

SOLAPUR UNIVERSITY, SOLAPUR.

Faculty of Science

Ph.D. Coursework Examination

**Syllabus
In Botany
w.e.f. June-2014**

Ph. D. Coursework Syllabus in Botany.

(w.e.f.June-2014)

There shall be four papers carrying 100 marks each as below.

Paper-I: Research Methodology, Information and Communication Technology (I.C.T) -100 Marks.

Paper II: - Recent Trends in Botany. 100 Marks

Paper III: - Advanced development in Botany. (Elective) -100 Marks.

(Paper:-3rd will of elective type and student should select any one subject as a Special paper)

Paper II: Recent trends in Botany: - 100 Mark

Unit: 1 Microscopy:

Phase contrast, Dark field and Scanning electron microscope, Microphotography, Camera Lucida. Working, principle and applications.

. Unit:-2. Separation Techniques:-

Basic principles of centrifugation, low and high speed centrifuges. Density gradient separation, Column Chromatography-Isoelectric focussing, Ion exchange and Affinity Chromatography, Gel electrophoresis.

Unit: 3- Spectroscopic and Tracer Techniques:-

Basic Principles, Nature of electromagnetic radiation, Beer-Lamberts law. UV-VIS Absorption Spectrophotometry-Instrumentation and applications. NMR, MASS spectrometry.

Isotopes in biochemistry, Measurement of radioactivity-Giger-Muller, Liquid Scintillation counting, Applications of radioisotopes.

.Unit: 4:- Culture Techniques.

Basic Principles, Culture types (algae, fungi, bacteria, plant), media preparation, sterilization, inoculation. Equipments-Laminar air flow, thermobath, shaker, stirrer, hot air oven, Electric autoclave.

Unit:-5 Staining Techniques:

Permanent staining technique used for microtome sections and for free hand sections. Microbial staining techniques. Cytological-technique-Fixatives, treatments and staining.

Unit:-6 Micrometry and Herbarium technique.

Determination of Micrometry factor. Techniques and applications of micrometry in research, Preparation of herbarium sp. Methodology, application and storage.

Unit: 7- Biotechnology

Recombinant DNA technology and gene cloning techniques of restriction mapping, construction of chimeric DNA, cloning in bacteria and eukaryotes, PCR and gene amplification Human genome project. Applications of biotechnology in agriculture and forestry

References:-

1. Introduction to plant tissue culture K Rajdan.Oxfoord and IBH Publishing Coy.
New Delhi.
2. Essentials of plant technique N. Dwivedi and R.B. Singh. Scientific Publishers, Mann Bhavan,
Ratanada Road.Jodhpur.34200
3. A Text Book of Plant Physiology. P Malik and K Shrivastava.Kalyani Publishers New
Delhi.110002.
4. Biological Techniques. (1and 2) P R Yadav and Rajiv Tyagi.Discovery Publishing House. New
Delhi.110002.
5. Bhojwani, S S and M K Rajdan.Plant tissue culture, Theory and practice. Elsevier Amsterdam
oxford.
6. Micro techniques. S R.Kulshrestha.Kalyani Publications New Delhi.110002.
7. Methods in plant molecular biology. M.A Schwer and Zeclinskin, Academic Press New York
(1989).
8. Techniques in Bioproductivity and Photosynthesis: Coombs, Hall Long and Scurlock Pergamon
Press Oxford. (1985).
9. Hand Book of field and herbarium Techniques.-S K Jain and R R. Rao.
10. Experiments in Microbiology, Plant pathology and tissue culture: K R Aneja. New Age
International Publishers.Ansari Road, New Delhi.110002
11. Practical Biochemistry -Principles and Techniques: Wilson and J K Walkers. Cambridge
Publishing Coy. (2000)
12. Elements of Biotechnology: P K. Gupta.Rastogi Publications Shivaji Road Meerut-250002.INDIA.
13. Plant Micro Techniques: Sass.
14. Plant tissue culture. M.K. Rajdan. Oxford and IBH publ. company pvt.ltd. New Delhi.
15. Plant tissue culture. Rajani Sharma, Campus books International, Ansari Road New Delhi.
16. Plant tissue culture. Kalayan Kumar De, New Central Book Agency pvt.ltd. Kolkata. 700009.
17. Fruit physiology and production. Amar Singh Kalayani Publishers.
18. Plant Biotechnology. Methods in tissue culture and gene transfer. R. Keshavchadran and M.S
Swaminathan, Universities press pvt. Ltd. Hyderabad 50029
19. Applied Radiobiology and Radiation Protection: Granier R and Gambini D J Ellis Harward, 1990
20. Biochemistry: L. Virakumary. MJP Publishers.Tamilnadu Book House 47 Nalathambi Street,
Chennai.600005.

21. A text book of Practical Botany vol. I & II: Ashok Bendre & Ashok Kumar, Rastogi Publications, Shivaji Road Meerut.250002
22. Modern Practical Botany Vol. I & II: B P Pandey. S Chand and Company.Ramnagar New Delhi. 110055
23. Fundamentals of Molecular Spectroscopy, C N Banwell and C M McCash.TATA McGraw-Hill Publishing Co. New Delhi.110008.
24. Spectroscopy of organic compounds. : P S Kalasi .New Age International Publishers.Darya Ganj New Delhi.110002.
25. Electron Microscopy .Prakash Trivedi. Oxford Book Company.Jaipur –New Delhi.
26. Nuclear and Radiation Chemistry. K Sharma, Goel Publishing House, Shivaji Road, Meerut.250001.
27. Nuclear and Radiochemistry. G Friedlander, J W Kennedy S Macias M Miller John Wiley and Sons New York.
- 28 Text Book of Spectroscopy. JyotiKumar, Sonali Publications, Ansari Road New Delhi.110002.
29. Spectroscopy. B K Sharma Goel Publishing House, Krishna Prakashan Media Pvt Ltd.Shivaji Road Meerut. 250001. U P.
30. Spectroscopy Applications to Organic Chemistry: S.S Nigam, V K Ramchandra and company Poona 2.
31. Absorption Spectroscopy of Organic Molecules, V M Parikh, Mehata Publishing House Sadashiv, Peth Pune 411030.
32. Chromatography :.Kamalesh Bhansal,Campus Books International,Prahlad Street,Ansari Road,Darya ganj New Delhi 110002.

Paper:-III: Advanced development in Botany.

Elective Paper:I Mycology and Plant Pathology

Unit 1:-Fungi:-General characters, thallus structure, nutrition in fungi. Methods of reproduction and classification of fungi, Symptomology and dispersal methods.

Unit 2:-Methods of Studying Plant Diseases:-

Field observations, collection of samples, Laboratory studies, Culturing of pathogenic organisms (Fungi, Bacteria, Mycoplasma etc.) Koch's Postulates

Unit 3:- Epidemiology, Assesment and forecasting of plant diseases.

Elements of epidemic, Factors affecting epidemic, development of epidemic and forecasting of plant disease epidemic.

Unit 4:- Biotechnology in relation to Plant pathology.

Plant pathological tissue culture technique, Genetic engineering in plant pathology. (Recombinant DNA Technology.) Molecular biology of plant pathogens.

Unit 5:-Principles of plant disease control.

Regulatory methods, Physical methods, Cultural methods. Direct protection-Biocontrol agents (Microbial), chemical control.

Unit 6:-Mushroom cultivation. , Mycorrhizal fungi.

Mushroom Production Technology-Food values of edible mushrooms. Cultivation of white buttan, Paddy straw and Oyster mushroom- Steps involved production of spawn .Diseases of mushrooms. Mycorrhizae- definition and types. Isolation techniques. Methods of inoculum production. Applications of mycorrhizal fungi in agriculture and forestry.

References:-

- 1) Botany for Degree student fungi, B R. Vashista and A K Sinha. Publ. S. Chand and company Ltd. Ramnagar New Delhi-110055.
- 2) Plant pathology. P.D.Sharma.Rastogi Publication.Shivaji Road Meerut.250002.
- 3) Fundamentals of Plant pathology.V.N.Pathak, N.M.Khatri and M.Pathak Publ. Agro bios (India).Agro house Chopasani Road Jodhpur 342002.
- 4) Agricultural Microbiology.G.Rangaswamy and D.J.Bagyaraj Prentice Hall of India. Pvt. Ltd.New Delhi.110001
- 5) Mycorrhizal Symbiosis.Harley, J.L. and Smith S.E. (1983), Academic press London.
- 6) Experiments in Microbiology, Plant Pathology and Biotechnology. K R Aneja. New Age International (pvt.Ltd) Publishers.Ansari Road Daryaganj New Delhi 110002.

- 7) Miller R. M. 1987 The ecology of Vesicular Arbuscular mycorrhizae in grass and shrub land In. GR Safir (Ed.) CRC Press Boca Raton Florida.
- 8) Smith S E and D J Read 1997, Mycorrhizal symbiosis. (2nd Edn.) Academic Press San Diego California, USA.
- 9) G N Agrios (1997) Plant pathology, (4th Edn.) Academic Press London.
- 10) Mycorrhizal Symbiosis Harley J L and Smith S E (.1983) Academic Press London.
- 11) C J Alexopolous, C N Mims, Introduction to Mycology. Wiley Eastern Ltd Ansari Road Daryaganj. New Delhi. 110002.
- 12) Josef Charles Walker Diseases of Vegetable crops. Srishti Distributors, JMD House, Ansari Road Daryaganj. New Delhi. 110002.
- 13) G Ragaswamy and A Mahadevan. Diseases of crop plants in India. Prentice Hall of India Pvt Ltd. New Delhi, 110001
- 14) I. Burdon: Diseases and plant population biology, Cambridge University Press.
- 15) S. Nagarajan. Plant disease Epidemiology, Oxford and IBH Publ. Coy. Ltd. New Delhi. (1983):
- 16) Iian chet (Ed.) Innovative approach to plant disease control wileg Inter Science publication, Hon Wiley and Sons New York (1987)
- 17) S.A Tarr. Principles of Plant pathology. Mac Millan Publishers ltd. London
- 18) R.T.V. Fox Principles of Diagnostic Techniques. in Plant Pathology. CAB International, Wallingford UK. (1993)
- 19) V.N. Pathak: Laboratory Manual of Plant Pathology (2nd.Ed.) Oxford and IBH Publishers, New Delhi. (1984).
- 20) R.S. Singh, Introduction to Principles of Plant Pathology. Oxford and IBH Publishers, New Delhi. (1984).
- 21) Text book of Plant Pathology. S.K. Singh and Seema, Shrivastava, Campus books International, Ansari Road New Dehli.
- 22) Plant pathology. G.K. Gupta, Discovery publishing house New Delhi.
- 23) Molecular Plant Pathology. laxman Desai, Paragon International publishers, Ansari Road New Dehli.
- 24) Plant Protection. K.M. Chandniwala, Anmol publs. Pvt. ltd. New Delhi.
- 25) Emerging Trends in Mycology, Plant pathology and Microbial Biotechnology. G. Bagyanarayana, Bhadraiah, I.K. Kunwar. B.S. Publication Sultan bazaar Hyderabad.
- 26) Techniques of Mushroom cultivation; P Shrivastav. Discovery Publishing House, New Delhi.

Elective Paper:-III- Taxonomy of Angiosperms.

1. **Taxonomy:** Aims, Principles and functions
- 2.
3. **International Code of Botanical Nomenclature (ICBN):** Principles, rules and recommendations, typification, priority of names, effective and valid publication, rejection of names, citation of authority, synonyms and homonyms
4. **Species concept:** Classical, modern, typological non dimensional and multidimensional

- 4 **Classification systems:** Principles, outlines, merits and demerits of Bentham and Hookers system, Cronquist's system, Dahlgren's system of classification.

- 5 **General evolutionary trends in Angiosperms:** Habitat and growth habit, vegetative and reproductive structures of flowering plants.

- 6 **Strategies for conservation: ex-situ conservation;** principles and practices, Role of Botanical gardens, field gene bank, seed bank, general account of BSI, National Bureau of Plant Genetics Resources (NBPGR), Indian Council of Agricultural Resources (ICAR), DBT, CSIR and DST.

References:

- 1) Ahmedullah, M. and M. P. Nayar. 1987. *Endemic Plants of the India Region (vol. I.)* Botanical Survey of India.

- 2) Cronquist, A. 1981. *An Integrated System of Classification of Flowering Plants.* Columbia University Press. New York.

- 3) Cronquist, A. 1988. *The Evolution of Classification of Flowering Plants (2nd Edn.)*. Allen Press. U.S.A.

- 4) Davis, P. H. and V. H. Heywood 1991. *Principles of Angiosperm Taxonomy.* Today and Tomorrow Publications, New Delhi.

- 5) Endress Peter, K. 1994. *Diversity and Evolutionary Biology of Tropical Flowers.* Cambridge.

Elective Paper-III:-Plant Physiology.
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Unit No.-1: Solutions, Suspensions and colloids:

True Solution, Suspension, Colloidal system, Methods of expressing the concentration of solution- Percentage, Molarity (Molar solution and molal solution, normal solutions, Hydrogen ion concentration, buffer solution.)

Unit No.-2: Enzymes.

Distribution of enzymes in plants, structure, active site, nomenclature, classification, nature of enzyme, factors influencing enzymatic activities, phytochrome control of enzyme, Hormonal regulation of enzyme, mode of action of enzyme activity.

Unit No.-3: Nitrogen Fixation in plants:

Nitrogenase, nif genes, regulation of nitrogen fixation, products of nitrogen fixation and their transport mechanism of nitrate uptake and reduction, transamination, nitrogen metabolism in relation to photosynthesis and respiration.

Unit;-4: Trace Physiology.

Oxidative stresses-Generation of reactive oxygen species, effect of ROS on metabolism, ROX detoxification mechanism in plants. Transgenic approaches.

Gaseous stresses-Effect of elevated CO₂ concentration on plant metabolism, effect of air pollutant SO₂ and O₃ on plants.

Thermal stresses-Effect of high and low temperatures on plant metabolism, Mechanism of temperature tolerance.

Radiation stresses- Influence of high light intensity on Photosynthesis, Photoprotection mechanism.

Unit No:-5:-Reproductive Physiology.

Florigen concept, flowering hormones and inhibitors –Transition flowering-Photoperiodism, thermoperiodism (vernalization) factors affecting vernalization. Flowering-Floral induction-photo induction cycle, night breaks, light breaks, light quality-flower development and fruiting.

Unit No:-6:-Secondary plant products.

Introduction, Phenols, Alkaloids-Isolation, characterisation, classification, role of alkaloids in plants, Terpenoides, Phenyl Propanoids metabolism, Flavonoids and Porphyrils.

References:-

- 1) Plant Physiology: P.S. Gill. Publisher .S Chand and company Limited, Ram nagar New Delhi.110055.
- 2) Fundamentals of Plant Physiology. : J L Jain. Publisher .S Chand and Company Limited, Ram nagar New Delhi.110055.
- 3) Plant Physiology V. Verma, EMKAY Publications. B-19, East Krishnanagar Delhi.110051.
- 4) Introductory Plant Physiology .G Ray Noggle & Fritiz.Prentice Hall of India. Pvt. Ltd. New Delhi.110001.
- 5) Plant Physiology. Salisbury and Ross, CBS Publishers and Distributors. Jain Bhavan Bholanathnagar, Shahadara-Delhi.110032.
- 6) Plant Physiology , V I Palladin,Arihant Publications,Jaipur.(INDIA)
- 7) Physiology of Transpiration in Plants: .Sundara Rajan. Anmol Publications, Pvt.Ltd. New Delhi.110002.
- 8) Laboratory Plant Physiology, Bernard S Meyer, D B Underson, C A Swanson. East west Press Pvt. Ltd. New Delhi.
- 9) Physiology of Crop plants, F P Gardner B Pearce, R L Mitchell.Scientific Publishers Ratanada Road, P O Box 91, jodhpur.342001.
- 10) Plant Physiology: R C Grewal Campus Books International, Prahlad Street, Ansari Road, Daryaganj.New Delhi.110002
- 11) Plant Physiology: Robert M.devlin.East west-Press Pvt.Ltd.New Delhi.
- 12) Plant Physiology: Devlin and Witham-CBS Publishers and Distributors. Jain Bhavan Bholanathnagar, Shahadara-Delhi.110032.
- 13) A Text Book of Plant Physiology.C P Maik &A K Shrivastava, Kalyani Publishers, New Delhi.
- 14) Plant Growth and Development, Leopold, A C (1974) Mc Graw-Hill Book Company, Inc. New York.
- 15) Elements of Enzymology.A N Shukla, Discovery Publishing House, Ansari Road, Daryaganj, New Delhi.110002

Ph.D. (Course Work) Nature of Question Paper Pattern

- Ph.D. कोर्सवर्कसाठी फक्त Long Answer व Short Answer असेच प्रश्न असतील.
- Ph.D. (Course work) प्रश्नपत्रिकेत कोणताही External Option व Objective प्रश्न असणार नाहीत.
- एकूण प्रश्न - ५ X गुण २० = १०० गुण
- प्रश्न क्रमांक १ ते ५
- (A) दिर्घोत्तरी प्रश्न (१० गुण)
- (B) Answer Any two out of three (प्रत्येकी ५ गुण)

या प्रश्नपत्रिकेच्या स्वरूपामुळे Internal Option हा २५% राहतो.