MAHARAJA GANGA SINGH UNIVERSITY
BIKANER (RAJ.)

SYLLABUS

SCHEME OF EXAMINATION AND COURSES OF STUDY

FACULTY OF SCIENCE

M.Phil. BOTANY

2022-23

M.G.S. University, Bikaner

M. Phil. (Botany) Syllabus -2022-23

General: There will be four papers in all. Paper I will be Compulsory paper on basic research methodology and instrumentation. Paper II and III will be selected by the candidate from any of the following groups.

Paper I, II and III shall carry maximum 100 marks.

Group A	Paper II	Biotechnology-I
	Paper III	Biotechnology-II
Group B :	Paper ll	Plant Physiology-I
	Paper III	Plant Physiology-II
Group C :	Paper II	Environment Biology-I
	Paper III	Environment Biology-II
Group D :	Paper ll	Phytopathology - I
	Paper III	Phytopathology – II
Group E :	Paper II	Pollution Ecology-I
	Paper III	Pollution Ecology-II
Group F :	Paper II	Ecology & Environment Biology-I
	Paper III	Ecology & Environment Biology-II
Group G :	Paper II	Molecular Biology & Microbiology-I
	Paper III	Molecular Biology & Microbiology-II
Group H :	Paper II	Bryology & Pteriodology Advance Morphology
	Paper III	Bryology & Pteriodology Recent Researches

Paper IV Dissertation (related to paper II or III) shall carry 100 Marks

Note:-At least 40% marks in each paper separately with minimum of 50% marks in aggregates for all the papers prescribed for the examination.

PAPER I - BASIC RESEARCH IN METHODOLOGY AND INSTRUMENTATION

Time: 3 **Max. Marks: 100** **Min. Marks: 40**

Note: Eight questions will be set by the examiner. The candidate will be required to answer any four questions.

1. Microscopy - Light, dark field, phase contrast, Fluorescent, Transmission and scanning electron microscopy.
2. Photography - Micro, Macro, time lapse and Vediophotography.
3. Molecular biological techniques - Southern. Northern and Western blotting, PCR, RELP and RAPD, electrophoresis.
4. Chromatography - Paper, TLC, HPLC, GLC.
5. Histological, Histochemical and Cytological techniques.
6. Herbarium techniques and characteristic survey.
7. Plant tissue culture techniques.
8. Microbial culture techniques.
9. Colorimetry and Spectrophotometry.

GROUP-A - PAPER II - BIOTECHNOLOGY-I

Time: 3 hours **Max. Marks: 100** **Min. Marks: 40**

Note: Eight questions will be set out of which candidate will answer any four questions.

1. Cell and tissue culture media, initiation of aseptic culture, cellular totipotency polarity, organogenesis and somatic embryogenesis.
2. Haploid production: Androgenesis (Anther and pollen culture, application in plant breeding).
3. In vitro clonal propagation (Micro propagation): techniques, merits & demerits, automation in microporopagation.
4. Protoplast isolation, culture and fusion. Selection of hybrid cells, Hybridization and Hybridization. Transfer of cytoplasmic male sterility using protoplast fusion methods. .

5 Tissue culture as a source of genetic variability somaclonal and gametoclonal variations, Selection, sources and causes of variations. Applications in crop improvement.

GROUP-A -PAPER III - BIOTECHNOLOGY-II

Time: 3 hours **Max. marks: 100** **Min. Marks: 40**

Note: Eight questions will be set out of which candidate will answer any four questions.

1. Genetic engineering: Techniques for the insertion for the insertion of foreign genes into plant cells, transplasma and vector.
2. Transgenic plants: Production, Roll of transgenic plants in crop improvement, gene silencing, environmental considerations for release of transgenic plants.
3. Molecular biology of nitrogen fixation and other genes involved in nitrogen fixation. Genetic manipulation of nitrogen fixation in legumes and non legumes.
4. Morpholigical, physiological and bio-chemical characteristic of micro organisms used in biotechnology, characteristic of microorganism used in biotechnology such as *Aspergillus, E.coil, Agrobacterium, Rhizobium, Bacillus, Saccharomyces, Spirulina, Streptomyces.*
5. Plant cell culture for the production of useful chemicals, pigments, flavonoids, insecticides and other secondary products. Isolation and characterization of mutant cell lines, auxotrophs. disease resistant cell lines, herbicide resistance.

GROUP-B- PAPER II - PLANT PHYSIOLOGY-I

Time. 3 hour: **Max. Marks: 100** **Min. Marks: 40**

Note: Eight questions will be set by the examiner. Candidates will answer any four questions.

1. Water relations: Cell water relations in classical and thermodynamic terms.
   Stomatal physiology and concept of stomata as physiological tool.
2. Stress Physiology: Plant Physiology in relation to heat, low temperature, water, salt and chemical stress.
3. Bioenergetics: Enthrophy, entropy, Free energy, activation energy, Exo Endothemic reactions, Equilibrium constant, energy right bonds, Redox potential.
4. Electron transport system : in relation to Photosynthesis and Respiration
   a. Photoelectron system in chloroplast.
   b. Respiratory chain in mitochondria.
   c. Biochemistry of ATP synthesis.
5. Growth Physiology: Mechanism of action of plant growth regulators.
   Hormone sensitivity concept, Growth inhibitors, Role of PGR's in forestry, Horticulture and Agriculture. Interaction of PGR's in relation to obsession and senescence.

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GROUP-B-PAPER III - PLANT PHYSIOLOGY - II

Time: 3 hours **Max. Marks: 100** **Min. Marks: 40**

Note: Eight questions will be set by the examiner. Candidates will answer any four questions.

1. Nitrogen metabolism: Nitrogen fixation. Chemistry and synthesis of amino acids and proteins.
2. Carbon: Pathways C3, C4 and C A 1 and their significance.
3. Regulation of alkaloid production in plant tissue cultures. Introduction, biosynthesis, Enzymes involved in biosynthesis accumulation, factors influencing the alkaloid content (with special reference to Tropane and Indole alkaloids).
4. Steroidal Sapogenins: Structure, biosynthesis and role of steriodal sapogenins with special reference to researches conducted in plant tissue culture.
5. Application of tissue culture :
   (a) Production of secondary metabolites (with special reference to hairy root culture and elicitation).
   (b) In Agriculture, forestry, horticulture pharmacological industries.
   (c) Somaclonal Variations.

GROUP-C-PAPER ll - ENVIRONMENT BIOLOGY- I

Time: 3 hours **Max. Marks: 100** **Min. Marks: 40**

Note: Eight questions will be set by the examiner; Candidates will answer any four questions.

1. Ecosystem management, biological diversity in desert ecosystem, Implementation of ecosystem in the natural resources science, Natural resources of Rajasthan, Lignites, Gypsum. Multani mitti, Salt, Copper, Mica and Zinc (occurrence, importance and origin).
2. Concept of genecological differentiation and adaptation, genetic model for range extension. Types of ecotypic variations.
3. Pollution hazards - Air, water, land and noise pollution, (causes and control) Green house effect, Global warming, CFC, Ozone depletion, Radiation and human diseases.
4. Pesticides and Herbicides - Uses and impact on Agroecosystem, salinization as an ecological problem and remedial measures.
5. Ecotechnology (Ecological engineering) valuation of life supporting environmental systems. Concept of energy rich plants, Desert plants yielding fuel, wax, gum, sazzi, alcohol,

Hydrocarbons.

6. Petroleum and allied products, and alterative energy resources. Energy crises, causes and remedies.

GROUP-C- PAPER III- ENVIRONMENT BIOLOGY -II

Time: 3 hours **Max .Marks:100** **Min. Marks: 40**

Note: Eight questions will be set by the examiner; Candidates will answer any four questions.

1. Environmental conservation for development and restoration of degraded environment.
2. Desert management multidisciplinary approach, IGN and its impact on soil and vegetational development activities.
3. Screening of Desert Flora - Identification of fast growing taxa for biomass production. Red Data Book, Green Book. Threatened plants of Rajasthan, Biosphere Reserves. Sancturies and National Parks.
4. Changing crop patterns in Arid /Semiarid zones of Rajasthan, Its impact on human society. Desert ethnobotany, waste and reclamational uraban land as resource.
5. Recent trends in linking the natural environment and economical ecological consequences of long term landscape. Transformation in relation to energy use and economic development.
6. Environmental awareness, perceptions and attitudes and public participation. The socio economic environment.
7. Allelopathy - General account with special reference to desert plants.

GROUP- D - PAPER II- PHYTOPATHOLOGY -I

Time: 3 h **Max. Marks: 100** **Min. Marks: 40**

Note: Eight questions will be set by the examiner, Candidates will answer any four

Question, Nature, concept and importance of plant disease.

2. History of PIant pathology and its modern trends, plant pathology in India and role if plant pathology in Indian Agriculture.
3. Pathogenesis: penetration and entry of plant pathogens and development of pathogenesis inside host tissues.
4. Epiphytotics: The spread of pathogens within crop areas. The factors which influence the dissemination of pathogens within crop & areas and phyllosphere relation to seed pathology.
5. Disease forcasting and remote sensing.
6. Enzymes and Toxins in plant diseases.

7. Plant disease control: Physical, chemical, biological, quarantine. Plant disease resistance and breeding of resistant varieties, role of biotechnology with special reference to plant pathology.
8. Techniques of isolation, purification of plant pathogens including biotrophic parasites culture testing efficacy of fungicides.
9. Disease appraise and estimation of crop loss due to plant disease. Disease intensity and crop loss relationship.

GROUP - D-PAPER III - PHYTOPATHOLOGY – II

Time: 3 hours Max. Marks: 100 Min. Marks: 40

Note: Eight questions will be set by the examiner; Candidates will answer any four questions.

1. Classification of Plant diseases.
2. Symptomatology : Description of symptoms of fungal, bacterial and viral diseases, Identification of plant diseases.
3. General account of disease with special reference to symptoms casual organism, disease cycles and control, measures of the following diseases : Smuts - Loose smuts of wheat, Covered smut of Barley, Whip smut of Sugar cane, Flag smut of Wheat, Blunt of Wheat, Rust -wheat rust, linseed rust, Wilt-- Flax, Gram, Pigeon pea, Cotton Downy mildew--Maize, Bajra, Grape seed, Opium. Powdery Mildew of grapes, wheat and cucurbits, blast of rice, *Helminthosporium* early blight and Late blight of potato; Tikka disease of ground nut, Red rot of sugarcane, ergot of bajra, anthracnose of Pomegranates.
4. General account of bacterial diseases : Fire blight of stone fruits, Tundu disease of Wheat, Crown gall disease of guar; leaf spot of cotton, soft rot of vegetables, Bacterial blight of rice, Brown rot and ring rot of potato.
5. Classification, morphology, physiology and nature of viruses. Transmission of virus diseases. Disease causes by Mycoplasma. Virus diseases of potato caused by PVX and PVY, Mosaic disease of tomato and cucumber, Tobaconecrosis, Buchy top of Banana, Yellow vein disease of bhindi, Grassy shoot of sugarcane, Sessamum phyllody, spike of sandal, witches broom of legumes.
6. Anatomy and classification of plant parasitic nematodes. Disease caused by nematodes - Root Knots, Molaya disease and ear cockle of wheat.
7. Classification and anatomy of insect induced gall. Physiology and biochemistry of insect galls formation. Study of some insect induced galls, Co*rdia, Ficus, Pongamia :* leaf gall,

Ziziphus, Prospopis stem galls.

8. Deficiency diseases: Khera disease of Peddy. Diseases due to nitrogen boron deficiency. Air ties in plants. Impact of air pollution induced foliar abnormalities in plants. Impact of air pollutants on phyloplane micro flora and disease development.

GROUP - E - PAPER II - POLLUTION ECOLOGY -I

Time: 3 hours **Max. Marks: 100** **Min. Marks: 40**

Note: Eight questions will be set by the examiner; Candidates will answer any four questions.

1. Global and regional environmental issues: Environmental priorities in India with particular reference to Rajasthan.
2. Global warming Causes-Carbon dioxide, methane, chlorofluoro carbons and halogens, nitrous oxide; Deforestation, consequences; Montreal Protocol; Role of NGO's and consumers.
3. Acid rain; Emission of sulphur dioxide and nitrous oxides. Transnational menace of acid rains. Chemistry of acid rain; consequences; and control.
4. Oil pollution; Oil seepages, leakages, tanker spills, fate of spilled oil; physical and biological effects of Oil pollution; control of oil pollution.
5. Desertification; Land degradation; Global programme of action stabilization of sand dunes. Environmental policy postulates; taxes, subsidies, incentive allowances eruption from tax to capital gains, rebate of cess levied on consumption of water, zero risk and Zero discharge; Emission trading policies and rights.
7. Environmental economics; GNP and ENP concepts.
8. Environmental politics; concept of global environmental democracy.
9. Environment and trade; the study state paradigm and free trade: GATT. TRIP'S, TRIMS, Patents; Trade Secrets; Copy right Trade Marks; Impact of trade on environment and vice-versa; Environmental dumping pollution havens, harmonizations, Ecolabelling.
10. Poverty and environment, Illiteracy; poverty of resources, Poverty in habitat. Poverty eradication.
11. Tourism and environment, benefits of tourism; General : effects on the environment benefits of tourism; General effects on the environment.
12. War and environment conventional nuclear, chemical and biological Warfare's threat; environmental security war and its alternatives; Bringing Justice by force; Replacing the law of jungle.

13. Environmental education; Environmental attitudes, Environmental perception; Environmental ethics.

GROUP -E- PAPER III - POLLUTION ECOLOGY II

Time : 3 hours **Max. Marks: 100** **Min. Marks :40**

Note : Eight questions will be set by the examiner. Candidates will answer any four questions.

1. Global and regional environmental hot-spots with particular reference to ecological imbalance. Environmental degradation and socio-economic contraints.
2. Air pollution. Air quality-causes of pollution, sources of pollution. Meterological aspects of air pollution. Impact of air pollution on plants, animals, man, environment, Indicator/susceptible species. Air pollution, tolerance index. Control and abatement of air pollution.
3. Water pollution: Water quality, sources of water pollution, water pollution facts and fantasics. Impact of water pollution. Control and treatment of water pollution.
4. Noise pollution. Sources of noise. Perception of noise, Audiological, biological and behavioural effects of noise. Noise pollution control and abatement.
5. Soil pollution: Sources and causes of soil pollution, Subsequent ecological effects of soil-pollution.
6. Pesticide and heavy metal pollution: Sources, mechanism and effects of these substances increasing pollution in the environment. The concept of bioaccumulation and biomagnification and examples of food chain, poisoning: Ecological and economic effects of the pollutions.
7. Radioactive pollution : General idea about source and effects.
8. Environmental management: Legislation and awareness with references to pollution problems, Environmental legislation significance and perspective impact of India's constitutional provisions. Pollution control and environment protection acts. Environmental awareness: Lessons from our ancient culture and heritage. Formal and informal education. Chipko movement past and present.
9. Environment monitoring and methodology: Monitoring or pollutants and pollution load Sampling methods Analysis methods for air, water and soil pollution. Data collection systems analysis and methods in controlling and predicting the pollution problem

GROUP - F - PAPER II - ECOLOGY AND ENVIRONMENTAL BIOLOGY-I

Time: 3 hours **Max. Marks: 100** **Min. Marks: 40**

Note: Eight questions will be set by the examiner. Candidates will answer any four questions.

1. Recent developments in ecosystem concept. Stability of ecosystem, Homeostasis - Biodemographic and biogeochemical regulation. Mc Arthour's stability index, Ecosystem maturation, patterns of change in maturity.
2. System Ecology: Mathematical tools in model building. Ecosystem analysis and criteria for developing a system model. Ecological data analysis by use of computers with-reference to Excel software.
3. Ecological variation and plant diversity. Environmental heterogeneity. Plant response on environmental gradients. Gynecological differentiation, evolutionary entitles and species population analysis. Genetic model for range extensions.
4. Ecology of stress conditions: Fluoride and salts, Current researches on inland salt marshes. Ecophysiological adaptation and production potential of plant under salt stress conditions, Traditional and potential utilization of halophytes.
5. Agro ecosystem: Pesticides as ecological problem. Biomagnifications, Fertilization aspects in tropical agriculture. Fertilizer use in dry soil and salt affected soils, Fertilizers and resistanceto stress conditions. Biofertilizers.
6. Stabilization of desert, land use patterns in semi - arids. Screening of desert flora for identification of fast growing taxa. Threatened and fast depleting taxa of Rajasthan desert.

GROUP - F- PAPER III- ECOLOGY AND ENVIRONMENTAL BIOLOGY - II

Time: 3 hours **Max. Marks: 100** **Min. Marks: 40**

Note: Eight questions will be set by the examiner; Candidates will answer any four questions.

1. Plant invasion in the tropics with particular reference to Indian subcontinant. Strategies and effect of invaders colonizing species and their recruitment. Allien'plant invaders of tropical fresh waters their ecological consequences.
2. Ecological disturbances, mining operations and its impact on vegetation.Revegetation of disturbed Lands. Nature of disturbances and population response. Species characteristics to disturbances, Reclamation of disturbed soils, suitable species for revegetation.
3. Researches on patterns of primary production and energy flow pathways in forest, forest depletion and their conservation. Bio-diversity and its relevance, Micropropagation and tissue culture in tree species

4. Biomass Production, bioenergy, Biogas from waste water, Microbial degradation. Use of micro organisms in pollution control. Biomonitoring of waste toxins. Global energy crisis, alternative sources of energy.
5. Global climatic changes: Air pollutants critaria and non criteria (conventional and unconventional) Pollutants zone depletion, green house effect. Acid rains, Indoor pollution, effect of air pollution and modern control technologies.

6. Degradation of fresh water bodies with special reference to Rajasthan. Eutrophication Biodynainic changes due to sewage waste disposal in water bodies. Hazardous chemical flate of toxins. Minimizing toxic effects. Toxicity measurement and toxicity rating, RiskAssessment.

GROUP-G-PAPER II- MOLECULAR BIOLOGY AND MICROBIOLOGY - I

Time: 3 hours **Max. Marks: 100** **Min. Marks: 40**

Note: Eight questions will be set by the examiner. Candidates will answer any four questions.

1. Genetic transfer process occurring in bacteria and bacteriophages conjugation, sexduction,transformation transduction.
2. The F Plasmids, functions encoded on F plasmids, interactions of the F plasmids with the bacterial geneophore and their genetic analysis.
3. Repair and recombination of DNA molecule.
4. Gene splicing the production of artificial DNA constructs.
5. Effects of chemical and physical mutagens on chromosomes and nucleic acids.
6. Experimental mutagenesis in higher plants. Role of induced mutation in agriculture.

GROUP-G-PAPER III - MOLECULAR BIOLOGY AND MICROBIOLOGY - II

Time: 3 hours **Max. Marks: 100** **Min. Marks: 40**

Note: Eight questions will be set by the examiner; Candidates will answer any four questions.

1. Practical use of bacterial genetics Bacteria as degraders in synthesis of needed biochemicals. Bacteria as testing agents for carcinogens and mutagens. Bacterial utilization for production of non conventional energy.

2. Microbiology of food; Micro-organisms important in food microbiology. Principle of food preservation and spoil food and enzymes production by micro-organisms.
3. Microbiology of water. Aquatic environment, water pollution due to microbes. Sewage disposal and potable water supplies.
4. Microbiology of soil; Decomposition of organic matter, carbon and nitrogen cycle, nitrogen fixation. Interaction among soil mico-organism. Rhizobium and soil fertility interaction in semi arid region of Thar desert.
5. Principals of immunology: Immunoglobulus, antigens, antibodies, antigen antibody reaction method, hypersensitivity.

GROUP- H -PAPER II- BRYOLOGY AND PTERIDOLOGY – I (ADVANCE ORPHOLOGY)

Time: 3 hour Max. Marks; 100 Min. Marks: 40

Note: Eight questions will be set by the examiner; Candidates will answer any four questions.

1. Adaptations for land habit.
2. Distribution patterns of Bryophytes and Pteridophytes in India with special reference to Rajasthan geographic consideration.
3. Evolution and specialization of gametophyte and sporophytic generations.
4. Spore morphology, spore germination, gametophyte types in Bryopytes and Pteridophytes. Evolutionary tendencies in the sporophytic generations

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GROUP-H-PAPER-III-BRYOLOGY AND PTERIDOLOGY-II (RECENT RESEARCHES)

Time: 3 hours Max. Marks: 100 Min. Marks: 40

Note: Eight Questions will be set by the examiner; Candidates will answer any four qeustions.

1. Regeneration studies and perennation mechanisms.
2. Methods of propagation. .
3. Ecology of Bryophyte and Pteridophytic flora.
4. Cytological studies in Bryophytes and Pteridophytes.
5. Recent research trends in Bryophytes and Pteridophytes.
6. Physiology, morphogenesis and culture of Bryophytes and Pteridophytes.