

CHHINDWARA UNIVERSITY, CHHINDWARA (M.P.)

SYLLABUS OF M.Sc.(Botany)

SEMESTER -IV

Name of Paper	Title of Paper	Max. Marks			Minimum Marks			Total Marks
		Theory	CCE	Practical	Theory	CCE	Practical	
Paper -I	Biotechnology, Tissue Culture and Genetic Engineering	40	10	50	15	4	20	
Paper -II	Instrumentation, Biostatistics, Remote Sensing & Biotechnology	40	10		15	4		
Paper -III (Elective-I)	(A) Ethnobotany (B) Industrial Microbiology	40	10	50	15	4	20	
Paper-IV (Elective-II)	(A) Limnology (B) Applied Mycology (C) Forest Ecology (D) Enviromental Biology and Pollution Ecology	40	10		15	4		

Board of Studies :

Chairman -

M. Chhabra
Dr. Satish Chila

Subject Expert -

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CHHINDWARA UNIVERSITY, CHHINDWARA (M.P.)

SYLLABUS PRESCRIBED FOR THE DEGREE OF MASTER OF SCIENCE IN BOTANY

(Academic Session 2020 – 2021 & Onwards)

FOURTH SEMESTER

Paper 1 – Biotechnology, Tissue Culture and Genetic Engineering

M.M. 40

UNIT – I

Biotechnology: basic concepts, history, principles and scope. Principles and Application of biotechnology in Agriculture, horticulture, forestry, food, and industries, health care and immunology. Environment biotechnology and ethics. Intellectual Property Right.

UNIT – 2

Concept of cellular differentiation and Totipotency. Establishment of Lab, aseptic techniques and sterilization of glasswares. Different types and preparation of media, Explant technique of tissue culture, meristem culture, anther culture, embryo culture and organogenesis. Somatic Hybridization, Protoplast isolation, Fusion and culture, Somatic cell genetics, application of tissue culture, Artificial seed, Somaclonal variation, Production of Secondary metabolites, cryopreservation, and germplasm storage.

UNIT – 3

Genetic engineering of plants: aims, strategies for development of transgenics, Agrobacterium – the natural genetic engineer, T-DNA and transposon mediated gene tagging. Microbial genetic manipulation, Bacterial transformation, Selection of recombinants and transformants, Genetic improvement of industrial microbes and nitrogen fixers.

UNIT – 4

Basic concept of recombinant DNA technology, Gene cloning- principles and techniques; Construction of Genomic and cDNA libraries; Choice of vectors, Enzymes involved in genetic engineering. Polymerase Chain Reaction; DNA finger printing.

UNIT – 5

Genomics and proteomics, molecular markers, Artificial chromosomes, DNA synthesis, DNA sequencing, High thought sequencing, Genome projects, Bioinformatics, Microarrays, Protein profiling and its significance.

M. K. Chaudhary

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FOURTH SEMESTER

Paper 2 – Instrumentation, Biostatistics and Biotechniques

M.M. 40

UNIT –1

Microscopy, TEM, SEM, ELISA, Electrophoresis, Western and southern blotting, Staining, Spectrophotometer, Colorimeter, X-ray differentiation, Centrifugation, Microtomy, pH metery, Chromatography, Laminar air flow. Fermentor (Bioreactor) design, Microbial fermentation process Culture and Production Media. Culture technique of fungi and bacteria. Bioremediation, Biosensors,

UNIT – 2

Measures of central tendencies, Standard deviation and standard error, Correlarion and regression, Chi square test and t – test. Methods of sampling; regular, random sampling, small samples, large samples. Theory of Probability; addition law and multiplication law, Binomial expansion.

UNIT – 3

Introduction to Computer; Fundamentals, usage of computers in Biology, sample graph plotting, Networking of computers; basic need and applications, Modern strategies of literature search, MS Office. Computer in biology: Sequence data bases, Analysis of protein and nucleic acid, Structure prediction, Simple molecular modeling, Sample graph plotting.

UNIT – 4

Remote sensing; concept and tools, Satellite remote sensing, basics, sensors, visual and digital interpretation, EMR bands and their applications, Indian remote sensing program, Thematic mapping of resources, Applications of remote sensing.

UNIT – 5

Analysis of water: pH, Turbidity, Conductivity, Total suspended solids (TSS), Total dissolved solids (TDS). Heavy metals: Copper, Zinc, Manganese, Iron, Cadmium, lead, Chromium, Mercury, Tin and Arsenic. Temporary and permanent hardness of water, Standard value set by WHO, Local standards such as National Drinking Water Quality Standard (NDWQS). Microbial analysis of water.

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FOURTH SEMESTER

Elective 1 (A) – Ethnobotany

M.M. 40

UNIT – I

Ethnobotany: Definition, Concept, Relevance and Scope of Ethnobotany, Sub-disciplines of Ethnobotany, Relation between Economic botany and Ethnobotany, World centers of Ethnobotany with special reference to India, Indian work on Ethnobotany.

UNIT – 2

Sources of data and methods of study of Ethnobotany. Sacred grooves – concept, classification, distribution and threats of sacred grooves in India. Plants used in various systems of medicines – Ayurvedic, Unani, Homoeopathic and Allopathic systems. General idea of active principles of plants and plant parts – their extraction and preparation of medicines in different systems.

UNIT – 3

Wild edible plants used by the ethnic people. Ethnoreligious plants used by tribals. Role of Ethnobotany in conservation of native plant genetic resources. Scope and uses of essential oil from plants as perfumes, cosmetics and as flavouring agents. Regional relevance and credibility of medicinal plants used by tribals of M.P.

UNIT – 4

Ethnobotanical plants used in fish poisoning and musical instruments, Plants in Mythology, Totem and taboos in relation to plants and their role in conservation, Plants as similes and metaphors. Folklore and folk tales. Ethnobotanical importance of *Butea monosperma*, *Madhuca indica*, *Azadirachta indica*, *Buchnanania lanzan*, *Pterocarpus marsupium*, *Terminalia arjuna*, *Cassia fistula*, *Withania somnifera*, *Rauwolfia serpentina* and *Hollarrhena antidysenterica*.

UNIT – 5

Detailed study of common plants and their parts used in the treatment of – Fever, cough, bronchitis, asthma, skin diseases, expulsion of worms, abdominal disorders, diarrhea and dysentery, jaundice, piles, bone fracture, heart diseases and urino-genital problems. Plants used in scarcity, emergency and as supplementary foods by tribes of M.P.



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FOURTH SEMESTER

Elective 1 (B) - Industrial Microbiology

M.M. 40

UNIT – 1

Basic techniques in microbiology – Microscopy, staining techniques, culture, nutrition and growth of microorganisms. Structure and replication of Viruses and other cellular microorganisms. Prokaryotic microorganisms - Classification and diversity of Bacteria. Eukaryotic microorganisms.

UNIT – 2

Food microbiology – Food spoilage, Food preservation methods, Microbial production of food such as fermented products, alcoholic beverages and vinegar. Fermented vegetables. Single cell protein production in industry, Fermented dairy products and uses.

UNIT – 3

Fermentation industry – Selection of microorganisms, Techniques of quality control. Production of antibiotics, steroids, human proteins, vaccines and vitamins. Survey of microorganisms of industrial use. Production of organic acids, amino acids, enzymes, solvents and fuels.

UNIT – 4

Microbial products – Recovery of minerals by using microbes, Oil recovery, Biodeterioration, Mushroom culture, Biotech products including human insulin. Microbial growth – environmental influences, physical control, chemical control and antibiotic control.

UNIT – 5

Water quality in industry – Bacteriological safety of potable water, Water quality analysis, Importance of BOD, Biodegradation of wastes and pollutants. Primary, secondary and tertiary sewage treatments.

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FOURTH SEMESTER

Elective 2 (A) - Limnology

M.M. 40

UNIT – 1

Definition and scope of Limnology. Water in Biosphere. General characteristics, classification, zonation and origin of lakes. Definition depth of lakes. Retention and replacement of water in lakes.

UNIT – 2

Ecological classification of freshwater organisms. Classification of Phytoplankton, Phytoplankton flora of lakes, Seasonal distribution and species composition of Phytoplankton. Effect of salinity and climate stress on distribution of Phytoplankton. Algal blooms. Characteristics and classification of Phytobenthos.

UNIT – 3

Categories of aquatic higher plants, Zonation of rooted higher plants. Some peculiarities of aquatic higher plants. Concept of productivity: Seasonal variation, Primary productivity in fresh water lakes, Study of primary production of macrophytes. Estimation of primary productivity. Lake bacteria – occurrence, characteristics and importance.

UNIT – 4

Physical factors affecting the flora – light, temperature, waves and currents. Chemical factors affecting the flora – oxygen, carbon dioxide and pH. Nutrients affecting the flora – Na, K, P, Ca and Mg.

UNIT – 5

Food chains, Food webs, Trophic levels and Energy flow in fresh water ecosystems. Eutrophication – causes, mechanism and significance. Management of fresh water bodies. Basic relationships and interaction among organisms. Symbiosis, competition, parasitism and predation of algae. Impact of human being on algae.



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FOURTH SEMESTER

Elective 2 (B) - Applied Mycology

M.M. 40

UNIT – 1

General characteristics of Fungi, Taxonomic status and classification of fungi, Fungi as pathogen to plants, Fungal diseases of human beings and animals, Fungi involved in degradation of goods and spoilage of foodstuffs. Fungal allergy.

UNIT – 2

Fermentation process- Solid state Fermentation (SSF), Submerged Fermentation (SMF), Continuous Fermentation, Fermentor (Bioreactor) design, Reactor types. Culture and Production Media. Microbial Strain and Strain improvements of industrial fungi. Microbial type culture collection and Gene bank (MTCC).

UNIT – 3

Fungi as food: detailed account of edible fungi with special reference to mushrooms and their cultivation, Yeast and its related industries, Single cell protein and its production, Economic importance of fructifications of few edible fungi.

Fungi as Medicines: Steroid bioconversion through fungi, Production of Vitamins – Riboflavin and Vitamin A. Industrial production of antibiotics - Penicillin and Cephalosporin. Medicinal value of ergot. Glycerol reduction.

UNIT – 4

Fungi in Industry: Baking, Brewery and Dairy industry. Fungi in enzyme production – Amylase, Cellulase, Protease and Invertase. Fungi in production of organic acids – Citric acid, Fumaric acid, Gluconic acid and Gallic acid.

UNIT – 5

Principles of fungal disease management, Disease forecasting, Regulatory and physical methods of disease management, Chemical and biological control methods, Fungi in agriculture – In improvement of soil fertility, Importance of Mycorrhiza.

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(Academic Session 2020 – 2021 & Onwards)

FOURTH SEMESTER

Elective 2 (C) - Forest Ecology

M.M. 40

UNIT – 1

Definition, scope and significance of Forest ecology. 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.

UNIT – 2

Classification of forest biomes, World distribution, Classification of forests in India – Tropical forests, Subtropical forests, Temperate forests and Alpine vegetation of Himalayas. Differences between true temperate and Indian temperate forests.

UNIT – 3

Phenomenon of succession in forests, Nature of climax, Role of grazing and anthropogenic factors, Forest environment, Climatic factors governing forest distribution. Microclimate of forests, Forest soils of India, Natural regeneration of forests.

UNIT – 4

Wildlife conservation and related legislation, Forest influences, Organic matter dynamics and annual budget sheets. Effect of wild animals on forest regeneration, human impacts; encroachment, poaching, grazing, live fencing, theft, shifting cultivation and control. Joint Forest Management, Involvement of women; Forestry Policies and issues related to land use, timber and non-timber products, sustainable forest management.

UNIT – 5

Forest ecology - Biotic and abiotic components, forest eco-systems; forest community concepts; vegetation concepts, ecological succession and climax, primary productivity, nutrient cycling and water relations; physiology in stress environments (drought, water logging salinity and alkalinity). Identification of species, composition and associations; dendrology, taxonomic classification, principles and establishment of herbaria and arboreta. Conservation of forest ecosystems. Clonal parks.

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FOURTH SEMESTER

Elective 2 (D) - Environmental Biology and Pollution Ecology

M.M.40

UNIT – 1

Concept, definition and characteristics of pollution. Sources, types and classification of pollutants. Pollution problems of World/India/Madhya Pradesh. Brief account of major environmental disasters of the past. Present status of the pollution in our country.

UNIT – 2

Composition of air, Sources and causes of air pollution, Effects of air pollutants on ecosystem components (particularly plants and animals), Meteorological aspects of air pollution, Climate change, Green house effect and ozone depletion, Biological indicators of air pollution. Sources and types of water pollutants, Effect of water pollution on ecosystem, Underground water pollution, Heavy metals and their effect on biota, Concept of bioaccumulation and biomagnifications.

UNIT – 3

Causes and sources of soil pollution, Ecological effects of soil pollution. Pesticidal and heavy metal pollution – sources, classification, chemical properties, effects on plants and animals. Solid wastes: pollution and disposal problems. Hospital wastes – effects and disposal. Causes, sources and effects of Nuclear pollution, Thermal pollution and Noise pollution.

UNIT – 4

Monitoring and analytical methods for air, water and soil pollution. Control and abatement measures of air, water and soil pollution. Standards and limits prescribed by different agencies for ambient air and water quality. Brief account of legislation and environmental protection acts in India. Public participation for combating pollution.

UNIT – 5

Basic concept and applications of Ecotechnology, Vermitechnology and Bioremediation. Sludge treatment. Ecosystem restoration – concept and success. Principles of analytical methods – Titrimetry, Gravimetry, Colorimetry, Spectrometry and Chromatography.

M. Chandra

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Chhindwara University, Chhindwara

M. Sc. Botany Semester IV

Practical Scheme for Practical - 1

(Based on Paper I and II)

M.M. - 50

1. Exercise based on Tissue Culture	-	10
2. Exercise based on Biotechnology	-	05
3. Exercise on Biostatistics	-	05
4. Exercise on Biotechniques	-	05
5. Spots 1 to 5	-	10
6. Viva voce	-	05
7. Sessional	-	05

Practical Scheme for Practical - 2

(Based on Paper III and IV)

Laboratory Exercises corresponding to Elected Theory Paper.

M.M. 50

M. Chandra

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Jun
6/2/2020