GOVT. DR. INDRAJEET SINGH COLLEGE, AKALTARA DISTT. JANJGIR-CHAMPA (C.G.)

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College Code- 3003

PROGRAMME OUTCOMES, PROGRAMME SPECIFIC OUTCOMES AND COURSE OUTCOMES

DEPARTMENT OF BOTANY

PROGRAM- BSc, BOTANY

Program Outcomes :

1. Knowledge and understanding about the plant diversity.
2. Practical skill in the field and laboratory experiments.
3. Presentation skills (oral & writing) in life sciences.
4. Scientific knowledge in life science and fundamental metabolism of plants.
5. Knowledge about the biodiversity exploration, estimation and conservation.

Program specific outcomes :

1. Stewardship responsibility.
2. Hands on expertise in biological sciences.
3. Entrepreneurship skill development.
4. Gain potential to get through competitive examinations.
5. Career opportunities and job opportunities.

PROGRAM- MSc, BOTANY

PROGRAM OUTCOME

PO1. Critical

Thinking: Think logically and organize tasks into a structured form. Understand the evolving state of knowledge in a rapidly developing field. Plan, Conduct and write a report on an independent term project.

PO2.

Practical skills:

Students learn to carry out practical work, in the field and in the laboratory, with minimal risk.

PO3.

Scientific knowledge: Apply the knowledge of basic science, life sciences and fundamental processes of plants to study and analyze any plant form.

PO4.

Social Interaction. Due to continuous field visits in the fields students interact with the social activities for their study.

PO5.

The Botanists and society: Apply reasoning informed by the contextual knowledge to assess plant diversity, its importance for society, health, safety, legal and environmental issues and the consequent responsibilities relevant to the biodiversity and conservation practice

PO6.

Ethics: The subject teaches students about the ethical approach, not to cut the plants.

PO7.

Environment and sustainability: Conservation practices are studied for sustainable development.

PO8.

Self-directed and Life-long learning: Each and every aspect of the syllabus teaches life- long learning.

PROGRAM SPECIFIC OUTCOME

PSO1. Understand occurrence, morphology, anatomy, reproduction and life cycles of lower group and higher group of plants.

PSO2. Identify affinities among different groups of plants.

PSO3. Gain the knowledge of evolution of plants.

PSO4. To get introduced with fossils, fossilization and some primitive plants.

PSO5. Understand different plant physiological processes i.e. photosynthesis, respiration, nitrogen metabolism, water absorption, mechanism of flowering, mineral nutrition, plant movements, etc.

PSO6. Understand the application of genetic engineering and plant tissue culture.

PSO7. Understand the basic concepts of ecology.

PSO8. To explore the plants of economic importance.

PSO9. Perform the laboratory techniques in anatomy, physiology, biochemistry, biotechnology, ecology and utilization of plants.

COURSE OUTCOME

SN	CLASS	PAPER	COURSE OUTCOME
1	BSc I	Ist: Bacteria, Viruses, Fungi, Lichens and Algae	On completion of this course students will be able ➢ To gain knowledge about microbial diversity. ➢ To understand about range of thallus structure of algae, fungi and lichen and their occurrence. ➢ To know about life cycles of different algal and fungal spp. ➢ To gain knowledge about economic importance of bacteria, viruses, algae, fungi and lichens.
2	BSc I	2nd: Bryophytes, Pteridophytes, Gymnosperms and Palaeobotany	➢ To understand about occurrence, structure and reproduction in bryophytes. ➢ To know the evolution of sporophytes in bryophytes. ➢ To gain knowledge about stellar evolution and seed formation habit in pteridophytes. ➢ To understand about occurrence, structure and life cycles of pteridophytes. ➢ To gain knowledge about distribution, structure and life cycles of gymnosperms. ➢ To know about economic importance of bryophytes, geological time scale, fossils and fossilization. pteridophytes and gymnosperms. ➢ To understand about geological time scale, fossils and fossilization.
3	BSc I	Practical	➢ To have the knowledge of study of morphology, anatomy of algae, fungi, bryophyte, gymnosperm. ➢ To know the technique of identification of plant disease symptoms. ➢ Gain knowledge of anatomy of some gymnosperms.
4	BSc II	Ist: Plant Taxonomy, Economic Botany, Plant Anatomy and embryology	➢ To know about Bentham and Hooker's system of Classification ➢ To understand about IUCN, Typification, numerical taxonomy chemotaxonomy, Herbaria and Botanical gardens. ➢ To gain knowledge about some important

			plant families. ➢ To explore the uses of plants as cereal, vegetable, oil, timber, spices, medicines, beverages, biodiesel plants. Also know about cultivation of important flowers and Ethnobotany of CG. ➢ To understand about plant root and stem structure, RAM, SAM organization, secondary growth and anatomical anomalies. ➢ To know the structure of a flower and its different parts. ➢ To get introduced to male and female gametophyte development, pollination, self-incompatibility, fertilization, endosperm and embryo development, polyembryony, apomixes and parthenocarpy.
5	BSc II	2nd Ecology and Plant Physiology	➢ To have knowledge of Ecology and its scope, understand different ecological factors, soil formation and soil profile. ➢ To understand Liebig's law of minimum, Shelford's law of tolerance, morphological and anatomical adaptations in hydrophytes, xerophytes and epiphytes. ➢ To know about population and community characterstics, population interactions. ➢ To understand about succession, ecotone, edge effect, ecotypes, ecads keystone species. ➢ To have knowledge of energy flow in ecosystem, food chain, food web and ecological pyramids and biogeochemical cycles. ➢ To understand osmosis, water absorption, mineral nutrition, transpiration photosynthesis and respiration. ➢ To gain knowledge of Plant growth hormone and mechanism of flowering. ➢ To know photoperiodism, vernalization, seed dormancy, germination and plant movement.
6	BSc II	Practical	➢ To get knowledge of study of some important plants in semi-technical language with their classification and identification.

			➢ To know about morphology and anatomy of root, stem, and leaves with the help of prepared slides. ➢ To know the structure of flower. To know the technique of study of ovules, placentation, embryo with the help of slides. ➢ To know about some experiments of osmosis, transpiration, photosynthesis, respiration. ➢ To have knowledge of studying of a community by quadrate method. ➢ To know about structure of ecosystem. ➢ Study of some economically important plants.
7	BSc III	Ist: Plant Physiology, Biochemistry and Biotechnology	➢ To understand osmosis, water absorption, mineral nutrition in plants. ➢ To have knowledge about photosynthesis and respiration. ➢ To gain knowledge of how light and temperature affects flowering in plants. ➢ To get introduced to the structure of phytochrome, cryptochrome and phototropin. ➢ To know the mechanism of nitrogen fixation in plants. ➢ To understand about different types of plant movements. ➢ To gain knowledge of mechanism of action of enzymes. ➢ To have knowledge about seed dormancy. ➢ To know the main techniques of genetic manipulation and plant tissue culture.
8	BSc III	2nd: Ecology and Utilization of plants	➢ To understand different ecological factors. ➢ To understand ecological relationship between organisms and their environment. ➢ To know about plant community and its development. ➢ To have knowledge of ecosystem, food chain, food web and ecological pyramids. ➢ To know about different biogeographical regions of India. ➢ To explore the uses of plants as cereal, vegetable, oil, timber, spices and medicines.

9	BSc III	PRACTICAL	➢ To know about some experiments of osmosis, transpiration, photosynthesis, respiration. ➢ To know the technique of identification of carbohydtraes, lipids and proteins. ➢ To have knowledge of studying of a community by quadrate method. ➢ To know about structure of ecosystem. ➢ Study of some economically important plants.
10	MSc I SEM.	Ist: Biology and Diversity of Virus, Bacteria and Fungi	On completion of this course students will be able to • Acquire the knowledge of history and development of Virology, Bacteriology and Mycology. • Develop an understanding of classification, nomenclature, distribution of microbes. • Understand the life cycle pattern and economic importance of microorganisms. • Learn the phylogeny and evolutionary concepts in lower group of organisms.
11	MSc I SEM.	2nd: Biology and Diversity of Algae, Bryophytes and Pteridophytes	• Acquire the knowledge of history and development of Phycology and Bryology. • Learn about the occurrence, distribution, structure and life history of lower plants. • Gain adequate knowledge of evolutionary concepts in Algae, Bryophytes and Pteridophytes. • Acquire knowledge of life cycle patterns and economic importance of Algae, Bryophytes and Pteridophytes.
12	MSc I SEM.	3rd: Cell and Molecular Biology of Plants	• It brings fundamental concepts as well as recent developments of cell structure and ultrastructure of organelles. • Acquire the knowledge about mechanism of translation, DNA replication,NDNA damage and repair, splicing of mRNA. • Understand about cytoskeleton, flagellar and other movements. • Get knowledge about mitosis and meiosis,

			cyclins and PCD.
13	MSc I SEM.	4th: Taxonomy of Angiosperms	• Prepare the botanical excursion report. • Understand classical and modern system of classification. • Acquire knowledge on molecular tools for classification. • Impart knowledge on taxonomic evidences. • Acquire knowledge about Plant conservation, sustainable utilization of bioresource and ecosystem research. • Know about endemism, hot spots and local plant diversity.
14	MSc I SEM.	Lab-1: Based on Paper I&II	• Identify cyanobacteria and algae. • Prepare and identify the fungal culture. • Know the symptoms of diseased specimens. • Identify Bryophytes and Pteridophytes.
15	MSc I SEM.	Lab-2: Based on Paper III&IV	• Know the technique of isolation of DNA, preparation of Karyotype. • Study of different stages of mitosis. • Obtained skill to identify the plants according to the rules. • Know the technique of preparation of Herbarium sheets. • Know about similarity coefficient and preparation of dendrograms. • Know the economic importance of plants.
16	MSc II SEM.	Ist: Cytology, Genetics and Cytogenetics	• To gain knowledge about DNA packeging. • To understand about structural and numerical Alter ations in chromosomes. • To know about mapping, genetic recombination in phages and bacteria. • To gain knowledge about gene structure. • Understand about mutation, transposable elements, oncogenes. • To understand about cytogenetics of aneuploids and heterozygotes, C value paradox, alien gene

			transfer.
17	MSc II SEM.	2nd: Biology and Diversity of Gymnosperm species	• To know about evolution of Gymnosperm and their characteristics. • To understand about classification and distribution of Gymnosperm. • To get acquainted with comparative study of Cycadeoidales, Cordaitales, Cycadales, Ginkgoales. • To know about comparative structure and reproduction in Cycadales, Ginkgoales, Coniferales, Ephedrales, Welwitschia and Gnetales.
18	MSc II SEM.	3rd: Plant Physiology	• To get knowledge about Plant-water relations, nutrient uptake, phloem loading and unloading. • To understand about nodule formation, nitrogen fixation, sulphate uptake and assimilation. • To get knowledge of mechanism of Photosynthesis. • To know about different biotic and abiotic stresses.
19	MSC II SEM.	4th: Plant Biochemistry and Bioenergetics	• To get knowledge of thermodynamic principles, structure and function of ATP. • To learn about plant respiration and lipid metabolism. • To know about enzyme action, its regulation and kinetics of enzyme catalysis. • To study about photomorphogenesis and phytochromes, cryptochromes, signaling and gene expression. • To know about physiological effects, signal transduction and gene expression of different plant hormones. • Study about photoperiodism, genetic and molecular analysis of floral induction and vernalization.
20	MSc II SEM.	Lab-1: Based on	• To know the technique of chromosome banding. • Study of effect of monosomy and trisomy on

		Paper I&II	phenotype of plants. • To know the technique of induction of polyploidy. • Gain skill about isolation of DNA and their estimation. • Comparative study of different gymnosperms. • Collection of various Gymnospermic plant material.
21	MSc II SEM.	Lab-2: Based on Paper III&IV	• Know the technique of measurement of catalytic activity of catalase and diastase. • Gain skill to determine R.Q. of different respiratory substrates. • Know the technique of separation of protein by PAGE. • Study of the effects of differernt factors on seed dormancy. • Study of Phototropic and Geotropic movements. • Know the technique of plasmolysis and deplasmolysis. • Study about transpiration. • Know the technique of extraction of chloroplast pigment and their separation. • Preparation of absorption spectrum of chlorophyll a. • To know the technique of colorimetry, spectrometry and fluorimetry.
22	MSc III SEM.	Ist: Plant Development	• To get knowledge about important features of plant development. • To know different aspects of seed germination and seedling growth. • Study of organization of SAM, control of differentiation of tissues and wood development. • To know about organization of RAM, vascular tissue differentiation and rootmicrobe interaction. • Understand about phyllotaxy, control of leaf formation.

			• Study of origin, structure and differentiation of different plant tissues. • To gain knowledge of secondary growth and abnormal secondary growth in various plants.
23	MSc III SEM.	2nd: Plant Reproduction	• To know about flower structure and genetics of floral organ differentiation. • Study of microspore and development of male gametophyte. • Understand about megasporogenesis, organization of female gametophytes, GSI and SSI, fertilization. • Know about embryogenesis, endosperm development, storage proteins, dynamics of fruit growth. • Understand about PCD, senescence.
24	MSc III SEM.	3rd: Plant Ecology	• Gain knowledge of different types of climatic, edaphic, biotic factors and their interrelationships. • To know about primary production in ecosystem, energy flow, trophic organization, litter fall and decomposition, different biogeochemical cycles. • Study of different biomes and vegetation of the world, analytical and synthetic characteristics of a community, ordination, concept of ecological niche. • Study of air, water and soil pollution and Climate change. • To know about resistance, resilience, ecological perturbations, EIA and ecosystem restoration, ecological management.
25	MSc III SEM.	4th: Plant Pathology	• Study of history of plant pathology, its development and trends in 21st century. • Understand about parasitic and non-parasitic diseases. • To know about parasitic ability and virulence, mode of infection.

			• Understand about role of enzymes in pathogenesis, resistance and susceptibility, phytoalexins.
26	MSc III SEM.	Lab-1: Based on Paper I&II	• To study the effect of different factors on seed germination and seedling growth. • Gain knowledge of SAM, phyllotaxy and internal structure of leaves. • Study of whole root and internal structure of roots. • Study of different types of tissues and secondary growth. • To know the technique of study of microspore, microsporogenesis, megaspors, megasporogenesis, pollen viability, pollen germination, pollen tube growth. • Field study of different types of pollination mechanism. • Study of emasculation, and isolation of embryos at different stages.
27	MSc III	Lab-2: Based on Paper III&IV	• Understand to calculate mean, variance, standard deviation, standard error, coefficient of variation and ttest. • To know about community characteristics by quadrate method. • Gain skill of determination of productivity of ecosystem. • To know the technique of determination of organic matter. • To know about calibration of microscope. • Gain skill of determination of dimensions of microbes and their isolation on media. • Study of symptoms of plant diseases, effects of various biopesticides and artificial pathogenesis.
28	MSc IV SEM.	Ist: Plant Cell, Tissue and Organ Culture	• To understand about basic concepts and scope of Biotechnology. • To get acquainted with cellular differentiation, totipotency, organogenesis and adventive

			embryogenesis. • To understand about somatic hybridization, artificial seed, protoplast fusion, production of secondary metabolites, cryopreservation.
29	MSc IV SEM.	2nd: Plant Resource Utilization and Conservation	• To gain knowledge of biodiversity of ecosystem, IUCN categories of threats, hot spots, utilization of plants. • To gate acquainted with world centers of primary diversity of domesticated Plants. • Understand about origin, evolution, botany, cultivation and uses of some important plants. • To have knowledge of *in situ* and *ex situ* conservation, B BSI, NBPGR, ICAR, CSIR, DBT.
30	MSc IV SEM.	3rd: Genetic Engineering of Plants and Microbes and Biostatistics	• To understand about gene cloning, DNA synthesis and sequencing, PCR, DNA fingerprinting. • To have knowledge of strategies for development of transgenics, *Agrobacterium*, gene tagging, chloroplast transformation, IPR, ecological risk. • Understand about bacterial transformation, selection of recombinants, nitrogen fixer's, fermentation technology. • To have knowledge of mapping of genes, molecular markers, genome projects, bioinformatics, microarrays and protein profiling. • To understand about dispersion, standard deviation, standard error, comparison of data by chisquare test.
31	MSc IV SEM.	4th: Plant Pathology-II	• To get knowledge of effect of environment on disease development. • Regulatory, chemical, biological and breeding for disease resistant varieties. • Crop loss estimate and recommended control for important plant diseases caused by bacteria, viruses, mycoplasma and nematodes.
32	MSc IV	Lab-1: Based	• To know the technique of preparation of Tissue

	SEM	on Paper I&II	Culture medium and method of transfer of explants on culture media. • Study of isolation of protoplast. • Initiation of organogenesis and embryogenesis using appropriate explants. • Study of some economically important plants. • To have knowledge of herbarium, field survey and scientific visit to a protected area.
33	MSc IV SEM.	Lab-2: Based on Paper III&IV	• Study of bacterial culture media. • To know the technique of isolation of total DNA and plasmid DNA. • Isolation of Rhizobium and Agrobacterium from plant. • Study of various bacterial/ fungal plant pathogens. • To know about antibiosis. • To gain skill of technique of isolation of cellulose.