Maharaja Surajmal Brij University

Bharatpur (Raj.)

SYLLABUS

B.Sc. Part I, II, III

BOTANY

Only For Session
2020-21

अकादमिक प्रभारी
महाराजा सूरजमल बृज विश्वविद्यालय
भरतपुर (राज.)

Session 2021-22

B.Sc. Part-I
BOTANY

Scheme:

Max Mark: 100		**Min. Pass Marks: 36**
Paper - I	3 Hrs duration	33 Marks
Paper - II	3 Hrs duration	33 Marks
Paper - III	3 Hrs duration	34 Marks
Practicals	4 Hrs duration	50 Marks
Duration of examination of each theory paper		3 hours
Duration of examination of practicals		4 hours

Note:

1. There will be 5 questions in each paper . All questions are compulsory. Candidate has to answer all questions in the main answer book only
2. Q.No. I will have 20 very short answer type Questions (not more than 20 words) of half marks each covering entire syllabus.
3. Each paper is divided into four units. There will be one question from each unit. These Q.No. 2 to 5 will have internal choice.

B.Sc. Part I
Paper-I
ALGAE, LICHEN AND BRYOPHYTA
Unit-I

General characters, Diverse Habitat. Range of thallus structure, Photosynthetic pigments and Food reserves. Reproduction (Vegetative, Asexual, Sexual), Types of life cycles: Economic Importance.

Unit-2

Type Studies

Cyanophyceae - Oscillatoria

Chlorophyceae- Volvox, Chara.

Xanthophyceae

Phacophyceae - Ectocarpus.

Rhodophyceae- Polysiphonia.

Unit-3

General characters, Habitat, Range of thallus structure. Reproduction (Vegetative and Sexual); Alternation of generations; Economic importance.

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Unit-4

Type Studies

Hepaticopsida - Marchantia.

Anthocerotopsida - Anthoceros.

Bryopsida - Funaria

Lichens- General characters, Habitat, Structure, Reproduction, Economic and Ecological importance of Lichens.

Suggested Laboratory Exercises:

1. Study of class material by making suitable temporary slides and study of permanent slides of, Oscillatoria, Nostoc, Volvox, Oedogonium, Chara. Vaucheria, Ectocarpus, Polysiphonia.
2. Study of external morphology and preparation of suitable sections of vegetative/reproductive parts of Riccia, Marchantia, Anthoceros, Funaria.
3. Study of lichens.

Suggested Readings:

1. Bold.H.C. Alexopoulous. C.J. and Delivoryas, T Morphology of Plant and Fungi (4th Ed.) Harper & Foul Co, New work, 1980.
2. Ghemawat, M.S. Kapoor, J.N. and Narayan, H.S. A text Book of Algae, Ramesh Book Depot, Jaipur, 1976.
3. Gilbart, M; Smith. Crypogamic Botany, Vol. I & II (2nd Ed.) Tata McGraw Hill. Publishing Co., Ltd., New Delhi, 1985.
4. Kumar, H.D. : Introductory Phycology, Affiliated East-West Press, Ltd. New York, 1988.
5. Puri. P.: Bryophytes, Atmaram & Sons. Delhi, Luchnow, 1985.
6. Sarabhai. R.C. and Saxana, R.C. : A text book of Botany. Vol I & II, Ratan Prakashan Mandir, Meerut, 1980.
7. Singh, V., Pande, P.C. and Jain, D.K.: A text book of Botany, Rastogi, & Co., Meerut, 2001.
8. Vashista, B.P.: Botany for Degree Students (Algae, Bryophytes) S.Chand & Co., New Delhi, 2002.

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Paper II

Microbiology, Mycology and Plant Pathology

Unit-I

Microbiology: Meaning and scope,

Eubacteria: General account, occurrence, morphology (structured and shapes), flagella, capsule, nutritional types. endospore, reproduction (binary fission, transformation, conjugation, transduction), economic and biological importance.

Mycoplasma and Phytoplasma: occurrence, morphology, reproduction and importance.

Virus: General characteristics and importance. Structure of TMV and Pox virus.

Unit-II

Fungi: General characters, occurrence, thallus organization, reproduction, economic importance.

Brief account, structure, importance and life history and/or disease cycle and control of the following:

Albugo and white rust; Sclerospora and Downy mildew/Green ear disease of Bajra; Aspergillus, Peziza.

Unit - III

Brief account, structure, importance and life history and/or disease cycle and control of the following:

Puccinia and Black rust of wheat: loose smut of wheat and covered smut of barley: Alternaria and early blight of potato.

Unit-IV

Causes and symptoms of plant diseases with special reference to green ear disease of Bajra, smut of wheat, citrus canker, little leaf of brinjal.

Suggested Laboratory Exercises:

1. Study of bacteria using curd or any other suitable material, Gram's staining of bacteria.
2. Study of Mycoplasma, TMV, bacteriophage (Photographs/3-D models).
3. Study of symptoms of plant diseases- Downy mildew of Bajra, Green ear of bajra, Powdery mildew.
4. Study of specimen, permanent slides and by making suitable temporary slides. Albugo white rust; Sclerospora-downy mildew, green ear; Aspergillus; Claviceps- ergot;, Peziza, Ustilago-Loose smut of wheat, covered smut of barley, Puccinia- Black rust of wheat: Agaricus and Alternaria- early blight of potato.
5. Media preparation: potato dextrose agar, Nutrient agar.
6. Culture techniques of fungi and bacteria.

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Suggested Books:

- Alexopoulos, C.J. and Mims, C.W. : Introductory Mycology, John Wiley and Sons, New York, 2000.
- Dube, H.C.:Fungi, Rastogi Publication, Meerut, 1989.
- Sarabhai, R.C. and Saxena, R.C.: A Text book of Botany, Rastogi Publication, Meerut, 1990.
- Sharma, O.P: Fungi, Today and Tomorrow Printers and Publishers, New Delhi, 2000.
- Vashihsta. B.R. Botany for degree students- Fungi, S.Chand & Co. New Delhi, 2001.
- Bilgrami, K.S. and Dube, H.C.: A Text book of modern plant Pathology, Vikas Publications, New Delhi 2000.
- Biswas, S.B. and Biswasa: An Introduction to Viruses, Vikas Publications, New Delhi 2000
- Clifton, A.: Introduction of Bacteria, McGraw Hill co. Ltd., New York, 1985.
- Madahar. C.L.. Introduction of Plants Virus. S.Chand and Co., New Delhi. 1978.
- Palzar M.J. Jr. Chan, E.C.S. and Krieg, N.R.: Microbiology, McGraw hill Edu. Pvt. Ltd., London 2001.
- Purohit, S.S Microbiology, Agro. Bot. Publication, Jodhpur 2002.
- Sharma, P.D. : Microbiology and Pathology, Rastogi Publication, Meerut, 2003.
- Singh. V. and Srivastava V. : Introduction of Bacteria. Vikas Publication, 1998.
- Cappuccino, J. and Sherman, N.: Microbiology: A Laboratory Manual (10 Th Ed.), Benjamin Cummings, 2013
- Aneja. K.R. Experiments in Microbiology, Plant Pathology and Biotechnology New age International (P) Ltd., Publishers, New Delhi 2003.
- Mehrotra, R.S. and Aggarwal, Ashok: Plant Pathology, Tata McGraw-Hill Education, 2003.

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B.Sc. Part-I

BOTANY: PAPER III- CELL BIOLOGY, GENETICS AND PLANT BREEDING

Unit I: Cell organelles and Nuclear material:

Ultrastructure and function of different cell organelles (cell wall, plasma membrane, nucleus, mitochondria, chloroplast, ribosome). Chromatin structure and chromosome organisation: eukaryotic and prokaryotic, Transposons.

Unit-2: Cell divisions

Cell Cycle, Mitosis: stages, structure and functions of spindle apparatus, anaphasic chromosome movement; Meiosis: its different stages- meiosis I, meiosis II, synaptonemal complex.

Basis of genetic material: Griffith's transformation experiment and the Hershey and Chase blender experiment to demonstrate DNA as the genetic material.

Extra nuclear genome: Mitochondrial and chloroplast genome, plasmids.

Chromosomal aberrations: Deletion, Duplication, Translocation, Inversion, Aneuploidy and Polyploidy.

Unit-3: Genetic Inheritance

Mendel's laws of inheritance and their exceptions: allelic (incomplete and co-dominance, lethality) and non-allelic interactions complementary genes, epistasis and duplicate genes).

Cytoplasmic inheritance: Maternal influence, shell coiling in snails.

Unit-4 : Plant Breeding

Introduction and objectives of plant breeding, general methods of plant breeding-in selfpollinated, cross-pollinated and vegetatively propagated crop plants. Introduction and acclimatization, selections, hybridizations, hybrid vigour and inbreeding depression. Role of mutation and polyploidy in plant breeding. Famous Indian and international plant breeders and their contribution.

Suggested Laboratory Exercises:

- Study of cell structure from Onion, Hydrilla and Spirogyra
- Study of cyclosis in Tradescantia spp.
- Study of plastid for pigment distribution in Lycopersicon, Cassia and Capsicum.
- Study of electron microphotographs of eukaryotic cells for various cell organelles.
- Study of electron microphotographs of virus, bacteria and eukaryotic cells for comparative study of cellular organization.
- Study of different stages of mitosis and meiosis in root-tip cells and flower buds respectively of onion.

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- To solve genetic problems based upon Mendel's Laws of inheritance: Monohybrid, Dihybrid, Back cross and Test cross.
- Permanent slides/Photographs of different stages of mitosis and meiosis, sex chromosomes, polytene chromosome and salivary gland chromosomes.
- Emasculation, bagging & Tagging techniques.
- Cross pollination Techniques.

Suggested Readings:

- Choudhary, H.K. (1989), Elementary Principles of Plant Breeding. Oxford and IBM Publishing Co, New Delhi.
- Gupta. P.K. (2009) Cytology, Genetics Evolution and Plant Breeding, Rastogi Publications, Meerut.
- Miglani, GS (2000), Advanced Genetics, Narosa Publishing House, New Delhi.
- Russel, PI.(1998). Genetics The Benejamins/Cummings Publishing Co., Inc. U.S.A.
- Shukla, R.S and chandel, P.S. (2000) Cytogenetics, Evolution and Plant Breeding, S.Chand & Co. Ltd. New Delhi.
- Singh, R.B.(1999), Text Book of Plant Breeding, Kalyani Publishers, Ludhiana.
- Dnyansagar. VR. (1986). Cytology and Genetics, Tata McGraw Hill Pub. Co. Ltd. New.
- Roy.SC. and De. KK. (1999) Cell Biology. New Central Book Agency (P)Ltd.Calcutta.
- Verma. PS and Agarwal, VK (2012) Cell Biology, Genetics, Molecular Biology, Evolution and Ecology, S.Chand and Co. Ltd. New Delhi.

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B.Sc. Part-II
BOTANY

Scheme:

Min. Pass Marks: 36		**Max Mark: 100**
Paper - I	3 Hrs duration	Max. Marks 33
Paper - II	3 Hrs duration	Max. Marks 33
Paper - III	3 Hrs duration	Max. Marks 34
Practicals Min. Marks : 18	4 Hrs duration	Max. Marks 50
Duration of examination of each theory paper		3 hours
Duration of examination of practicals		4 hours

Note:

1. There will be 5 questions in each paper . All questions are compulsory. Candidate has to answer all questions in the main answer book only
2. Q.No. 1 will have 20 very short answer type Questions (not more than 20 words) of half marks each covering entire syllabus.
3. Each paper is divided into four units. There will be one question from each unit. These Q.No. 2 to 5 will have internal choice.

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B.Sc. PART-II

Paper I : Molecular Biology and Biotechnology

UNIT-1

Genetic Material: Biological, chemical and physical nature of hereditary material, structure of DNA and RNAs (mRNA, tRNA and rRNA). Watson and crick model of DNA, Nucleosome model.

DNA replication: Meselson- stahl experiment of semiconservative replication of DNA.

UNIT-2

Central dogma of life, Transcription in eukaryotes: role of promoter, gene, pre mRNA synthesis, pre mRNA processing: capping, splicing and polyadenylation.

Translation: genetic code (Codon), initiation, elongation and termination.

UNIT-3

Biotechnology: Functional definition. Basic aspects of plant tissue culture, basal medium, media preparation and aseptic culture technique. Concept of cellular totipotency; Callusing; Differentiation and Morphogenesis; Micropropagation; Tissue culture and its applications. Basic concept of Protoplast culture, Anther culture, Embryo culture nad their applications.

UNIT- 4

Recombinant DNA Technology: Tools and Techniques used in rDNA technology. Restriction enzymes. Vectors for gene transfer, Bacteriophage, plasmids, cosmids and Artificial chromosome, cDNA technology, gene amplification.

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B.Sc. Part II

Paper- II (Pass Course Syllabus)

Plant Physiology and Biochemistry

(2 Hrs/week) Max. Marks 33; Duration of examination of theory paper: 3hours

Unit-1

Water : Absorption and transport of water; Ascent of sap. Transpiration, stomatal factors affecting transpiration. Guttation.

Mineral Nutrition : Essential micro and macro nutrients; their uptake, hydroponics-and nutrient requirement deficiency and toxicity symptoms.

Unit- 2

Photosynthesis : Pigments, Photosynthetic apparatus, Light reaction, photo system I & II, Z scheme, photophosphorylation, C3 (Calvin cycle), C4 Cycle, and factors affecting the photosynthesis.

Respiration : Aerobic and anaerobic respiration; RQ (Respiratory Quotient), Kreb's cycle, electron transport system, oxidative phosphorylation and factors affecting the process, Fermentation.

Unit-3

Carbohydrates: Introduction, importance, nomenclature, classification, molecular structure & function of mono, di and polysaccharides, their properties, glycosidic linkages and glycoprotein.

Proteins: Amino acids-structure, electrochemical properties, peptide bonds, chemical bonds and nomenclare, structure and classification of proteins, physical and chemical properties.

Enzymes: Structure, nomenclature & classification of enzyme. Characteristics of enzymes. mechanism of action, multi-enzyme system, regulation of enzyme activity.

Unit- 4

Photoperiodism & vernalisation: Physiology and mechanism of action, concept of florigen and phytochrome.

Plant Hormones: Auxins, Gibberellins, Cytokinins, Ethylene and ABA: discovery & Physiological effects.

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Exercises:

1. To determine the osmotic potential of vacuolar sap by plasmolytic method.
2. To study the permeability of plasma membrane using different concentrations of organic solvents.
3. To study the effect of temperature of permeability of plasma membrane.
4. To Separate chloroplast pigments by solvent method.
5. To Separate chloroplast pigments using paper chromatography.
6. To separate amino acids in a mixture by paper chromatography.
7. To prepare the standard curve of protein.
8. To demonstrate the tests for proteins in the unknown samples.
9. To demonstrate the enzyme activity Catalase, peroxidase and amylase.
10. To demonstrate the tests for different types of carbohydrates and lipids.
11. Bioassay of growth hormone tauxin, cytokinin, gibberellins.
12. Demonstration of phenomenon of osmosis by use of potato osmometer
13. To demonstrate root pressure.
14. To demonstrate rate of transpiration by use of photometers.
15. Photosynthesis by inverted funnel method. Moll's experiment.
16. To demonstration anaerobic and aerobic respiration.
17. R.Q.by Ganong's respirometer.
18. Measurement of growth using auxanometer.

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B.Sc. Part II

Paper- III : Pteridophytes, Gymnosperms And Palaeobotany

Exam Duration : 3 Hrs. Maximum Marks : 34

Unit-I

General characters of pteridophytes. Distribution and alternation of generation. Stelar system in pteridophytes. Apogamy and Apospory. Economic importance of pteridophytes.

Unit-II

Morphology, anatomy and reproduction of psilotum, Selaginella, Equisetum and Marsilea. Characteristics of Gymnosperms, distribution (K.R.Sporne)

Unit-III

Morphology, anatomy, reproduction and life cycle of Cycas, Pinus and Ephedra.

Unit-IV

Process of fossilization, types of fossils, techniques of study of fossils. Geological time scale. Primitive land plant: Rhynia, Fossil pteridophytes.

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B.Sc. Part-III
BOTANY

Scheme:

Min. Pass Marks: 36		**Max Mark: 100**
Paper - I	3 Hrs duration	Max. Marks 33
Paper - II	3 Hrs duration	Max. Marks 33
Paper - III	3 Hrs duration	Max. Marks 34
Practicals Min. Marks : 18	4 Hrs duration	Max. Marks 50
Duration of examination of each theory paper		3 hours
Duration of examination of practicals		4 hours

Note:

1. There will be 5 questions in each paper . All questions are compulsory. Candidate has to answer all questions in the main answer book only
2. Q.No. I will have 20 very short answer type Questions (not more than 20 words) of half marks each covering entire syllabus.
3. Each paper is divided into four units. There will be one question from each unit. These Q.No. 2 to 5 will have internal choice.

B.Sc. Part-III
Paper-I : Plant Morphology And Anatomy

Unit-I

The basic body plan of flowering plant- diversity of plant form in annuals, biennials and perennials; branching pattern; monopodial and sympodial growth; meristematic, simple, complex and secretary tissues.

Unit-2

Cambium and its functions, formation of secondary xylem; a general account of wood structure growth rings; sapwood and heartwood; secondary phloem-structure and function; peridern. Anomalous secondary growth.

Unit-3

The leaf: arrangement and diversity in size and shape: Stomata- Structure and types, stomatal index. Senescence and abscission.

The root system: structural modification and root microbial interaction.

Unit-4

Morphology and anatomy of seed (monocotyledons and dicotyledons): Significance of seedsuspended animation, dispersal strategies. Vegetative propagation.

Suggested readings:

- Cutter. F.G. 1969 Part I cells and tissues Edward Arnold. London.
- Cutter.E.G. 1971 Plant Anatomy Experiment and interpretation, part II, Organs educated Arnold; London
- Esan. K. 1977 Anatomy of Seed Plants, 2nd edition John Wiley & Sons, New York
- Fahn. A. 1985 Plant Anotomy Pergamon Press Oxford.
- Hartman H.T. and Kestler, D.E. 1976 Plant Preparation Principles and of India Pvt. Ltd. New Delhi.
- Manseth.J.D. 1988 Plant Anatomy. The Benjamin/Cumming Publishing co. Inc. Mento Park. California, USA,

Suggested Laboratory Exercises:

1. Study of any Commonly occurring Plant to understand the body plan and modular type of growth.
2. Life forms exhibited by flowering plants visit to a forest or a garden)
3. L.S. of shoot tip to study the organization of meristem and origin of leaf primordial.
4. Monopodial and Sympodial types of branching in monocots & dicots.
5. Anatomy of Primary and Secondary growth in monocots and dicots using hand out sections of sunflower, maize, cucurbita stem and roots.
6. Anamolous secondary growth in stem, Salvadora. Bignonia. Bougainvillia. Bouhaenia myctanthes Leptadema, Deacena.
7. Study of diversity on leaf shape and size Internal structure of leaf-Dorsiventral and isobilateral leaves, study of stomatal types.
8. Examination of seed (monocot and dicots) Structure seed viability test.
9. Specimen study of modifications of plant parts for Negetive reproduction

B.Sc. Part-III

PAPER-II : Ecology and Economic Botany

Unit-I

Plants and Environment: Atmosphere (four distinct zone viz. stratosphere, troposphere, mesosphere, and thermosphere). Adaptation(Morphological, anatomical and physiological responses) of plants to water (Hydrophytes and Xerophytes). Light (global radiation, photosynthetically active radiation. Zonation in water body: littoral, limnetic and profoundal zones; Photoperiodism, heliophytes and sciophytes). Temperature (Raunker's classification of plants: megatherm, mesotherm, microtherm, heikistotherm; themoperiodicity and vernalisation). Soil (soil Profile, development-weathering and maturation). Soil texture, soil types, role of pH, organic matter (EPA remain).

UNIT-II

Population ecology, Community, Ecosystem and Phytogeography: Community characteristics: stratification, life forms and biological spectrum. Ecological succession: types (primary and secondary), mechanism, nudation, migration, ecocis, reaction and climax, xerosere, hydrosere; Ecosystems; Structure- abiotic and biotic components, trophic level, food chain, food web, ecological pyramids, energy flow (Box and Pipe model of Odum). Vegetation types of Rajasthan. Endangered plants of Rajasthan.

UNIT-III

Basic concept of center of origin of cultivated plants. Food plants. Wheat, maize, sugarcane. Vegetables: general account with a note on radish, onion, garlic, cauliflower, cucumber, tomato, lady finger and pea. Fruits: General account with a note on banana, ber, mango, jamun, watermelon, guava and orange. Vegetable oil: Ground nut, mustard.

UNIT-IV

Spices: General account with an emphasis on those cultivated in Rajasthan (Cumin, Capsicum, Coriander). Beverages: Tea and Coffee. Medicinal plants: General account with an emphasis. Fibres: Cotton and jute. Rubber. Ethnobotany: A general account.

Practical Exercise:

1. Study frequency and density, abundance plant species of campus vegetation by quadrate method.
2. Variation in soil moisture in relation to depth.
3. To estimate bulk density of grassland and woodland soil.
4. To estimate the porosity of grassland and woodland soil sample.
5. To determine moisture content of grassland and wood land soil.

6. To measure dissolved oxygen content in polluted and unpolluted water samples.
7. To measure temperature of different water bodies.
8. Water holding capacity of the soil.
9. Find out pH of soil sample by universal indicator method.
10. Find out pH of water sample by pH meter.
11. Find out transparency of waterbody by sechhidisk.
12. Study morphology (external and internally) of hydrophytes (Hydrilla stem, Typha leaf and Nymphaca/Eichhornia petioler and xerophytes (Calotropis, Capparis and Casuarina stem, Nerium leaf with reference to their adaptations.
13. Study following specimen with special reference to:
    1. Botany of the economically important part.
    2. processing, if any involved.
    3. Specimen of cereals, pulses, spices beverage (Tea & coffee) beans, sugar, or seeds (mustard, groundnut)
14. Study of starch grain in potato and pea histochemical test cellulose, lignin, starch Fat, protein and tannin.
15. Submits specimens of locally important medicinal Plants.

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B.Sc. Part-III

PAPER-III : Angiosperm - Taxonomy and Embryology

UNIT-I

Introduction of Taxonomy, Units of classification, Concept of genus and species, Botanical Nomenclature, International code of Botanical Nomenclature.

Types of systems of classification : Bentham and Hooker's, Engler's, Engler and Prantle's system.

Diversity of flowering plants illustrated by members and economic importance of the following families: Apiaceae and cucurbitaceae.

UNIT-II

Rubiaceae, Apocynaceae, Asclepieadaceae, Convolvulaceae, Lamiaceae, Chenopoliaceae, Euphorbiaceae, Liliaceae.

UNIT-III

Structure of anthor, Microsporogenesis, Tapetum-Types and functions, development of male gametophyte.

Types of ovules and Megasporogenesis, development of female gametophyte (Embryosac). Fertilization, double fertilization, significance of double fertilization.

UNIT-IV

Development of dicot and monocot embryo. Formation of embryo, Types of Embryo. Endosperm, Types of Endosperm, Endosperm haustoria. Polyembryony, Parthenocarpy.

Taxonomy

The following are suitable for study of families.

1. Ranunculaceae: Ranunculus, Delphinium
2. Fabceae: Pisum Sativum

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