

Ph.D. Course Work 2012

Sub : Botany

Important points to be noted:

- ❖ Duration of Course Work : One Semester (6 Months)
- ❖ Total Marks : 200 (Four papers 50 Marks Each)
- ❖ Passing marks will be: 40 %.
- ❖ Duration of Examination: 2 Hrs. for each paper
 - Paper I:** Research Methodology : 50 Marks
 - Paper II:** Subject paper -I : 50 Marks
 - Paper III :** Subject paper – II : 50 Marks
 - Paper IV:** Review of literature : 50 Marks

Subject Course Work: 100 Marks (2 Hrs.)

- ❖ Examination will be held at the end of the Semester.
- ❖ Total Lecture Hour (periods) for Paper II (elective units): 60 (sixty).

Scheme of Examination of Pre-Ph.D. (Course Work) Examination

Paper No.	Nomenclature of the Paper	Internal Assessment	Theory (Written Exam)	Max. Marks	Lectures (One hour per lecture)
Paper I	Research Methodology	-	50	50	42
Paper II (Subject)	Paper I of selected group(A/B/C/D/E)	-	50	50	25
Paper III (Subject)	Paper II of selected group (A/B/C/D/E)	-	50	50	25
Paper IV	Review of Literature	50	-	50	60

Elective Groups for subject papers –(Candidate have to select one group from the followings-)

Group - A

- Paper – I - Plant Ecology –I
- Paper – II - Plant Ecology –II

OR

Group - B

- Paper – I - Plant Molecular Biology and Biotechnology-I
- Paper – II - Plant Molecular Biology and Biotechnology-II

OR

Group - C

- Paper – I - Plant Microbe Interaction – I
- Paper – II - Plant Microbe Interaction – II

OR

Group – D

- Paper – I - Biological Nitrogen Fixation- I
- Paper – II - Biological Nitrogen Fixation- II

OR

Group - E

- Paper – I - Stress Biology –I
- Paper – II - Stress Biology –II

Paper No.	Nomenclature of the Paper	Internal Assessment	Theory (Written Exam)	Max. Marks	Lectures (One hour per lecture)
Paper I	Research Methodology	-	50	50	42

Paper-I – Research Methodology

Unit - 1

1. **Introduction to Research Methodology:** Meaning, Objectives, Significance, Types
2. **Research Problem:** Definition, testing and procedures

Unit-2

1. **Hypothesis:** Definition, testing and procedures
2. **Research Design/Plan:** Meaning, need and features, Basic principle of experimental signs

Unit-3

1. **Data collection/data analysis:** Tools for data collection
2. **Statistical Applications:** Mean, Median, Mode, Mean Deviation & Standard deviation, Correlation and Regression, Probability distributions ,chi square test, z test, t test, two sample t test, paired-t test

Unit- 4

1. **Report Writing:** Types of Reports, Research Report Format, Referencing, Bibliography, Appendices
2. **Computer Applications:** Fundamentals of Computers, Operating systems, use of software (MS-Office, SPSS)

Unit-5

1. **Safety and safety measures:** Introduction, safety of individuals/laboratory/community/environment
2. **Code of Ethics/ethics of research/good laboratory practices:** IPR and record keeping/archives

References:

1. Methodology of Research in Social Sciences by O. R. Krishnaswamy and M. Rangnatham Himalaya publication House, 2005, ISBN: 8184880936
2. Research Methodology: Methods and Techniques by C. R. Kothari, New Age International Publishers, ISBN:81-224-1522-9
3. Statistical Methods for Research Workers by Fisher R. A., Cosmo Publications, New Delhi ISBN:81-307-0128-6
4. Design and Analysis of Experiments by Montgomery D.C. (2001), John Wiley, ISBN: 0471260088
5. SPSS online manual
6. MINITAB online manual

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Paper II (Subject)	Paper I of selected group(A/B/C/D/E)	-	50	50	25

PAPER II

Plant Ecology

Unit I-

1. Vegetation analysis tools and ordination.
2. Species association in natural conditions.

Unit II

1. Population measures, growth rate and carrying capacity quantifications

Unit III

1. Ecosystem analysis and quantification parameters to measure rate of transfer system budgeting, efficiencies and stability.

Unit IV

1. Edaphic parameters and their measurements.

Unit V

1. Ecology of Indian desert.
2. Balance Types; Electric and Electronic Balance

Paper No.	Nomenclature of the Paper	Internal Assessment	Theory (Written Exam)	Max. Marks	Lectures (One hour per lecture)
Paper III (Subject)	Paper II of selected group (A/B/C/D/E)	-	50	50	25

PAPER III

Plant Ecology

Unit I-

1. Pollution assessments and management techniques .

Unit II

1. Biodiversity estimates and conservation practices

Unit III

1. Agro ecological techniques.

Unit IV

1. Natural resources assessment and monitoring at village level.

Unit V

1. Nursery preparation and seedling assessments.
2. Landscape assessment and its application.

Paper No.	Nomenclature of the Paper	Internal Assessment	Theory (Written Exam)	Max. Marks	Lectures (One hour per lecture)
Paper II (Subject)	Paper I of selected group(A/B/C/D/E)	-	50	50	25

PAPER II

Plant Molecular Biology and Biotechnology Tools and Techniques

Unit I-

1. Microscopes
2. Centrifuge
3. Spectrophotometer/Spectrofluorimetry

Unit II

1. Chromatography
2. Electrophoresis
3. Gel-Documentation system

Unit III

1. PCR/RT-PCR
2. Proteomics/Microarray/Liquid handling devices

Unit IV

1. Basic of Bioinformatics
2. Autoclave/Laminar Air Flow Bench/Bio-safety Hood

Unit V

1. Growth/Culture Room.
2. Green House/Hardening Facilities.

Paper No.	Nomenclature of the Paper	Internal Assessment	Theory (Written Exam)	Max. Marks	Lectures (One hour per lecture)
Paper III (Subject)	Paper II of selected group (A/B/C/D/E)	-	50	50	25

PAPER III

Plant Molecular Biology and Biotechnology-Experimentation

Unit I-

1. Specimen preparation for microscopic observation

Unit II

1. Extraction, purification and quantitative/qualitative analysis of proteins and DNA/RNA hybridization

Unit III

1. Amplification of DNA/cDNA
2. Culture media preparation and sterilization

Unit IV

1. Explant selection, surface sterilization
2. Induction, multiplication and maintenance of cultures

Unit V

1. In vitro and ex vitro rooting.
2. Hardening/acclimatization of plantlets.

Paper No.	Nomenclature of the Paper	Internal Assessment	Theory (Written Exam)	Max. Marks	Lectures (One hour per lecture)
Paper II (Subject)	Paper I of selected group(A/B/C/D/E)	-	50	50	25

PAPER II

Plant Microbe Interaction - I

Unit I-

An overview of plant pathology.

Unit II

Plant disease definition, mode of infection of plant pathogens, disease symptoms.

Unit III

Disease cycles and plant disease diagnosis including principles (Koch's postulates)

Unit IV

Introduction to mycology, terms and classification

Unit V

Fungal and bacterial pathogens: Characteristics, classification, identification and disease they cause.

Paper No.	Nomenclature of the Paper	Internal Assessment	Theory (Written Exam)	Max. Marks	Lectures (One hour per lecture)
Paper III (Subject)	Paper II of selected group (A/B/C/D/E)	-	50	50	25

PAPER III

Plant Microbe Interaction - II

Unit I-

Introduction to microbiology: History, Classification.

Unit II

Aseptic techniques (physical, Chemical methods)- isolation and pure culture.

Unit III

Techniques – staining (Simple Gram's, Capsule, Spores, Acid fast Staining)

Unit IV

Preservative techniques, Microscopy-light microscope-Dark field microscope phase contrast Microscope-Electron microscope SEM, TEM.

Unit V

Microbial ecology-nature of soil organism and their interactions-positive and negative interaction-mycorrhizal symbiosis-management of mycorrhizae - inoculum production and use – applied aspects of ecto and endo mycorrhizae.

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Paper II (Subject)	Paper I of selected group(A/B/C/D/E)	-	50	50	25

PAPER II

Biological Nitrogen Fixation - I

Unit I-

Methods/protocols used for BNF – Acquiring knowledge about native/wild legumes of India/arid and semi-arid regions through flora/field survey Identification of legumes; through ILDIS GRIN database/flora's; Nodulation data base. ILDIS GRIN Nodulation; Sprent 2008-2009 dulation in legumes.

Unit II

acterial type collection/culture centers National and International Morphological parameters; Mmicroscopic work/microtome, Knowledge of (RNB) Root nodule bacteria; alpha and beta rhizobia; agricultural/native.

Unit III

Isolation, purification and maintenance of rhizobial /endophytes /non rhizobial bacteria.

Unit IV

Identification of bacteria: Ployphasic approach; Bergey's manual.

Unit V

Lab manuals on rhizobial technology; Manual of Rhizobial Technology (Vincent, 1970), Hand book of rhizobia (Somasegran and Hoben, 1994).

Paper No.	Nomenclature of the Paper	Internal Assessment	Theory (Written Exam)	Max. Marks	Lectures (One hour per lecture)
Paper III (Subject)	Paper II of selected group (A/B/C/D/E)	-	50	50	25

PAPER III

Biological Nitrogen Fixation - II

Unit I

Phenotypic & Molecular characterization of symbiont and non-symbiont, Phenotypic characterization : acid/alkali production; NaCl, pH tolerance and temperature tolerance; Intrinsic antibiotic resistance property, Carbon utilization.

Unit II

Biochemical characterization ; Oxidase/catalase test; HCN, H₂S, ammonia, indole and amylase production; NR test; Phytase activity, litmus milk reaction, casein hydrolysis, citrate utilization, gelatinase activity.

Unit III

Screening of PGP characters in bacterial Isolates : Phosphate solubilization; IAA production; Siderophore production; ammonia production; cellulose, pectinase and chitinase activity.

Unit IV

Genotypic characterization : Bacterial cell template preparation; Genomic DNA isolation; PCR and its functioning; setting various protocols for amplification of genes. Designing of primers; preparations of primers, dNTPs, buffers, master mix, cell templates Amplification of house keeping genes (16S rRNA, atpD, glnII, dnaK) and symbiotic genes (nifH, nod A and C). Purification of PCR products; Sequencing reaction.

Unit V

Bioinformatics : ncbi nt database; FASTA format; chromatograms; Nucleotide mega blast; bacterial identification; depositing nt sequences; use of gene tools for alignment and editing; Obtaining gene accession numbers from ncbi; phylogenetic relationship, phylogenetic trees.

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Paper II (Subject)	Paper I of selected group(A/B/C/D/E)	-	50	50	25

PAPER II

Stress Biology -I

Unit I

1. Plant water relation.
2. Photosynthetic pigments and photosynthesis.

Unit II

1. General account on carbohydrates, proteins, nucleic acids and lipoids
2. Respiration.

Unit III

- 1 Characteristics and nomenclature of enzymes.
2. Tools and techniques for estimation of biochemical's and assay of enzymes
preparation of reagents and plant extracts.

Unit IV

1. Centrifugation and spectro-photometry.
2. Seed dormancy and seed germination.

Unit V

1. Photomorphogenesis and plant growth.
2. Minerals nutrition and ammonia assimilation system in plants.

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Paper III (Subject)	Paper II of selected group (A/B/C/D/E)	-	50	50	25

PAPER III

Stress Biology - II

Unit I

Physiological mechanism and effects of plant hormones – Auxins, Cytokinins, Gibberellic acid, ABA and Ethylene in plants.

Unit II

1. Types of abiotic and biotic stresses.
2. Plant responses to water deficit and salinity.

Unit III

1. Measurement of membrane stability index and chlorophyll stability index under stress.
2. General accounts on effect of heat stress, metal toxicity and UV-B radiations.

Unit IV

Role of PGRs (Salicylic acid, triazoles, ethephon and brassinosteroids) in plant under stress.

Unit V

Significance of antioxidants and stress proteins (water deficit, salinity and heat stress) in plants.

Paper No.	Nomenclature of the Paper	Internal Assessment	Theory (Written Exam)	Max. Marks	Lectures (One hour per lecture)
Paper IV	Review of Literature	50	-	50	60

PAPER – IV

Review of literature.