

DEPARTMENT OF BOTANY  
University of Delhi  
Delhi 110007

Ph.D. Course work



**Passed by DRC/Staff Council held on 24<sup>th</sup> May, 2012**  
**Ph.D. in Botany**

All the students admitted to the Ph.D. programme in the Department of Botany have to complete the Coursework as per the guidelines laid down in the 'Delhi University Ordinance VI-B'. The Coursework will be offered at least once in a year, as per the Ph.D. admission notice issued by the Faculty of Sciences from time to time. The coursework has two parts, BOTPHD - I & II. BOTPHD-I is compulsory and deals with a review of literature, work plan and a tentative outline of the proposed work. This paper will be offered by the respective supervisors in collaboration with the Research Advisory Board of the student. **BOTPHD - II deals with research methodology** and have six components, of which GR1 and GR2 are compulsory. The students have to choose any two of the remaining four components, out of which one will be main and the other will be ancillary (GR3, GR4, GR5 and GR6). The students admitted are free to attend lectures of all the papers, however, they will be evaluated only for papers/groups opted by them. The details of the syllabus are appended. This course shall be governed by the Department of Botany, Faculty of Science, University of Delhi, Delhi.

## PROGRAMME STRUCTURE

Paper code	Name of the Paper	Theory Main/ Ancillary	Practical/ Viva-voce	Total Marks
<b>BOTPHD - I</b>	Dissertation	75	0/75	150
<b>*BOTPHD – II (Research Methodology)</b>				
<b>GR1</b>	Effective communication, writing and biostatistics	10	10/0	20
<b>GR2</b>	Instrumentation	5	5/0	10
<b>GR3</b>	Methods for field biology (Systematics, evolution, ecology and reproductive biology)	40/20	60/0	100/20
<b>GR4</b>	Methods for molecular techniques and tissue culture	40/20	60/0	100/20
<b>GR5</b>	Methods for physiology and biochemistry	40/20	60/0	100/20
<b>GR6</b>	Methods for microbiology and plant- parasite/microbe interactions	40/20	60/0	100/20
<b>Total marks</b>		150	150	300

\* The admitted students will be evaluated for 150 marks for each of the paper, and in paper II the marks are allocated as follows.

**GR 1** – 20 marks (theory 10 and practical 10), **GR2** - 10 marks (theory 5 and practical 5), any of the **GR 3/4/5/6** as main (theory 40 and practical 60) and any one of the GR 3/4/5/6 as ancillary (theory 20 and practical nil).

## **Syllabus**

### **Ph.D. Coursework**

#### **GR1 – Effective communication, writing and biostatistics**

1. Basic biostatistics for biologists.
2. Effective science writing.
3. Common mistakes in sentence construction.
4. How to write in a concise way.
5. How to check your manuscript for style and pattern for the journal?
6. What is the correct way of citing a reference?
7. What is plagiarism and how to avoid it?
8. How to prepare a simple and effective presentation slide.
9. How to make a presentation?

#### **GR2 – Instrumentation**

1. Fundamentals of Microscopy – Optical, confocal, fluorescence, scanning and EM.
2. Fundamentals of Spectrometry – Visible, UV, AAS, Flame photometry, NIRS.
3. Fundamentals of Chromatography – paper, TLC, HPLC, GC.
4. Fundamentals of electrophoresis.
5. Fundamentals of Microtomy.
6. IRGA – Photosynthesis and respiration.
7. PCR.
8. NO analyser.

#### **GR3 – Methods for field biology (Systematics, evolution, ecology and reproductive biology)**

1. Field sampling and sample physical and chemical analysis.
2. Vegetation/community analysis methods.
3. Phylogenetic analysis.
4. Breeding systems analysis.
5. Plant Systematics\* (nomenclature, key and herbarium).
6. Methods for pollination ecology.
7. Application of GIS/RS technology.

\* is also offered to all students of botany as a general lecture too.

#### **GR4 - Methods for molecular techniques and tissue culture**

1. Plant tissue culture methods.
2. Isolation and analysis of DNA/RNA.
3. Genetic transformation and expressions methods.
4. Synthesis of markers and gene manipulation.
5. Computational biology approaches for analysing molecular data.
6. Ovule clearing and cytology.

#### **GR5 – Methods for physiology and biochemistry**

1. Isolation of lipids and analysis techniques.
2. Extraction and evaluation of bioactive compounds through TLC & HPLC.
3. Antibody generation, antigen antibody reactions (immunochemistry).
4. Protein over-expression in *E.coli* and its metal chelate affinity purification.
5. Optimization of apoplastic protein extraction.
6. Biochemical analysis to study plant-pathogen interactions.
7. Analytical techniques for sugars and proteins.
8. Analytical techniques for hormones/enzymes.

#### **GR6 – Methods for microbiology and plant parasite interactions**

1. Isolation, culture of microorganisms from soil.
2. Methods to study colonization, isolation and culture of AM fungi.
3. Biochemical analysis to study plant-pathogen interactions.
4. Microbial culture methods.
5. Replicate plating techniques.
6. Gram staining techniques.
7. Isolation of lipids and analysis techniques.
8. Techniques for rearing and studying plant-feeding insects.
9. Bioremediation of toxic heavy metals.