



**जननायक चन्द्रशेखर विश्वविद्यालय, बलिया-277001 (उ.प्र.)**  
**Jananayak Chandrashekhra University, Ballia-277001 (U. P.)**



## **FACULTY OF SCIENCE**

**Course structure and Syllabus**

**Ph.D. Course work system**

**BOTANY**

**UNDER SEMESTER SYSTEM**

**ACADEMIC SESSION -2019-20**



**Ph.D. (Doctor of Philosophy)**

**BOTANY**

**FACULTY OF SCIENCE**

**SEMESTER SYSTEM**

**Ph.D.BOTANY**  
**COURSE WORK SYSTEM**  
**COURSE STRUCTURE, SYLLABUS/Ph.D. COURSE WORK**

1. PAPER-1-Research Methodology and Computer Application Credits-4, MM-100
2. PAPER-2- Research and Publication Ethics Credits-2, M.M.-100
3. PAPER-3- Instrumentation, Techniques and Statistical tools in Botany Research  
Credits-4, M.M.-100
4. PAPER-4- Advances in Plant Sciences Credits-4, M.M.-100

Total-14 Credits and Maximum Marks-400

**After the completion of course work**

- |                                    |              |
|------------------------------------|--------------|
| 1. SYNOPSIS SEMINAR                | Satisfactory |
| 2. ORAL COMPREHENSIVE              | Satisfactory |
| 3. COURSE SEMINAR                  | Satisfactory |
| 4. THESIS PRE SUBMISSION SEMINAR   | Satisfactory |
| 5. THESIS (DOCTORAL RESEARCH WORK) | Satisfactory |
| 6. THESIS VIVA-VOCE                | Satisfactory |

**PROPOSED REGULATIONS**

Semesters/Papers	Title of the papers	Theory	
		Max. Marks	Min. Marks
Paper 1	(Theory Paper)	100	40
Paper 2	(Theory Paper)	100	40
Paper 3	(Theory Paper)	100	40
Paper 4	(Theory Paper)	100	40
<b>Total aggregate of First Semester will be 50 %</b>			Max. Marks – 400 Min.Marks – 200
SYNOPSIS SEMINAR			Satisfactory
ORAL COMPREHENSIVE			Satisfactory
COURSE SEMINAR			Satisfactory
THESIS PRE-SUBMISSION SEMINAR			Satisfactory
THESIS (DOCTORAL RESEARCH WORK)			Satisfactory
THESIS VIVA-VOCE			Satisfactory

**Note-**

1. The research work may be initiated as per Ph.D. ordinance.
2. The evaluation of seminar presentation and oral comprehensive examination shall be done by the departmental committee which shall be constituted by the Head of Department /Principal of College.
3. The minimum passing marks of every paper at least will be 40 % in theory and total aggregate of the semester will be 50 % minimum.

# Ph.D. Course in Botany

## Syllabus

(Effective from the academic year 2019-2020 onwards)

### COURSE STRUCTURE–SYLLABUS of Ph.D. COURSE WORK

**PAPER-I: RESEARCH METHODOLOGY AND COMPUTER APPLICATION 4**  
**Credits, M.M.100 (COMMON SYLLABUS)**

**PAPER-II: RESEARCH AND PUBLICATION ETHICS Credits-2, M.M.-100**  
(As per UGC Recommendation)(COMMON SYLLABUS)

**PAPER III –Instrumentation, Techniques and Statistical tools in Botany**  
**Research Credit:4 MM:100**

#### UNIT I: Instruments and Techniques-

- A. Microscopy and Cytological techniques** – Pre-treatment, fixatives and stains. Different types of Microscopes.
- B. Biochemical techniques-** Principles and methodology of colorimetry, spectrophotometry, pH meter, lyophilisation, centrifugation, basic principles underlying different types of centrifuges. Chromatography – partition, thin layer, adsorption, sephadex, ion exchange, gas liquid chromatography, HPLC, Electrophoresis- Agarose electrophoresis, polyacrylamide disc and slab gel with and without SDS (PAGE and NATIVE PAGE), urea, 2-mercaptoethanol and ampholytes, electrofocusing and 2D electrophoresis, Nucleic acids – isolation and purification. Southern, Northern hybridization and Western Blotting techniques, Colony hybridization. Polymerase Chain Reaction. Genome mapping; molecular markers – RFLP, RAPD, AFLP. Protein-isolation and purification by ion exchange gel filtration and affinity purification
- C. Culture techniques** – Instruments used, Isolation and culture of microorganisms from soil and plant tissues, plant tissue culture techniques (cell and organs), media preparation (PDA, Nutrient Agar, Bolds basal medium, MS medium, Gamborg's medium). Sterilization techniques.

#### UNIT II: Statistical Applications:(Problem based)

- A. Central Tendencies**, Standard deviation, Standard error, Co-efficient of variation,
- B. Null Hypothesis**, level of significance, Chi-square Test, 't'-Test and 'F'-Test, Analysis of Variance for one-way and two-way classified data.
- C. Experimental Design**

#### UNIT III:(Practicals)

**Phytochemistry:** Extraction, isolation, characterization and identification of Biochemicals, as Chloroplastic pigments, Proteins, Carbohydrates, Nucleic acids, Enzymes, Proline, etc.

#### UNIT IV:(Practicals)

**Culture Methods:** Preparation of different types of Culture medium and culture of microbes

**Books Recommended-**

1. Wilson K and John Walker, 1999. *Principles and Techniques of Practical Biochemistry*, Cambridge University Press.
2. Harborne J.B. 1998. *Phytochemical Methods - A Guide To Modern Technique of Plant Analysis*, 3rd edn, Chapman & Hall, UK.
3. Swain T. 1963. *Chemical Plant Taxonomy*, Academic Press London
4. Sundararaj, P. And Siddu, A. 1995. *Qualitative Tests and Quantitative Procedures in Biochemistry*. Wheeler & Co. Ltd., New delhi, India.
5. Heldt, Hans-Walter. 2005. *Plant Biochemistry*. Academic Press- an Imprint of Elsevier, New Delhi, India.
6. Singh, V.P. and Purohit, S. 2003. *Research Methodology in Plant Sciences*. Scientific Publishers (India), Jodhpur.
7. Dhopte, A.M. and Livera-M, M. 1989. *Useful Techniques for Plant Scientists*. Publication of Forum for Plant Physiologist, R.D.G. College, Hostel-1, Akola-444001(M.S.), India.
8. Panse, V.G. and Sukhatme, P.V.1985. *Statistical Methods for Agricultural Workers*. Indian Council of Agricultural Research, New Delhi, India.
9. Chandel, S.R.S. 1999. *A Handbook of Agricultural Statistics*. AchaPrakashanMandir, Kanpur, India
10. Banerjee, P.B. 2014. *Introduction to Biostatistics*. S.Chand & Company Pvt. Ltd., New Delhi, India.

**PAPER IV – Advances in Plant Sciences**

**Credit:4 MM:100**

**UNIT I:**

**A. Physiology of seed germination**-primary/early biochemical events of germination. Appearance and role of proteases, amylases and lipases in hydrolyzing stored food materials in storage organs. Mobilization of hydrolysed products to the growing embryonal axis/seedling.

**B. Biochemical composition of legume and cereal seeds/grains**- Seed proteins –albumins, globulins, glutelins and prolamines their structure, function and composition. Seed carbohydrates – starches and soluble carbohydrates including flatulence factors, structure and composition. Seed oils and lipids- structure and composition.

**C. Physiology of seed/grain development-growth patterns**- sigmoid and double sigmoid growth curves – phases of growth – role of pericarp (hull), seed coats and flag leaf in seed/grain development. Biosynthesis of proteins, carbohydrates, lipids during seed grain development.

**UNIT II:**

**A. Mycology and Plant Pathology**- Plant-pathogen interactions; principles of plant disease development; Management of Plant diseases (Chemical, biological and integrated disease management); Biotechnological approach to disease control; Defence mechanism of plant; Mycorrhizae, Mycotoxins and Biopesticides

**B. Environmental Biology**

Conservation of flora in India, Rare and endangered species of flowering plants and their *in situ* (including National parks, Wildlife sanctuaries and biosphere reserves in peninsular India) and *ex situ* conservation. Biodiversity –Types, values, threats and “Hotspots”. Global warming, Ozone depletion and Green house effect. Energy – sources – Fossil fuels, natural gas, wind energy, Bio energy and energy conservation. Floristic regions of India. Flora of peninsular India, their affinities and endemism with particular reference to angiosperms. Vegetation/forest types in peninsular India.

**UNIT III:(Practicals)**

**Physiological effects and mechanism of action of different Plant Growth Regulators**- Auxins, Gibberellins, Cytokinins, Abscisic acid, Polyamines, Salicylic acid, etc.; Water deficit and its physiological consequences; Drought tolerance mechanism; Salinity stress and

plant responses; Heat stress and Heat shock proteins; Metal toxicity; Pollution stress; Biotic stress; HR and SAR mechanism.

#### **UNIT IV:(Practicals)**

**Culture Methods:** Preparation of different types of Mycological Culture medium and culture of Pathogenic Fungi and control mechanism

#### **Ecological Studies related Practical**

#### **Books Recommended-**

1. Bewley, J.D. and M. Black, 1985. Seeds: Physiology of development and germination, Plenum Press : New York.
2. Mukherji, S. And Ghosh, A.K. 2012. Plant Physiology. New Central Book Agency (P) Ltd., New Delhi, India.
3. Weil J.H. 1990. General Biochemistry, Wiley Eastern Limited, New Delhi.
4. Arora S.K. 1982. Chemistry and Biochemistry of food legumes, Oxford and IBH Publication, New Delhi.
5. Mehta S.L., Lodha, M.L. and Sane, P.V. 1993. Recent Advances in Plant Biochemistry. Publication and Information Division, ICAR, New Delhi.
6. Khan, T.I. and Shishoda, Y.S. (1998). Biodiversity conservation and sustainable development., Pointer Publ., Jaipur, India
7. Trivedi, P.R. and Gurudeep Raj. 1992. Environmental Wildlife and Plant conservation. Akashdeep Publ. Hojuse, New Delhi.
8. Mukherjee, B. 1997. Environmental Biology, Tata McGrew Hill Publ. Co. Ltd. New Delhi

