जननायक चंद्रशेखर विश्वविद्यालय, बलिया
Jananayak Chandrashekhar University, Ballia

(2018 Onwards)

SYLLABUS STRUCTURE
Ph.D. (BOTANY)

Jannayak Chandrashekhar University, Ballia-277001,U.P.

Instructions and Scheme of Examination in Ph.D. Course in Botany

BOTPHD-I

1. Duration of course : Six (06) Months
2. Eligibility : Masters Degree in Botany (with minimum 55% marks, 50% for OBC, SC & ST)
3. Total Maximum Marks : 300 (three papers, 100 marks each)
4. Details of the Papers :

Paper No.	Nomenclature	Max Marks	Internal Assessment	External Assessment Theory	Time
PHD BOT 101	**Research Methodology**	**100**	**25***	**75**	**3 Hrs**
PHD BOT 102	**Tools and Techniques**	**100**	**25***	**75**	**3 Hrs**
PHD BOT 103	**Advances in Plant Sciences**	**100**	**25***	**75**	**3 Hrs**

*** Following will be the criteria for the award of Internal Assessment:**

(i). Attendance : 5 marks
- < 65% : 0 marks
- 65 to 70% : 2 marks
- 71 to 75% : 3 marks
- 76 to 80% : 4 marks
- ➢ 80% : 5 marks

(ii). Assignment / Presentation : 10 marks
(iii). Written Test : 10 marks
5. Aggregate passing marks : 50%
6. Minimum passing marks in Each paper : 33%
7. Instructions for Paper Setter

There will be Total Nine Questions in each paper. Question No.1 (15 marks) will be compulsory and shall contain short answer type six questions (2½ marks each) with 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, each carry equal marks (15 marks each, Total paper 75 Maximum marks).

BOTPHD-II

1. Synopsis submission, presentation and approval.
2. Pre-Ph.D submission, presentation and final approval.
3. Ph.D submission and viva.

Guidelines for Candidates:

All the students admitted to the Ph.D programme in the Department of Botany have to complete the coursework of six months, as per guidelines laid down by the Jannayak Chandrashekhar University, Ballia. The coursework will be offered at least once in a year, notice issued by the Faculty of Sciences from time to time. The coursework has two parts, BOTPHD-I and BOTPHD-II. BOTPHD-I deals with three papers, which candidates have to clear with aggregate 50% marks. After passing the coursework BOTPHD-II will be applied. Students have to submit the synopsis followed by the presentation and approval then will be registered under the guide with specialization.

List of colleges eligible for conducting Ph.D course:

a. S M M Town PG College, Ballia
b.

List of Faculty members recognised as Guide:

a. Dr Ravindra Pratap Raghava, Associate Professor and Head
b. Dr Nisha Raghava, Associate Professor
c. Dr Subhash Chandra, Assistant Professor
d.

Number of seats available per guide:

a. Dr Ravindra Pratap Raghava : 6
b. Dr Nisha Raghava : 6
c. Dr Subhash Chandra : 4

Ph.D. Course in Botany Syllabus
(Effective from the academic year 2018 onwards)

PHD BOT 101: PAPER I – Research Methodology

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 of Research-Objective, Introduction, Design of work, Guidelines for design of Experiments, Material and methods, Compilation and documentation of Data.

Major Research Institutes related to Plant Sciences in India. A brief idea about Government Research and funding agencies, as DST, DBT, ICAR, CSIR, UGC, CST, etc.

UNIT III:

Writing and Presentation: Various types of literature. Format of Research paper and significance of writing Research paper and Review articles. Effective presentation of Research Findings. Procedure of Reference Citation. Major Research Journals and Scientific Publishers of India. Impact factor and Citation Index. Intellectual Property Right and patenting.

UNIT IV:

Statistical Applications:

Standard deviation, Standard error, Co-efficient of variation, Null Hypothesis, level of significance, Chi-square Test, 't'-Test and 'F'-Test, Analysis of Variance for one-way and two-way classified data.

Books Recommended-

1. Kothari, C.R. and Garg, G. 2014. Research Methodology: Methods and Techniques. New Age International Publishers, New Delhi, India.
2. Panse, V.G. and Sukhatme, P.V.1985. Statistical Methods for Agricultural Workers. Indian Council of Agricultural Research, New Delhi, India.
3. Chandel, S.R.S. 1999. A Handbook of Agricultural Statistics. Acha Prakashan Mandir, Kanpur, India
4. Banerjee, P.B. 2014. Introduction to Biostatistics. S.Chand & Company Pvt. Ltd., New Delhi, India.
5. Arora, J.R.. Madhan Mohan, T., Rajendran, G.J., Kannan, S. And Nambiseshan, S. 1993. Research Profile of Biotechnology Activities in India-A Directory. PID, New Delhi.
6. Kumar, R. 2012. Research Methodology: A Step-By-Step Guide for Beginners. SAGE Pub. India Pvt. Ltd., New Delhi.
7. Bhattacharya, D.K. 2013. Research Methodology, Excel Books, New Delhi.

PHD BOT 102: PAPER II – Instrumentation and Techniques in Research

UNIT I: Basic Techniques-

Microscopy and Cytological techniques – Pretreatment, fixatives and stains. Different types of Microscopes.

Biochemical techniques- Principles and methodology of colorimetry, spectrophotometry, pH meter, lyophilisation, centrifugation, basic principles underlying different types of centrifuges. Chromatography – partition, thin layer, adsorbtion, sephadex, ion exchange, gas liquid chromatography, HPLC.

UNIT II:

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 III:

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 filteration and affinity purification.

UNIT IV:

Phytochemistry: Extraction, isolation, characterization and identification of Biochemicals.

Computer applications: MS Office- Word, Power point Presentation, Excel, Popular Image Formats. Connecting to the Internet, Browsing the Web, Searching for Information, literature and research papers, Downloading, Sending and Receiving Email

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, Champan & 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. Snell, N. 1998. Sams' Teach yourself: The Internet Starter Kit. Macmillan Computer Pub, USA with Techmedia Pub, New Delhi.
9. Freeze, J.T. 2000. Sams' Teach yourself: Computer Basics. Macmillan Computer Pub, USA with Techmedia Pub, New Delhi.
10. Gupta, V. 2014. Rapidex Computer Course. Pustak Mahal, Delhi.

PHD BOT 103: PAPER III – Advances in Plant Sciences

UNIT I:

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.

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.

UNIT II:

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.

Germplasm resources of food grains – pulses, cereals and oil seeds – collection and *ex situ* and *in situ* conservation – Role of IPGRI (International Plant Genetic Research Institute) (Rome), NBPGR (New Delhi) and ICRISAT (Patancheru, Andhra Pradesh) in germplasm collection and conservation of most common cereal and pulse crops.

UNIT III:

Physiological effects and mechanism of action- 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:

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

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.

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