property rights and its benefit to people and society who share their knowledge and wisdom. • Will be able to understand develop skill in collection of data about ethnomedicinal plants							

Unit	Contents	Hours
1	Ethnobotany: Its scope, interdisciplinary approach. Role of ethnomedicine and its scope in modern times	12
2	History and principles of Ayurveda, Unani and Siddha systems of medicines. Indigenous knowledge and its importance.	12
3	Ethnic groups of India: Major and minor tribes with special reference to Madhya Pradesh, life styles of ethnic tribes, conservation practices of biodiversity	12
4	Plants used by ethnic groups as food, medicines (<i>Adhatodavasica</i> , <i>Aegle marmelos</i> , <i>Asparagus racemosus</i> , <i>Azadirachta indica</i> , <i>Phyllanthus emblica</i> , <i>Rauwolfia serpentina</i> , <i>Tinospora cordifolia</i> , <i>Terminalia arjuna</i> , <i>Tridax procumbens</i> and <i>Withania somnifera</i>), beverages, vegetables, fodder, fibre, resins and other uses. NWFP (Non-Wood Forest Produces).	12
5	Ethnobotany and Ethnopharmacology as a tool to protect interests of ethnic groups and rural development. Impact of Ethnobotany in herbal-medicine industry, land-use development, agriculture, forestry, betterment of rural livelihoods and education.	12

DEPARTMENT OF BOTANY
DOCTOR HARISINGH GOUR VISHWAVIDYALAYA, SAGAR (M.P.)
(A CENTRAL UNIVERSITY)

Syllabus 2022-2023

Class	Subject	Semester	Paper	Course Code	Nature of Course	Course Title	Marks	Credit
M.Sc.	Botany	I	Practical	BOT AEC-118	Ability Enhancement Course	Ethnobotany and Indigenous Knowledge(P)	100	04

Suggested Laboratory Exercises

1. Collection, processing and preservation of ethnobotanical specimens in the institutional repository.
2. Identify and document plant parts used in preparation of crude drugs/herbal formulations.
3. Field trip to tribal settlement to survey, document and frame hypothesis on people-plant relationship.
4. Review of a Peoples Biodiversity Register (PBR) in collaboration with BMC (Biodiversity management committee) of a local self-government.
5. Conservation of ethno-medicinally important plants.

Essential readings:

1. Jain, S. K. (1989). Methods and approaches in Ethnobotany. Society of Ethnobotanists, Lucknow
2. Jain, S. K. (1995). A manual of Ethnobotany. Scientific Publishers, Jodhpur

3. Jain, S. K., Mudgal, V., Banerjee, D. K., Guha, A., Pal, D. C. and Das, D. (1984). Bibliography of Ethnobotany. Botanical Survey of India, Howrah

Additional readings:

1. Jain S.K.(1997). Contribution to Indian Ethnobotany, Sci. Publ. Jodhpur *Snehalatha* and Jain, S. K. (1998). *Historical Archive in Ethnobotany. Institute of Ethnobotany, NBRI, Lucknow.*
2. Ethnobotany-Principles and application. John Wiley& Sons Ltd., West Sussex, England.

DEPARTMENT OF BOTANY
DOCTOR HARISINGH GOUR VISHWAVIDYALAYA, SAGAR (M.P.)
(A CENTRAL UNIVERSITY)

Syllabus 2022-2023

[illegible]

Unit	Contents	Hours
1	Mushroom definition, Characteristics of mushrooms, Categories (edible,poisonous,medicinal) Biodiversity of wild mushrooms.	9
2	Ecological importance of Fungi in general and mushroom in particular, speciallyLocally growing Mushrooms	9
3	Classification, identification and cultivation methods of mushrooms.(<i>Pleurotus</i> , <i>Agaricus</i> and <i>Calocybe</i> and <i>Cordyceps</i> Species)	9
4	Diseases of mushrooms, use of spent mushroom compost as bio-control agent, secondary metabolites of mushrooms.	9
5	Mushroom by-products (pickle, soap, medicine) Agri-business-(concept of marketing, market channels, SWOT analysis)	9

DEPARTMENT OF BOTANY
DOCTOR HARISINGH GOUR VISHWAVIDYALAYA, SAGAR (M.P.)
(A CENTRAL UNIVERSITY)

Syllabus 2022-2023

Class	Subject	Semester	Paper	Course Code	Nature of Course	Course Title	Marks	Credit
M.Sc.	Botany	I	Practical	BOT SEC-120	Skill Enhancement Course	Mushroom Biology	100	01

Suggested Laboratory Exercises

1. Field survey for Mushrooms collection, Collection methods and their identification, preparation of e – herbarium.
2. Different media preparation for mushroom culture.
3. Spawn preparation.
4. Cultivation of *Pleurotusspecies*, *Agaricusspecies* and *Cordycepspecies* and production of Mushroom compost.
5. Estimation of carbohydrate and protein in mushroom
6. Antimicrobial activity of mushrooms.
7. Use of SMC (spent mushroom compost) as a biofertilizer and Bio- control agent.

Essential Readings:

1. Miles P.G and Chang S.T 1997 Mushroom Biology-Concise basics and current developments.
2. Kango. N 2010Textbook of microbiology IK international publishers and distributors New Delhi
3. Gunasekaran P. 1995 A laboratory manual of microbiology
4. Pathak, . V.N Yadav N and Gour, M Mushroom production and processesing Technology. AgrobiosJhodhpur
5. Sharma B.C and Sharma N.P 2013 Mushroom cultivation and users. and. AgrobiosJhodhpur

Additional Readings:

1. Pegler D and Spooner B 1997 The mushroom Identifier Published by Grange Books London U.K.

2. Aneja 2005 Experiments in microbiology, plant pathology and biotechnology
3. Vyas D, Khare P.K., Paliwal G.S., and Gupta R, K 2011 Microbial Biotechnology and Ecology Daya publishing house New Delhi .
4. Borkar, S.G. & Patil, N. (2016). Mushroom: A Nutritive Food and its Cultivation. Bio Green Books, New Delhi.

Syllabus 2022-2023

Class	Subject	Semester	Paper	Course Code	Nature of the Course	Course Title	Marks	Credit
M.Sc.	Botany	II	I	BOT-DSM-211	Discipline Specific Major-1	Plant Physiology and Biochemistry (T)	100	04
	Objectives: The major objective of this paper is to develop understanding forwards vital function carried out by the plants.To understand the basic concept of Biochemistry. Structure of carbohydrates, respiration and lipid metabolism, Nitrogen fixation, amino acids and Proteins and techniques in Biochemistry. Learning Outcomes of The Course: The students Studying of the course Unit I: Will able to get understanding regarding water and water relationship. Generate awareness about importance of nutrients. Movements of water and Plant water relations, this skill helped them for plantation of plants. Unit II.Will able to understand role of light and light harvesting complexes. Photo synthetic response of C₃, C₄ plants and xenobiotic. This provide skill enable them to understand metabolic pathways occurs in plants. Unit III.Will able to learn importance of plant growth hormones and their biosynthesis this provide a skill to students who wishes to establish entrepreneurship in floriculture and seed development. Unit IV: Understand the law of thermodynamics, basic concepts of enzymology, kinetics of enzyme action. Respiration and lipid metabolism. Unit- V Understand the biological nitrogen fixation, nodule formation and nod factors, mechanism of nitrate uptake and reduction, ammonium assimilation. Contents							Hours
1	Plant water relations: Physical properties of water; diffusion, osmosis, translocation of water, concept of water potential, Transpiration, Physiology of stomata, plant-water relations, mechanism of water transport through xylem.Plants and inorganic nutrient: Essential nutrient, nutrient role and deficiency symptoms, Toxicity of micro nutrient, root-microbe interactions in facilitating nutrient uptake, comparison of xylem and phloem transport, phloem loading and unloading, passive and active							10

	solute transport, membrane transport proteins.	
2	Light and pigment: photoreceptor. Photosynthesis: Bioenergetics, Photophosphorylation, light harvesting, Complexes, photosynthetic carbon reduction, (PCR) C4 syndrome, Crassulacean acid, metabolism (CAM) Translocation of xenobiotic chemical. Signal transduction: Overview, receptors and G-proteins, phospholipid signaling, role of cyclic nucleotides, calcium-calmodulin cascade. Sensory photobiology: History of discovery of phytochromes and cryptochromes, and their photochemical and biochemical properties,	10
3	Plant growth regulators and elicitors: Physiological effects and mechanism of action of auxins, gibberellins, cytokinins, ethylene, abscissic acid, brassinosteroids, polyamines, jasmonic acid and salicylic acid. The flowering process: Photoperiodism and its significance, endogenous clock and its regulation, floral induction and development - genetic and molecular analysis, role of vernalization. Stress physiology: Plant responses to biotic and abiotic stress, mechanisms of biotic and abiotic stress tolerance, HR and SAR, water deficit and drought resistance, salinity stress, metal toxicity, freezing and heat stress, oxidative stress.	8
4	Thermodynamics of biological system: Laws of thermodynamics; concept of free energy; energy transfer and redox potential. Basics of enzymology: classification and nomenclature of enzymes; enzymes as biocatalyst; kinetics of enzyme action; significance of K_m; regulation of enzymes activity; factors affecting enzyme activity. Carbohydrates: Mono, Di, Oligo and Poly saccharides, biosynthesis of Sucrose, Starch and Cellulose. Respiration and lipid metabolism: Overview of plant respiration, glycolysis, the TCA cycle, electron transport and ATP synthesis, pentose phosphate pathway, glyoxylate cycle, alternative oxidase system, structure and function of lipids, fatty acid biosynthesis, synthesis of membrane lipids.	17
5	Nitrogen fixation, nitrogen and sulphur metabolism: Overview, biological nitrogen fixation, nodule formation and nod factors, mechanism of nitrate uptake and reduction, ammonium assimilation, sulfate uptake, transport and assimilation. Techniques in biochemistry: Principles of light and electron microscopy; phase contrast and fluorescence microscopy; TEM and SEM; Cell fractionation producers; principles of various chromatography techniques- paper chromatography; TLC, GLC and HPLC; autoradiography and its applications. Amino acid and Proteins: structure acid base properties optical and stereochemical properties. Primary, secondary, tertiary and quaternary structures.	15

DEPARTMENT OF BOTANY
DOCTOR HARISINGH GOUR VISHWAVIDYALAYA, SAGAR (M.P.)
(A CENTRAL UNIVERSITY)

Syllabus 2022-2023

Class	Subject	Semester	Paper	Course Code	Nature of Course	Course Title	Marks	Credit
M.Sc.	Botany	I	Practical	BOT-DSM -212	Discipline Specific Major-1	Plant Physiology and Biochemistry	100	02

Suggested Laboratory Exercises:

1. Preparation of standard curve of glucose and determination of glucose content in given plant material.
2. Determination of osmotic potential of vacuolar sap by plasmolytic method
3. Separation of chlorophyll pigment by paper and column chromatography
4. To determine the rate of photosynthesis under different light qualities, CO₂ effect.
5. Bioassay of auxins and cytokinins using appropriate plant material
6. To determine the rate of transpiration under different environmental condition.
7. Preparation of standard curve for carbohydrate and protein
8. Enzymology: activity of catalase, invertase, amylase and urease, and effect of pH and temperature on enzyme activity.
9. Isolation and identification of *Rhizobium* from different plants
10. Study of instruments and principle of TLC, HPLC and Centrifuge, Spectrophotometer.

Essential Readings

11. David, Nelson, L., Michael M. Lehninger principles of Biochemistry (2011) fourth Edition, Cox Publisher.
12. Farrell, O., Ryan T. Ranallo, Experiments in Biochemistry : A Hands on approach Publisher : Books Cole.
13. Garrett, R.H. and Grisham, C.M. (2010) Biochemistry : Publisher Book Cole.

Hopkins W.G 2008 Introduction to Plant Physiology IV Edition John Wileys and Sons, London U.K.

2. Devi, P. 2000. Principles and Methods of Plant Molecular Biology, Biochemistry and Genetics. Agrobios, Jodhpur, India.
3. Glick, B.R. and Thompson, J.E. 1993. Methods in Plant Molecular Biology and Biotechnology. CRC Press, Boca Raton, Florida.
4. Bitar, L. Zeigen, E, Moller, I.M. Murphy A. 2015 Plant Physiology and Development sinauranociatessunderland USA.

Additional Readings

1. Moore, T.C. 1974. Research Experiences in Plant Physiology: A Laboratory Manual. Springer-Verlag, Berlin.
2. Roberts, J. and Tucker, G.A. 2000. Plant Hormone Protocols. Humana Press, New Jersey, USA.
3. McDonald M 2003 Photobiology of higher Plants, John Wileys
4. Wadte, S.S. and Baiy M.M.V. (2004). Plant Physiology Laboratory guide, SSBES Yeshwant Mahavidyalaya Nanded.
5. Sen N. (1984) Laboratory Exercises in Plant Physiology, Arun Prakashan Gwalior
6. Jain, 2000: Fundamentals of Plant Physiology, S. Chand, New Delhi.
7. Chauhan, N. 2016: Development in Physiology, Biochemistry and Molecular Biology of Plants. Bio Green Books, New Delhi.
8. Eric, E. Conn Paul. K. Stumpf, George Bruening, Roy Doi (1987) Out lines of Biochemistry : John Wiley USA.
9. Bucha, (2015). Biochemistry and Molecular Biology of Plants. JWO.
10. Chauhan, N. (2016). Development in Physiology, Biochemistry and Molecular Biology. Bio Green Book, New Delhi.
11. Sharma, S. (2016). Practical Manual of Biochemistry. Medtech.

DEPARTMENT OF BOTANY
DOCTOR HARISINGH GOUR VISHWAVIDYALAYA, SAGAR (M.P.)
(A CENTRAL UNIVERSITY)

Syllabus 2022-2023

Class	Subject	Semester	Paper	Course Code	Nature of Course	Course Title	Marks	Credit
M.Sc.	Botany	I	Practical	BOT-DSM -214	Discipline Specific Major-2	Biology and Diversity of Spermatophytes	100	02

Suggested Laboratory Exercises:

1. Study of complex tissues viz. Xylem and Phloem, Tracheids, Vessels and Sieve tubes and Companion cells.
2. Comparative study of the wood anatomy and vegetative and reproductive parts of *Cycas*, *Pinus*, *Cupressus*, *Araucaria*, , *Taxodium*, *Podocarpus*, *Agathis*, and *Ephedra*
3. Study of important fossil gymnosperms from prepared slides.
4. Description of a specimen from representative, locally available families
5. Herbarium techniques, Field trips within and around the campus; compilation of field notes and preparation of herbarium sheets and e-herbarium. Use of flora for identification of specimens. Comparison of different species of a genus and different genera of a family

Essential Reading:

1. Sharma O.P 2009 Plant Taxonomy 2 edition Tata McGraw Hill
2. Baruah, A Handbook of Angiosperm Taxonomy and Useful Plants, Aavishkar Publishers
3. Nairne A K. Scientific Classification of Flowering Plants, Discovery publication house New Delhi.
4. Grant W.F 1984 Plant Biosystematics -. Academic press London
5. Dikshit, A Siddiqui, MO and Pathak, A- 2016 Taxonomy of Angiosperm – Basic concept, Molecular aspects and Future Prospects by Studerra Press, New Delhi.
6. Bhatnagar, S.Pand MoitraA.. 1996Gymnosperms., New Age International Pvt. Ltd., New Delhi

7. Sharma, O.P 1999Gymnosperms. PragatiPrakashan, Meerut
8. Chamberlain, C.J.. 1971 Gymnosperms: Structure and Evolution Chicago University Press.

Additional Reading:

- 1 Pullaiah,T 2013 Text book of Biosystematics Theory and Practical Regency Publication New Delhi
- 2 NaikV.N Taxonomy of Angiosperm –.
- 3 Sambamurty A.V.S.S Taxonomy of Angiosperms IK international Publishers New Delhi
- 4 Sporne, KR1974 The Morphology of Gymnosperms.. Hutchinson University Library, London
- 5 .Singh, m.p. &Abb, S.G.(2016): Essentials of Plant Taxonomy and Ecology, Bio Green books, New Delhi.

DEPARTMENT OF BOTANY
DOCTOR HARISINGH GOUR VISHWAVIDYALAYA, SAGAR (M.P.)
(A CENTRAL UNIVERSITY)

Syllabus 2022-2023

Class	Subject	Semester	Paper	Course Code	Nature of the Course	Course Title	Marks	Credit
M.Sc.	Botany	II		BOT-MDM-215	Multi Disciplinary Major-3	Forest Ecology (T)	100	04
	Course Objectives: Principal objective of the course is to impart the details of global distribution of different types of forests in relation to climatic conditions. Dependency of humans on forests and needs for conservation. Ecological concepts pertaining to the management and growth and development of forests in general and Indian forests in particular. Course Learning Outcomes: Upon the completion of the course the students will be able to Unit I: Understand the importance of forest resources. Unit II: Learn the structure and functions of forests as ecosystems. Unit III: Have the in-depth knowledge of distribution of forests globally and regionally. Unit IV: Understand the forest succession in relation to climate and soils. Unit V: Learn the conservation policies for wildlife conservation in India.							

Unit	Contents	Hours
1	Introduction, Importance of forest resources, forest communities of different climatic zones, Methods of studying structure and composition of forest communities. Forest types of India and M.P.	10
2	Classification of forest biomes, World distribution, Classification of forests of India, Tropical forest, Subtropical forests, Temperate forest, Alpine vegetation of Himalayas. Differences between true temperate and Indian temperate forests.	10
3	Phenomenon of succession in forest, Nature of climax, Role of grazing and anthropogenic factors, Forest environment, climatic factors governing forest distribution, Methods of studying environmental factors in forests.	8
4	Microclimate of forest, Forest soils of India, Forest Natural regeneration, Joint Forest management concept and practice.	17
5	Wildlife conservation and related legislation, Seed biology, Forest Influences, Organic matter dynamics and annual budget sheets	15

DEPARTMENT OF BOTANY
DOCTOR HARISINGH GOUR VISHWAVIDYALAYA, SAGAR (M.P.)
(A CENTRAL UNIVERSITY)

Syllabus 2022-2023

Class	Subject	Semester	Paper	Course Code	Nature of Course	Course Title	Marks	Credit
M.Sc.	Botany	I	Practical	BOT-MDM-216	Multi Disciplinary Major-3	Forest Ecology	100	02

Suggested Laboratory Exercises:

1. A survey and reconnaissance of a nearby forest to have an idea of various herb, shrub and tree species.
2. Sampling of the forest vegetation by quadrat method for determining density, frequency and basal area of different tree species.
3. Studying forest natural regeneration.
4. Study of climatic factors inside and outside a forest.
5. Visits to forest of different edapho-climatic zones.
6. Excursions to places of importance to forestry research, such as IIFM – Bhopal, SFRI and TFRI Jabalpur, FRI Dehra Dun etc.

Essential Readings

1. Champion, H.G and Seth, S.K 1968 General Silviculture for India, Govt, Of Indian Publication, Delhi
2. Champion, H.G and Seth (1968) A revised survey of forest types of India Govt, Of India Publication., Delhi
3. Puri, G.S, Mehar-Homeji, V. M, Gupta, R.K. Puri, S (1983) Forest Ecology, Oxford, IBH Pub. Co. New Delhi
4. Kimmins, J.P. (1997) Forest Ecology. Printice Hall, New Jursey, USA
5. Misra, R (1968) Ecology work Book Oxford, IBH Pub. Co. New Delhi
6. Smith R.L. (1996) Ecology and Field Biology. Harper Collins
7. Odum, E.P. (1971) Fundamental of Ecology, Saunders's Pub. Athens. G.A

Additional Readings

1. UNESCO (1978) Tropical Forest Ecosystems, unesco, UNeP/FAO Paris
2. Ovington, J.D (1965) Woodlands. The English University, Press. London

3. Troup, R.S (1921) Silviculture of Indian Trreess Vol I-III Clarendon Press, Oxford
4. Burton, V. B. Donald, R. Z and Stephen, H.S (1998) Forest Ecology. J. Wiley and sons, NY.

DEPARTMENT OF BOTANY
DOCTOR HARISINGH GOUR VISHWAVIDYALAYA, SAGAR (M.P.)
(A CENTRAL UNIVERSITY)

Syllabus 2022-2023

[illegible]

DEPARTMENT OF BOTANY
DOCTOR HARISINGH GOUR VISHWAVIDYALAYA, SAGAR (M.P.)
(A CENTRAL UNIVERSITY)

Syllabus 2022-2023

Class	Subject	Semester	Paper	Course Code	Nature of Course	Course Title	Marks	Credit
M.Sc.	Botany	I	Practical	BOT-AEC-218	Ability Enhancement Course	Ecosystem Services	100	01

Laboratory/Field Exercises:

1. Identification and characterization of ecosystem services of a nearby forest/grassland/pond ecosystem.
2. To identify and characterize various drivers impacting ecosystem services in of an ecosystem.
3. To study the change in quantity and quality of ecosystem services due to varying degree of product extraction and other disturbances.
4. Quantification of various types of services as classified in the Millennium Assessment Goal of forest ecosystem

Essential Readings:

1. Ecosystem Services from concept to practice, by JetskeBouma and Pieter Van Beukering, 2015. Cambridge University Press, UK.
2. Ecosystem Services - Concept, Methods and Case Studies, by Karsten Grunewald and Olaf Bastian, 2015, Springer.
3. Conserving and Valuing Ecosystem Services and Biodiversity – Economic, Institutional and Social Challenges, by K. N. Ninan, 2009. Earthscan, publishing for Sustainable future, London.
4. The law and policy of ecosystem services by Ruhl, J. B., Kraft, Steven E., and Lant C. L. Island Press, 2007, University of

Michigan, ISBN: 1559630949

5. Payments for Ecosystem Services: Getting Started: a Primer. United States. Agency for International Development, Katoomba Group, Forest Trends, 2008, ISBN: 9789280729252

Additional Readings:

1. Ecosystem services certification: Opportunities and constraints by Meijaard, E., Sheil, D., Guariguata, M.R., Nasi, R., Sunderland, T.C.H., Putzel, L., Center for International Forestry Research (CIFOR) Bogor, Indonesia, 2011, ISBN: 978-602-8693-59-2
2. MA: Millennium Assessment, Ecosystem and Human Well-being. A frame work for Assessment. Washington, DC: Island Press; 2003
3. MA: Millennium Assessment, Ecosystem and Human Well-being. Current State and trends. Volume 1, Washington, DC: Island Press; 2005
4. MA: Millennium Assessment, Ecosystem and Human Well-being. Synthesis. Washington, DC: Island Press; 2005
5. MA: Millennium Assessment, Ecosystem and Human Well-being. Scenarios. Volume 2, Washington, DC: Island Press; 2005
6. MA: Millennium Assessment, Ecosystem and Human Well-being. Policy responses. Volume 3, Washington, DC: Island Press; 2005
7. MA: Millennium Assessment, Ecosystem and Human Well-being. Multiscale Assessments. Volume 4, Washington, DC: Island Press; 2005.

DEPARTMENT OF BOTANY
DOCTOR HARISINGH GOUR VISHWAVIDYALAYA, SAGAR (M.P.)
(A CENTRAL UNIVERSITY)

Syllabus 2022-2023

Class	Subject	Semester	Paper	Course Code	Course Title	Marks	Credit
M.Sc.	Botany	II		BOT-SEC-220	Biochemical and Molecular Techniques	100	01

EXPERIMENTS:

1. Laboratory safety guidelines.
2. To determine an unknown protein concentration by plotting a standard graph of BSA using UV-Vis Spectrophotometer and validating the Beer- Lambert's Law.
3. To determine sugar concentration in plant samples.
4. To determine chlorophyll concentration in leaf samples
5. Enzyme activity; Cellulase, Lipase, Protease, Catalase
6. Effect of temperature on enzyme activity.
7. Polymerase Chain Reaction
8. Isolation & Purification of genomic DNA from bacteria
9. Isolation & Purification of plasmid DNA
10. Separation of proteins by native and SDS-PAGE.

Essential Readings:

1. Michel R. G and Sambrook J. Molecular Cloning- A laboratory manual. Cold spring harbor laboratory press, 2012.
2. Nelson.D.L, Cox. M. M. Lehninger's. Principle of Biochemistry. 6th ed. Freeman, 2009
3. Laboratory Exercises in Microbiology, Fifth Edition by Harley–Prescott, The McGraw–Hill Companies, 2002

Suggested Readings:

4. Wilson K and Walker J, Principles and Techniques in Practical Biochemistry, 5th Ed., Cambridge University Press, 2000.
5. Holtzhauer M, Basic Methods for the Biochemical Lab, Springer, 2006.