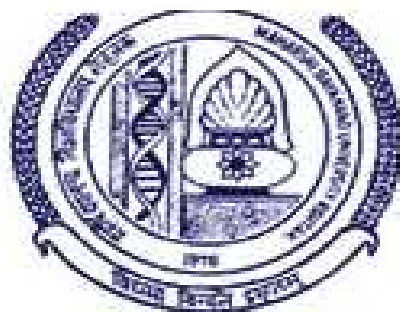


DEPARTMENT OF BOTANY

Syllabus and Scheme of Examination

Ph.D. (Botany)



Maharshi Dayanand University

Rohtak 124001

DEPARTMENT OF BOTANY

**Syllabus and Scheme of Examination of Ph. D. Course Work
w.e.f. Academic session 2016-17**

Programme Specific Outcomes:

Students who obtain degree in Ph.D. (Botany) will:

- PSO1 Be able to articulate and apply basic principles related to techniques and equipment used in botanical investigation.
- PSO2 Be able to critically analyze data and use results to evaluate hypotheses in the context of primary literature.
- PSO3 Be able to formulate hypotheses informed by primary literature and test them using appropriate experimental and observational approaches.
- PSO4 Be able to prepare and give a written or oral presentation, using data that synthesizes information from multiple sources including primary scientific literature.

Credit Matrix for Ph. D. Program in Botany

Paper Code	Nomenclature	Theory	Internal assessment	Max. Marks	Credits
17BOTPC I	Research Methodology	80	20*	100	4
17BOTPC2	Tools and Techniques	80	20*	100	4
17BOTPC3	Advances in Plant Sciences	80	20*	100	4
17BOTPC4	Review writing and presentation/**Seminar	-	-	100	2
Marks & Credits Total				400	14

***Internal Assessment:**

Two assignments of 10 marks each

****Seminar**

Division of Marks:

Participation	:	10
Seminar report:		10
Presentation	:	15
Discussion	:	15
Total	:	50

Pass percentage will be 50% in each paper.

DEPARTMENT OF BOTANY

17BOTPCI - Research Methodology

Course outcomes

After successful completion of the course:

- CO1 Students will be able to identify the research problem and to design their experiments.
- CO2 Students will be able to formulate and test their research hypothesis.
- CO3 Students will be able to use various statistical tools and analyse their data.
- CO4 Students will be able to write their research articles and reports.
- CO5 Students will be able to present their research work at various platforms.

Total Marks: 100
Semester End Exam Marks: 80
Internal Assessment Marks: 20
Time: 3 hrs.

Instructions for paper setter:

There will be a total of nine questions. Question No. 1 will be compulsory and shall contain short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. Candidates will be required to attempt one question from each unit-. They will attempt five questions in all.

UNIT I

Research Methodology: Meaning of Research in Biological Sciences; Characteristics of Research, Research student and research supervisor; Process of research; Identification and criteria of selecting a research problem (Hypothesis); Formulation of objectives; Research plan and its components; Methods of Research and Difficulties in Biological research;

UNIT II

Research Proposal and experimental design: Key elements- Objective, Introduction, Design or Rationale of work, Guidelines for design of experiments, Material and methods, Designing biological experiments, Compilation and documentation of data; Major research institutes related to plant sciences in India, brief idea about government research agencies such as DBT, DST, ICMR, CSIR and UGC.

UNIT III

Writing and presentation: Format of research paper and report writing, Procedure of Reference Citation; Significance of writing research papers and review articles; Major scientific publishers; Impact factor and citation index; Ethical issues in research; Intellectual Property right and Plagiarism; Effective presentation of research findings.

UNIT IV

Statistical applications: Standard deviation, Standard error, Co-efficient of variation, probability distributions: Binomial, Poisson and Normal Distributions (areas method only) including problems. Sample statistics and parameters, population null hypothesis, level of significance. Definitions and applications of Chi-square test, 't' and 'f' test. Analysis of variance with linear models, Analysis of variance for one-way and two way classified data.

Books Recommended

1. Research Methodology- G.R. Basotia and K.K. Sharma.
2. Research Methodology- C.H. Chaudhary, RBSA Publication
3. Research Methodology: An Introduction - Wayne Goddard & Stuart Melville
4. Research Methodology - Ranjit Kumar
5. Research Methodology: Methods & Techniques - Kothari, C.R.

17BOTPC2 - Tools and Techniques

Total Marks: 100
Semester End Exam Marks: 80
Internal Assessment Marks: 20
Time: 3 hrs.

Course outcomes

After successful completion of the course:

- CO1 Students will be able to use GC, HPLC, PCR, FTIR and other instruments for their scientific work.
- CO2 Students will know practical and working knowledge of various laboratory and field botanical methods.
- CO3 Students will be able to collect the plant specimens and identify them with the help of floras and manuals.
- CO4 Students will acquire technical competency and will be able to get employment in different sectors of research and development.

Instructions for paper setter:

There will be a total of nine questions. Question No. 1 will be compulsory and shall contain short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. Candidates will be required to attempt one question from each unit. They will attempt five questions in all.

UNIT-I

Bioseparation techniques: Principle & application of gel filtration, ion exchange & hydrophobic interaction chromatography, thin layer chromatography, gas chromatography; High pressure liquid chromatography (HPLC), Fast Protein Liquid Chromatography, Electrophoresis (agarose and page); Isoelectric-focussing (IEF); Ultracentrifugation (Velocity and buoyant density).

UNIT – II

Gene cloning: Isolation and Purification of DNA from living cells total cell, Plasmid DNAs, Polymerase Chain Reaction for DNA amplification, RT-PCR, cloning PCR or AFLP product after electrophoresis, pulse field electrophoresis for separation of large DNA molecules, Introduction of DNA in to the host cells and selection, Principles & technique of nucleic acid hybridization & cot curve, sequencing of nucleic acid, Southern, Northern, & Western blotting techniques

UNIT - III

Techniques in Field Botany

Plant identification: International code of Botanical Nomenclature: Salient features, important rules and recommendation; Identification keys; Herbarium Methodology: Collection, poisoning, drying and preservation of herbarium specimens, Important National and International herbaria; Ethnobotanical survey techniques.

UNIT – IV

Computer applications: MS Office. Popular image formats. Scientific literature databases: Science direct and Pubmed. Primary databases: Gene bank, EMBL, DDBJ, Swiss Prot, PIR and MIPS. Sequence comparison with BLAST, FASTA and CLUSTAL-W. Motif analysis and presentation with PROSITE and PRINTS.

Suggested Books:

1. Molecular cloning A Laboratory Manual 3rd edition Vol. 1, 2, 3- Sambrook and Russell, Churchill press, 2007
2. Principals and Techniques of Biochemistry and Molecular Biology, Edited by Keith Wilson and John Walker, Sixth Edition, Cambridge University Press.
3. Brown. T. A. (1995).Gene Cloning an Introduction.(3rd edition).Chapman Hall, 2-6 Bunday Row, U.K.

17BOTPC3 - Advances in Plant Sciences

Total Marks: 100
Semester End Exam Marks: 80
Internal Assessment Marks: 20
Time: 3 hrs.

Course outcomes

After successful completion of the course:

- CO1 Students will get in-depth knowledge about the current status of biodiversity, IPR and biopiracy.
- CO2 Students will be able to understanding of genetic engineering, transgenic crops and molecular markers.
- CO3 Students will be able to identify biotic and abiotic stress in plants and assess their physiological effects.
- CO4 Students will be able to use of different protein and molecular markers in stress tolerance mechanism.

Instructions for paper setter:

There will be a total of nine questions. Question No. 1 will be compulsory and shall contain short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. Candidates will be required to attempt one question from each unit. They will attempt five questions in all.

UNIT I

Biodiversity: Introduction, estimation, distribution, significance, causes of depletion and conservation strategies; Biodiversity hot spots; Impact of climate change on biodiversity; Biodiversity and biotechnology relationship; Biopiracy and intellectual property rights; Organizations involved in biodiversity conservation; Indian Biodiversity Act (2002)

UNIT II

Molecular Biology: Role of engineering in stress tolerance, Kinds of molecular markers- Proteins markers, Isozyme markers and DNA markers, advantages, disadvantages & applications of molecular markers in the field of molecular biology, Relationship among different molecular markers. Cry genes- classification and properties, *Bacillus thuringensis* endotoxin and their mode of action, Advantages of molecular markers in transgenic crops.

UNIT III

Stress Physiology: Physiological Effects and Mechanism of action of Auxins, Gibberellins, Cytokinins, Abscisic acid, Polyamines and Salicylic acid Water deficit and its physiological consequences, drought tolerance mechanisms, salinity stress and plant responses, heat stress

and heat shock proteins, metal toxicity, pollution stress. biotic stress, HR and SAR mechanisms. Biotechnological approaches for stress tolerance in plants.

UNIT IV

Enzyme Technology: Introduction to enzymes, specificity of enzyme action, kinetic and chemical mechanisms of enzyme – catalyzed reactions, enzyme inhibition, active site structure, enzyme assay, application of enzymatic analysis in agriculture, environment, medicine and forensic science and industry. Stability, denaturation and renaturation of enzymes, immobilized enzymes and their uses, Biosensors. Recent advances in enzyme technology, future prospects for enzyme technology.

Suggested Books:

1. Enzyme Technology by Martin Chaplin and Christopher Bucke (1990) Cambridge University Press.
2. Biocatalysts and Enzyme Technology by Klaus Buchholz , Volker Kasche, Uwe Theo Bornscheuer (2005), 1 edition, Wiley-VCH.
4. Enzyme Technology, edited by Ashok Pandey, Colin Webb and Carlos icardo Soccol (2006), Springer US.
5. Introduction to plant physiology by W.G. Hopkins and NPA Huner, Wiley Int.3rd Ed.
6. Old and Primrose (1984).Principles of gene manipulation. Blackwell
7. Patterson, 1996. Genome mapping in plants, Academic Press.330p
8. Weising, K., H. Nybom, K. Wolff, W. Meyere.1995. DNA Fingerprinting.CRL Press

17BOTPC4 - Review writing and presentation/Seminar

Total Marks: 100

Course outcomes

After successful completion of the course:

- CO1 Students will be able to write research articles & thesis related to their research work.
- CO2 Students will be able to identify research gaps and give direction for future research.
- CO3 Students will be able to search literature and use of research databases.
- CO4 Students will be able to present their work in an effective way and defend their research work during thesis seminars.