**Botany**

**CURRICULUM FOR B.SC. (PASS)**

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**CURRICULUM FOR B.SC. (PASS)**

Revised Curriculum in the discipline of Botany recommended by the National Curriculum Revision Committee (NCRC) for BSc (pass) degree, taught in the affiliated colleges, under the jurisdiction of the **Shaheed Benazir Bhutto University, Shaheed Benazirabad**.

There shall be four papers of 100 marks each and four practical’s of 50 marks each, corresponding to the theory courses.

Paper I (Diversity of plants.) B.Sc(Pass) Part 1

Paper II (Plant Systematizes, Anatomy and Development) B.Sc (Pass) Part 1 Paper III (Cell Biology and Genetics) B.Sc (Pass) Part II Paper IV (Plant Physiology and Plant Ecology) B.Sc Part II

**BOTANY**

 **B.Sc (Pass) PART I**

**PAPER – I**

**DIVERSITY OF PLANTS AND PALEOBOTANY**

Comparative study of life from and structure, ecological relationships, physiological reproduction and economic significance of:

1. Viruses (RNA & DNA) types with special reference to TMV.
2. Bacteria (with specific reference to biofertilizers, pathogen city and industrial important)
3. Algae ( Fresh and Marine)
4. Fungi (Moulds, Mildews, Rusts, Smuts and Mushroom with their implication on crop production and industrial application)
5. Bryophytes
6. Marchantia
7. Funereal
8. Anthoceros
9. Pteridophytes.
10. Psilopsida (Psilotum)
11. Evolution of leaf and Evolution of seeds.
12. Lyeopsida (Equisetnun)
13. Pteropsida (Andianum, Marsilea)
14. Palo botany

 Introduction to Paleo botany

1. Fossils and Fossilization
2. Geological time scale
3. Palaeopalynolog
4. Gymnosperms
5. Origin of Gymnosperm
6. Distribution of Gymnosperm
7. Morphology and classification of Gymnosperms
8. Distribution of Gymnosperms in Pakistan
9. Economic importance of Gymnosperms
10. **Angiosperms**

Overview of Angiosperms

**Practical**

 Culturing, maintenance, preservation and staining of micro organisms Study of the morphology and reproductive structures of the types mentioned in theory papers Fossil study with general survey field study of Bryophytes, Pteridophytes and Gymnosperm Identification of various types mentioned from prepared slides and fresh collection. Collection of diseased specimens of plants and their identification.

**Book recommended:**

1. Agrios, G.N (2004). Plant pathology. 8th ad Academic press London.
2. Alexopoulos C.J., Mims G W & Black well, M. (1996) Introductory Mycology. 4th ad John Wiley & sons New York U.S. A
3. Andrew, H.N. (1967) studies in Paleobotnay John Willy & Son Inc. New York
4. Bold H.C, Morphology of plants. 2nd ad Harper & Row, and New York
5. Ingrouille, M (1992). Diversity and Evolution of land plants
6. Lee. R E. (1999). Psychology. Cambridge University Press, UK
7. Prescol, L M, Harley. J.P & Klein, A D (2004) Microbiology, 3rd ad WMC Brown U.K
8. Raven, P H, Evert RE & Eichorn, S.E (1999). Biology of Plant W H. Freeman & company U.K.
9. Ross F C (1994). Introduction to microbiology. John Willy & Son Inc. New York U.S.A
10. Shukla, T N, (1981). Essential of Paleobotany McGraw Hill Book Co. New York U.S.A
11. Taylor. (1981) Introduction to Paleobotany. McGraw Hill Book Co. New York U.S.A
12. Vashishta B R (2000). Botany for degree students. S.Chand & Company. Ltd New Delhi India.

**PAPER II**

**PLANT SYSTEMATICS, ANATOMY AND DEVELOPMENT**

 Plant systematics

1. Introduction to plant systematics aims, objectives and importance.
2. Classification importance, brief history, introduction, various systems of classification (Brief account of all systems)
3. An Introduction to nomenclature, importance of Latin names and binomial systems with an introduction to international Code of Botanical Nomenclature (ICBN)
4. Morphology and photography. A detailed account of various morphological characters of root , stem, Leaf, Inflorescences, flower Placenta ion and fruit types.
5. Diagnostic characters, economic importance and distribution pattern of the following families.
6. Ranunculaceae
7. Brassicaceae ( Crucifer)
8. Fabaceae (Luguminosae)
9. Rosaceous
10. Euphorbinceae
11. Cucurbitaceous
12. Solunaceae
13. Lamiaceae (Labiate)
14. Asteraceae (Compositae)
15. Lalinceac ( Sen. Lato)
16. Pocono (Gramineae)

Practical

1. Identification of families given in syllabus with the help of Taxonomy keys.
2. Technical description of common flowering plants belonging to families mentioned in theory course.
3. Field trips should be undertaken to study and collect local plants. Students should submit 50 fully identified herbarium specimens.

Books recommended.

1. Lawrence, G.H.M, (1951) Taxonomy of Vascular Plants. McGraw Hill Company U.S.A
2. Benson, L (1962) Plant Taxonomy method & principle. Renold Press Company New York
3. Moore, R.C., Clarke W.D & Vodopich D.S (1998). Botany McGraw Hill Books Co, New York U.S.A
4. Davis, P.H & V.H. Hey Wood (1965) Principle of Angiosperm Taxonomy. D.Van Nor strand Company New York.
5. Raven, P H, Evert R.E & Eichhorn, S.E (1999). Biology of Plants. W.H Freeman & company U.S.A.
6. Jones, S B & A E Luchsinger (1979) Plant Systematies McGraw Hill Book Company New York.
7. Panday, B P (2004). A textbook of Botany (Angiosperms). S.Chand & Co New Delhi India.
8. Rajput M T M Hassney S.S & Khan K.M (1996). Plant Taxonomy Oxford Publisher Limited Karachi Pakistan.
9. Stacee, C.A. (1980) Plant Taxonomy & Bio Systamatics University Park Press Baltomore U.S.A.
10. Stuessy, T F (1990). Plant Taxonomy Columbia University Press, U.S.A.

 **ANATOMY AND DEVELOPMENT**

1. Anatomy
2. Cell structure, Cell wall and chemical composition of cell
3. Concept, structure and function of various tissues e.g.
4. Parenchyma
5. Collenchyma
6. Sclerenchyma
7. Epidermis (including stomata and trichomes)
8. Xylem
9. Phloem
10. Meristem, types, Stem and roof apex.
11. Vascular cambium
12. Structure and development of root, stunt and leaf, primary and secondary growth of dicot stem, peridern
13. Characteristics of wood porous and ring- porous, sap and heart wood, soft and hard wood. Annual ring.

**Practicals:**

 Practical will be done covering the main nears taught during lectures.

1. Development ( Embryology)
2. Early development of plant body **capsella** bursa-pastoirs
3. Structure and development of anther.

Microsporogensis

Microgametophyto

1. Structure of Ovule

Magasporogenosis.

Megagametogenesis

1. Endosperm formation
2. Parthenocarpy
3. Polyembryony in Angiosperm

**Practicals:**

 Practical will be done covering the main areas taught during lectures.

Book recommended

1. Fahan, A (1990) Plant Anatomy, Pergamun press, Oxford UK.
2. Essu, K (1960). Anatomy of seed plants. John Wiley, New York.
3. Meheshwari, (1980) Embryology of Angiosperms recent addition McGraw Hill Company U.S.A
4. Panday, B P (1990) Embryology of Angiosperms. S.Chnad & Company Ltd, New Delhi, India

**B.S c. (PASS) PART II**

**PAPER III**

**CELL BIOLOGY, GENETICS AND EVOLUTION**

Cell Biology

1. Structures and functions of bio-molecules

Carbohydrates

Lipids

Proteins

Nucleic Acids

1. Cell. The physico-chemical nature of plasma membrane and cytoplasm.
2. The ultra structure of plant cell with a brief description and functions of the following organelles
3. Endoplasmic reticulum ii. Plaids
4. Mitochondria iv. Ribosomes
5. Dictyosomes vi. Vacuoles
6. Micro bodies (glyoxysomes + Poroxysomes)
7. Nucleus: nuclear membrane, nucleolus, ultra structure and morphology of chromosomes karyotype analysis.
8. Reproduction in somatic and cmbryogenic cell. Mitosis, cell cycle.
9. Chromosomal aberration.
10. Changes in the number of chromosome. Aneupoloidy and cuploidy.
11. Changes in the structure of chromosomes, deficiency, duplication, inversiori and Tran’s location.

**Practicals:**

1. Study of cell structure using computerized microscope and elucidation of ultra structure from electron microphotographs
2. Measurement of cell size
3. Study of mitosis and meiosis by smear/ squash method and from prepared slides.
4. Study of chromosome morphology and variation in chromosome number.
5. Chemical tests for the following cell constituents.
6. Starch ii. Cellulose
7. Lignin. iv. Proteins

 Practical will be done covering the main areas taught during lectures.

**Genetics**

1. Introduction, scope and brief history of genetics. Mendelian inheritance, laws of segregation and independent assortment, back cross, test cross dominance and incomplete dominance.
2. Sex linked inheritance, sex linkage in Drosophila’s and man (colour blindness). XO, XY, WZ, mechanmism, sex limited and sex linked characters, sex determination.
3. Linkage and crossing over: definition, group linkage, constitution of linkage maps, and detection of linkage.
4. Molecular genetics: DNA replication – Nature of gene, genetic code, transcription, translocation, and protein synthesis, regulation of gene expression (e g. Lac operon)
5. Transmission of genetic material in Bacteria: Conjugation and gene recombination in E.coli transduction and transformation.
6. Principle of genetic engineering/ biotechnology: Basic genetic engineering techniques
7. Application of genetics plant improvement: Induction of genetic variability (gene mutation, recombination), physical and chemical mutagens, selection, hybridization and plant breeding techniques, establishment of varieties, and release of new varieties.
8. Introduction of genetic conservation
9. Over view of genetic Evolution

**Practicals:**

 Practicals will be done covering the main areas taught during lectures.

**Book recommended**

1. Carroll, S B, Grimier, J K & Welnerbee, S D, (2001) from DNA to Diversity Molecular genetics and the Evolution of animal Design. Black well Science.
2. Dyonsage, V.R., (1986) Cytology and genetics. Tata and McGraw Hill Publication Co. ltd New Delhi
3. I loelzel, A.R., (2001) Conservation genetic Kluwar. Academic Publishers U.S.A
4. Lewin, R, (1997). Principles of human Evolution Black well Science.
5. Lodish H, (2001). Molecular cell Biology. W.H Freeman & Co. London. U.K
6. Sinahh U & S. Sinah, (1988). Cytogenesis plant breeding & Evolution, Vini Sinah U & S. Sunita. (1990) Vikas publishing House PVT, New Delhi India.
7. Strick berger, M.V., (1988) Genetics, Mac- Millan Press ltd, London, U.K

**PAPEER IV**

**PLANT PHYSIOLOGY AND ECOLOGY**

**Plant Physiology**

1. Water relation (water potential, osmotic potential, pressure potential, Potential). Absorption and translocation of water. Stomatal regulation.
2. Mineral nutrition: Soil as a source of minerals.

Passive and active transport of nutrients

Essential mineral elements, Rote and deficiency symptoms of macronutrien

1. Solutions and Colloidal system
2. Ascent of Sap.
3. Translocation of food

Pathway of translocation, source and sink interaction, materials translocation mechanism of phloem transport, loading and unloading

1. Photosynthesis: introduction, Mechanism: Light reaction(electron transport photo phosphorylation) and dark reaction (Calvin cycle)
2. Respiration: Definition and respiratory substrates Mechanism. Gloycolysis Krebs cycle. Anaerobic respiration quotients
3. Leaves and Atmosphere.

Transpiration and its kinds factors Affecting on Transpiration, Gaseous exchange, mechanism of stomata movement (photoactive opening and closing and opening). Factors affecting stomatal movement

 **Practical:**

1. Preparation of solution of specific normality of acid/base, salts, sugars, molar solutions and their standardization.
2. Determination of uptake of water by swelling seeds when placed in chloride solution of different concentrations.
3. Measurement of leaf water potential by the dye method.
4. Determination of the temperature at which beet root cells lose their
5. Determination of the effects of environmental factors on the rate of a leafy shoot by means of promoter/by chloride paper method
6. Experience of chlorophyll from the leaves and separation of componentpignuts ona paper chromatogram. Study of absorption spectra using spectrophotometer.
7. Estimation of oxygen utilized by respiring plant by Winkler’s method.

 Book recommended

1. Ihsan Illahi (1995) Plant physiology, Biochemical Processes in plants. UGC press Pakistan.
2. Salisbury F.B & C.B Ross, (1992) Plant Physiology. 5th Edition. Wadsworth publishing Co Belmont CA.
3. Taiz L&E Zeiger, (2002). Plant Physiology. 3rd. Sinecures Publication. Co. Inc Calif. U.S.A.
4. Hopkins W.B, (1999) Introduction to Plant Physiology. 2nd Ed. John Wiley & Sons New York.
5. Witham F.H & Delvlin. (1986) Exercise in plant physiology. AWS Publishers. Boston. U.S.A.

 **Plant Ecology**

1. Introduction and recent developments in ecological concept, levels of organization.
2. Environmental Complex
3. Climatic Factors II) Edaphic Factors
4. Topographic Factors IV ) Biotic Factors
5. Ecosystem concept, Flow of Energy in ecosystem.
6. Productivity in ecosystem
7. Biogeochemical Cycle.
8. Plant Succession
9. Biological Interactions, types classification

 **Practical:**

1. Determination of various physical and chemical features of the soil and water.
2. Determination of organic contents and soil organism.
3. Demonstration of effect of light, temperature, water and soil on the germination, growth and productivity of plants.
4. Determination of relative humidity and rainfall.

**Book recommended**

1. Barbour, M G, J.H. Burke & W.D. Pitts, (1999). Terrestrial plant Ecology. The Benjamin, Cumming Publishing Co. Palo Alto, California, USA
2. Chap nun, J.L & Reiss, M.J., (1999). Ecology; Principles and Applications. Cambridge University Press, UK.
3. Hussain F, (1989). Field and Labortatry Manual of Plan Ecology. National Academy of Higher Education, Islamabad, Pakistan
4. Krebs C.J., (1997). Ecology. Harper and Row Publishers.
5. Moore P.D & S.B. Chapman, (1986). Methods in plant Ecology. Blackwell Scientific Publication, Oxford, U.K.
6. Ricklefs, R.E, (2000). Ecology, W.H. Freeman & Co, UK.
7. Ricklefs, R.E, (2001). The Economy of Nature. W.H. Freeman & Co, UK.
8. Silver town, J.W. & Levitt-Doust, J, (1993). Introduction to plant population biology. Blackwell ‘’scientific Pub, London. U.K.
9. Smith, R.L, (1996). Elements of Ecology. Harper & Row Publisher, New York U.S.A.
10. Townsend C.R., Harper, J.L & Begun; M.E, (2000). Essentials of ecology. Blackwell Scientific Pub, London, U.K.

 **SAMPLE**

 Marking scheme/ instructions for the examiners

 Paper-II

**Section**  (Plant systematizes) Technical description of angiosperm plant (Distribution of Marks )

 Marks

1. Description of vegetative parts ------------------------ 2
2. Description of floral parts ------------------------------- 5
3. Flora Formula ---------------------------------------------- 2
4. Scientific illustration-------------------------------------- 3 20
5. Identification of specimen with reason-------------- 3
6. Herbarium sheets------------------------------------------ 5

**Section**  (Plant Anatomy)

 Preparation of permanent slide (Distribution of Marks)

1. Preparation of slide---------------------------------------- 5
2. Labeled diagram-------------------------------------------- 3 15
3. Description--------------------------------------------------- 5
4. Identification with reason-------------------------------- 2

**Section**  (Development/Embryology)

Identification of permanent slides (Distribution of Marks)

1. Spotting of embryological material-------------------- 10 10

Viva & Certified Journals--------------------------------3+2 5 5

Total Marks--------------------------------------------------- 50