Chhindwara University, Chhindwara (M.P.)

SYLLABUS OF M.A./M.Com./M.Sc./M.H.Sc. PREVIOUS/FINAL OR SEMESTER -- IV

Name of Paper	Title of paper	Max. Marks			Minimum Marks			
		Theory	CCE	Practical	Theory	CCE	Practical	Total Marks
Theory-I	Advance Molecular Biology	40	10		13	04		
Theory-II	Applied Biotechnology	40	10		13	04		
Theory-III	Biology of Immune System	40	10		13	04		
Elective-I	Resource utilization & Conservation	40	10		13	04		
Elective-II	Agriculture Microbiology	40	10		13	04		
Practical-I							50	
Practical-II							50	

Board of Studies :

I. Chairman – Dr. Ajay Kumar Bhardwaj

II. Subject Expert –

1. Dr. Pratima Khare
2. Dr. Jitendra Maliya
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Chhindwara University, Chhindwara (M.P.)

SYLLABUS OF M.A./M.Com./M.Sc./M.H.Sc. PREVIOUS/FINAL OR SEMESTER -- IV ----

Name of Paper	Title of paper	Max. Marks			Minimum Marks			
		Theory	CCE	Practical	Theory	CCE	Practical	Total Marks
Elective-III	Dissertation for one Month							
	A. Valuation	50			20			
	B. Viva-voce	.						
	External Expert	25			10			
	Internal	25			10			
	Total.	100						

Board of Studies :

I. Chairman – Dr. Ajay Kumar Bharduaj

II. Subject Expert –

1. Dr. Pratima Khare
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छिन्दवाड़ा विश्वविद्यालय, छिन्दवाड़ा

Session -2020-2021

Class/कक्षा	:	**M.Sc.**
Semester/सेमेस्टर	:	**Semester IV**
Subject/विषय	:	**Biotechnology**
Title of Subject Group	:	**Advance Molecular Biology**

Particulars/विवरण

Max. Marks 40

UNIT-I: **Microbial Genetics**: gene transfer mechanism in microbe transformation, transduction, conjugation and recombination, Horizontal gene transfer, genetics of model organism- Neurospora, Yeast and E.coli.

UNIT-II: **Gene concept**: Classical concept, molecular concept of the gene. Jumping genes, Split genes, Pseudo genes, overlapping gene, repeated gene, natural gene amplification, molecular basis of cancer - oncogene, tumor suppressor genes,.

UNIT-III: Lytic and Lysogenic cycles, IS, and Tn elements in bacteria, Bacterial plasmids, gene regulation during development, E coil recombination system.

UNIT-IV: Recombinant DNA technology : methods of creating recombinant DNA molecule, properties of restriction endonucleases and their mode of action, selection screening construction of DNA library. Use of cloned gene, sub-cloning; recombinant proteins production in bacteria, site-directed mutagenesis, RFLP, PCR, DNA-fingerprinting, antisense-RNA technology, chromosomal walking.

UNIT-V: **Frontiers in Biotechnology:** Stem Cell Technology, Human Cloning Ethical issues & risks associated with it, Nano biotechnology:- Introduction to nanoscience, size matter, tools for measuring nanostructure Biosencer development and application, Nanotech impact on types of DNA chips & their production, SNP and genome mismatch signals, functional proteomics – RT PCR Human Genome Project , Bioterrorism.

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Books recommended

Molecular cloning : A Laboratory Manual , J. Sambrook : Fritsch and T. Maniatis Cold Spring Harbor Laboratory Press, New York, 2000.

Introduction to practical molecular biology P.D. Dabre, John Wiley & sons Ltd. N York 1988

Molecular Biology LabFax, T.A. Brown (Ed) Bios Scientific Publishers Ltd. Oxford, 1991

Molecular Biology of the Gene (4th edition), J.D. Watson N.H. Hopkins, J.W. Roberts J.A. Steitz and A.M. Weiner, The Benjamin/ Cummings Publ Co. Inc. California, 1987.

Molecular Cell Biology (2nd Edition) J. Darnell, H. Lodish and D. Baltimore, Scientist American Books, Inc., USA, 1994.

Molecular Biology of the Cell (2nd Edition) B. Alberts, D. Bray, J. Lewis, M. Raff, K. Roberts, and J. D. Watson, Garland Publishing, Inc., New York, 1994.

Gene VI (6th Edition) Benjamin Lewin, Oxford University press, U.K., 1998.

Molecular Biology and biotechnology; a comprehensive desk reference, R.A. Meyers (Ed.)

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Session -2020-2021

Class/कक्षा : **M.Sc.**

Semester/सेमेस्टर : **Semester IV**

Subject/विषय : **Biotechnology**

Title of Subject Group : **Applied Biotechnology**

Particulars/विवरण

Max. Marks 40

UNIT-I: **Industrial Biotechnology:** Microbial strain of industrial importance, microbial production of antibiotics (penicillin , streptomycin & tetracycline), Vitamins (Vit B12), amino acids (glutamic acid) & enzymes (amylase, protease, invertase & pectinase), microbial production of alcoholic beverages (whisky & brandy), vinegar, citric acid, acetic acid, glycerol, acetone, foods–SCP, Biotransformation of steroids and pesticides.

UNIT-II: **Agricultural Biotechnology:** Role of biofertilizers and biopesticides in sustainable development, petrocrops, aquaculture, Improvement of nutritional value of seed storage protein, starch, oil. Transgenic plants for increased shelf life molecular mapping of genes of agricultural importance, sericulture, transgenic fish Plant Variety Protection Act, Plant breeders rights, International Convention on biological diversity.

UNIT-III: **Food Biotechnology:** Prokaryotic & Eukaryotic based products (fermented meats, milk products, yoghurt, cheese, cereal, wine, beer), Impact of biotechnology on microbial testing of food, current/traditional methodology and new approaches (use of gene probes, RDT, Bioluminescence), Safety evaluation of genetically engineered enzyme/novel food products, Natural Control of Micro Organism and preservation, Biogums, Bio-colours Fumaric acid, sweetener, fat substitutes, natural & modified starch, fats & oils food.

UNIT-IV: **Environmental Biotechnology:** Environmental pollution and their management, concept of Global Warming and Ozone depletion (Ecofarming, Green house effect & acid rain), Waste water treatment, solid waste management, conventional & modern fuels & their environmental impact, Bioremediation, Biodegradation of xenobiotic compounds, Biomineralization, Biotechnological approaches for Preserving biodiversity (Gene banks ,Germ Plasm Banks & their management).

UNIT-V: Stem Cell Technology, Human Cloning Ethical issues & risks associated with it, Nano biotechnology:– Introduction to nanoscience, size matter, tools for measuring nanostructure Biosensor development and application, Nanofabrication, Nanotech impact on types of DNA chips & their production, SNP and genome mismatch signals, functional proteomics – RT PCR Human Genome Project , Bioterrorism, Bioweapons

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RECOMMENDED BOOKS:

Fundamental of food Biotechnology (1996). Lee, B.H.

Biotechnology & Food Ingredients (1991) Goldberg, I & Williams, R.
Food Biotechnology: Micro Organisms (1995) Hui, Y.H. Biotechnology:
Food Fermentation Vol. I & II (1999), Joshi, V.K. & Pandey, A.

Pesticide Microbiology, Hill I.R. & Asight, S.J.L.

Biotech in Industrial Waste treatment & Bioremediation (1996) Hickey, R.F.Smith, G.

Biodegradation & Bioremediation: Soil Biology (2004). Singh, A., Word, O.P.

Environmental Biotechnology (1998), Agarwal, S.K.

Plant Biotechnology & Molecular Markers (2004) Shrivastava et al
Agricultural Biotechnology (1998) Altman, A.

Plant Biotechnology: The Genetic Manipulation of Plant (2004) Adrianstater et al

Legal Aspect of Gene Technology (2004) Brian, C.

The GMO Hand Book: Genetically Modified Animals, Microbes & Plant (2004)
Sarad, R.P.

Food & Vegetable Biotech (2004) Valpuseta A
passion of DNA, Watson J.D.

DNA Microarrays & gene expression, Baldi, P & Hatfield, G.W.

Nanobiotechnology- Next Big Idea, Mark et al

Gene Cloning, Brown, T.A.

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छिन्दवाड़ा विश्वविद्यालय, छिन्दवाड़ा

Session -2020-2021

Class/कक्षा : **M.Sc.**

Semester/सेमेस्टर : **Semester IV**

Subject/विषय : **Biotechnology**

Title of Subject Group : **Biology of Immune System**

Particulars/विवरण

Max. Marks 40

UNIT-I: **Immunology:** An introduction and historical perspective, antigens and antigenicity, addjuvants, immune system organs, tissues & cell lymphocytes, lymphoid organs , mono nuclear phagocytic system, myeloid system, immunity–active & passive, Natural humoral and cellular immunity.

UNIT-II: **Immunoglobulins:** Structure of IgG (b), various classes of antibodies, Antibodies diversity-theories and molecular mechanism, class-switching, monoclonal antibodies (hybridoma technology) , recombinant antibodies, antigen- antibody interaction.

UNIT-III: **Immunological Responses:** Cell mediated immune response, Major Histo-compatibility Complex, Cellular interactions in the immune response–antigen processing and presentation, recognition of antigens by T & B cells, T – cell receptor complex, B–cells receptor complex.

UNIT-IV: **Complement System:** Classical, alternative and lactin pathways and their regulations. Dendritic cells and N cells. Cytokines, immunological tolerance, hypersensitivity, anti-immune diseases & AIDS.

UNIT V: Mechanism and therapeutic approaches, immunodeficiency syndrome and their diagnosis, vaccines-active and passive immunization, whole organism vaccines, macromolecules as vaccines, Immunodiagnostic: precipitation techniques, agglutination, fluorescence techniques.

RECOMMENDED BOOKS:

Essentials of Immunology – Roitt

Immunology – An Introduction (2004) – Tizard, I.R., Thompson Pub.

Immunology – Roitt.

Principle & Practice of Immunoassay 2nd Ed. – Christopher & David

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Session -2020-2021

Class/कक्षा	:	**M.Sc.**
Semester/सेमेस्टर	:	**Semester IV**
Subject/विषय	:	**Biotechnology**
Title of Subject Group	:	**Practical's I**

Practical Based on Theory Paper I, II, III

Suggested Practical Based on Theory Paper I,II,III & IV

To isolate genomic DNA from fungi by LETS methods.
To determine the quantity and quality of the isolated fungal DNA
To determine the agarose gel electrophoresis of the isolated fungal DNA.
To isolate plasmid DNA from bacteria by quick method.
To purify the DNA from agarose gel.
To study the Thermal cycler.
To study the gel documentation system.
Immuno diffusion.
Immuno electrophoresis.
Study of agglutination & rosette formation.
PAGE on native gel & study of isozyme by activity staining.
Permanent slide on mammalian physiology.
Determination of aspartate content is given sample by enzymatic method.
To immobilize chymotrypsin on agarose gel beads by Oxirane method.
Production of monoclonal antibody against purified protein.
To detect nitrate reductive in leaf extracts by immnuno diffusion test.
To detect antibodies in sera by competitive ELISA.
Identification of bacteria by using fluorescent antibody techniques (FAT).
Quality testing of milk by resazuring test.
Determination of phasphatase activity in butter, whey, milk powder.
Microbiological analysis of food production.
Presumptive test for coliform in butter.
Analysis of mycotoxin in fungal contaminated food materials.

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Session -2020-2021

Class/कक्षा	:	**M.Sc.**
Semester/सेमेस्टर	:	**Semester IV**
Subject/विषय	:	**Biotechnology (Elective Paper-I)**
Title of Subject Group	:	**Resource Utilization & Conservation**

Particulars/विवरण

Max. Marks 40

UNIT – I: Major Biomes of the world, Tropical rain & Seasonal Forests, Temperate rain & Seasonal forests, Boreal forests, Grasslands, Deserts, Aquatic Ecosystems wetlands, Lakes & Ponds Streams & Rivers, Marine & Estuarine habitats.

UNIT – II : Resource utilization, Status & Utilization of Biodiversity, Sustainable development resources from forest, Grassland and aquatic habitats, Food forage, Fodder, Timber & Non-wood forest products, Threats to quality & quantity of Resources due to overexploitation.

UNIT –III :Strategies for conservation of resources: Classifications of resources, Principles of conservation, *In-situ* conservation sanctuaries, National parks, Biosphere reserves for wildlife conservation, Habitateconservation practices of conservation for forests ranges, Soil and water.

UNIT – IV :Air, Water and Soil pollution, Kinds, Sources, Quality parameters, Effects on structure & function of ecosystems, Management of pollution, Bioremediation, Climate changes sources, Trends & role of greenhouse gases, Effect of global warming on climate, Ecosystem processes & Biodiversity, Ozone layer & Ozone hole.

UNIT – V :Resource monitoring, Remote sensing concepts & Tools, Satellite remote sensing basics sensors,Visual & digital interpretation, EMR bands and their applications, Indian remote sensing program,Thematic mapping of resources, Application of remote sensing in Ecology &Forestry.

Books recommended

- Chopra R. N. (1933) Indigenous Drugs of India.
- Hayes W. B. (1953) Fruit Growing in India.
- Atkinson E. T. (1980) Economic Botany of Himalayan Regions.

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Session -2020-2021

Class/कक्षा	:	**M.Sc.**
Semester/सेमेस्टर	:	**Semester IV**
Subject/विषय	:	**Biotechnology**
Title of Subject Group	:	**Practical's II based on Elective Paper-I (Resource Utilization & Conservation)**

Suggested Practical Based on Theory Paper Elective Papers

To find the pH of the various sample of soil by pH meter.
To determine the presence of carbonate in different soil mixtures.
To determine the presence of phosphate in soil and water sample.
To determine the presence of nitrate in mixture sample.
To determine the presence of nitrite in mixture sample.
To determine frequency, density and abundance of herbaceous species from local garden.
To determine the biomass of plant vegetation.
To determine leaf area, dry weight and moisture content of few species of plant from grassland.

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Session -2020-2021

Class/कक्षा	:	**M.Sc.**
Semester/सेमेस्टर	:	**Semester IV**
Subject/विषय	:	**Biotechnology (Elective Paper-II)**
Title of Subject Group	:	**Agriculture Biotechnology**

Particulars/विवरण

Max. Marks 40

UNIT – I: History, scope and development of agricultural microbiology, rhizosphere and phyllosphere: concept, importance, factors affecting microbial diversity.

UNIT – II: Soil health: crop residues, humus, mineralization, immobilization, soil-sickness, composting, vermicomposting, green manure. Effect of crop residues on plant growth; biodegradation of pesticides and pollutants; biodegradation fate, bioavailability, acceleration, bioremediation. Biofertilizers: types, production, formulation and constraints.

UNIT – III: General idea about major agricultural pests: Plant diseases- late blight potato, downy mildew of pea, stem gall of coriander, powdery mildew / rust / smut, rust of linseed, Ergot of bajara, Anthracnose of soybean, Tikka disease of groundnut, wilt of arhar, bacterial blight of paddy, citrus canker, leaf curl of papaya, little left of brinjal. Insects: gram, soybean. Weeds: parthenium, xanthium, waterhyacinth, cyperus, phalaris

UNIT – IV: Post harvest losses of agricultural products: causes, problems and management recent trends in pest management: strategies, mass production, formulation and application technology, achievements, constraints

UNIT – V: Biotechnology in agriculture: the new green revolution, transgenic crops, gene protection technology, frost control technology, resistant varieties. Bioconversion futurology: exploitation of agricultural wastes for food / feed and fuel.

List of Recommended Books

1. Soil microbiology by Subba Rao
2. Soil and microbes by Waksman and Starkey.
3. Plant pathology by Mehrotra.
4. Alexander, M. Introduction to Soil Microbiology, 3rd Edition. Wiley Eastern Ltd., New Delhi
5. Microbiology by S.S. Purohit.

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Session -2020-2021

Class/कक्षा	:	**M.Sc.**
Semester/सेमेस्टर	:	**Semester IV**
Subject/विषय	:	**Biotechnology**
Title of Subject Group	:	**Practical's II based on Elective Paper-II (Agriculture Microbiology)**

Suggested Practical Based on Theory Paper Elective Papers

Practicals

6. Isolation and Enumeration of the microorganism from soil by serial dilution agar plate method.
7. Isolation of fungi from soil by warcup's method.
8. Isolation of azotobacter species from soil.
9. Isolation of microorganism from rhizosphere.
10. Isolation of microorganism from phyllosphere (phyloplane) by serial dilution, agar plate method or leaf impression method.
11. Plant diseases – leaf curl of papaya, rust of wheat, citrus canker, red rot of sugarcane. Study of weeds- Parthenium, water hyacinth.

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Session -2020-2021

Class/कक्षा	:	**M.Sc.**
Semester/सेमेस्टर	:	**Semester IV**
Subject/विषय	:	**Biotechnology (Elective Paper- III)**
Title of Subject Group	:	**Dissertation for one Month**

DISSERTATION	Maximum Marks
A. Valuation	50
B. Viva Voce (EXTERNAL)	25
C. Viva Voce (INTERNAL)	25
Total	100

*** If the student selects Elective paper 3 along with Paper I, II & III in IVth semester of M.Sc. Final then he/she will be exempted to appear in Practical II of Semester IV**

Abhaudkar 6.2.2020

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