B. Sc. (HONS.) BOTANY

1st Semester

PAPER CODE	PAPER NAME	INTERNAL	EXTERNAL	TOTAL
BSHB101	Cryptogams	40	60	100
BSHB102	Lab. work based on Course	60	40	100
Total		**100**	**100**	**200**

2nd Semester

PAPER CODE	PAPER NAME	INTERNAL	EXTERNAL	TOTAL
BSHB201	Microbiology, Plant Pathology, Cytology and Genetics	40	60	100
BSHB202	Lab. work based on Course	60	40	100
Total		**100**	**100**	**200**

3rd Semester

PAPER CODE	PAPER NAME	INTERNAL	EXTERNAL	TOTAL
BSHB301	Phanerogams	40	60	100
BSHB302	Lab. work based on Course	60	40	100
Total		**100**	**100**	**200**

4th Semester

PAPER CODE	PAPER NAME	INTERNAL	EXTERNAL	TOTAL
BSHB401	Ecology, Physiology and Biochemistry	40	60	100
BSHB402	Lab. work based on Course	60	40	100
Total		**100**	**100**	**200**

5th Semester

PAPER CODE	PAPER NAME	INTERNAL	EXTERNAL	TOTAL
BSHB501	Comparative studies of Cryptogams	40	60	100
BSHB502	Comparative studies of Phanerogams	40	60	100
BSHB503	Plant Ecology	40	60	100
BSHB504	Lab. work based on Course	60	40	100
BSHB505	Lab. work based on Course	60	40	100
BSHB506	Lab. work based on Course	60	40	100
Total		**300**	**300**	**600**

6th Semester

PAPER CODE	PAPER NAME	INTERNAL	EXTERNAL	TOTAL
BSHB601	Plant Metabolism, Biochemistry and Biotechnology	40	60	100
BSHB602	Microbiology and Plant Pathology	40	60	100

BSHB603	Cytogenetics and Evolutionary Processes	40	60	100
BSHB604	Lab. work based on Course	60	40	100
BSHB605	Lab. work based on Course	60	40	100
BSHB606	Lab. work based on Course	60	40	100
BSHB607	Field Study*	60	40	100
Total		**360**	**340**	**700**

*Subject to sanction of leave of absence on duty/duty leave to the accompanying teachers

B.SC. (HONS.) BOTANY

SEMESTER I

BSHB101: CRYPTOGAMS

General classification of Cryptogams; study of structure, reproduction and life history of the following representative forms included in various groups

Section A: Algae

1. Main characteristics of Chlorophyceae, Xanthophyceae, Phaeophyceae, Rhodophyceae and Cyanophyceae

2. Chlorophyceae: Volvox, Oedogonium, Draparnaldiopsis

3. Xanthophyceae: Vaucheria

4. Phaeophyceae: Ectocarpus, Sargassum

5. Rhodophyceae: Polysiphonia

6. Cyanophyceae: Nostoc, Scytonema

Section B: Fungi

1. General characteristics of Mastigomycotina , Zygomycotina, Ascomycotina, Basidiomycotina and Deuteromycotina

2. Mastigomycotina: Saprolegnia, Albugo

3. Zygomycotina: Rhizopus

4. Ascomycotina: Peziza

5. Basidiomycotina: Agaricus, Puccinia

6. Deuteromycotina: Alternaria, Cercospora

Section C: Bryophytes

1. General characteristics of Hepaticopsida, Anthocerotopsida and Bryopsida

2. Hepaticopsida: Marchantia

3. Anthocerotopsida: Anthoceros

4. Bryopsida: Funaria

Section D: Pteridophytes

1. Important characteristics of Psilophyta, Lycophyta, Sphenophyta and Filicophyta; Various types of steles

2. Lycophyta: Selaginella

3. Sphenophyta: Equisetum

4. Filicophyta: Pteris

BSHB102: Lab. work based on Course

SEMESTER II

BSHB201: MICROBIOLOGY, PLANT PATHOLOGY, CYTOLOGY and GENETICS

Section A: Microbiology and Plant Pathology

1. History and scope of Microbiology

2. Position of microorganisms in the living world; morphological, metabolic and molecular criteria for the classification of bacteria (scheme not required)

3. Structure of a bacterial cell: capsule and slime, flagella, cell wall, cell membrane, chromosome, plasmid and endospore

4. Structure of bacteriophages belonging to 'T' series

5. Lysogenic and lytic cycles

6. A brief account of genetic recombination in bacteria (transformation, conjugation and transduction)

7. Role of microorganisms in cycling of carbon and nitrogen.

8. Microorganisms and the production of alcoholic beverages, antibiotics and single cell protein

9. General symptoms of viral, bacterial and fungal diseases of plants.

10. The study of the following plant diseases: Tobacco mosaic, citrus canker, late blight of potato, powdery mildew of pea, loose smut of wheat, covered smut of barley and wilt of pigeon pea

Section B: Cytology and Genetics

1. Ultrastructure of plant cell: Nucleus, cytoskeleton

2. Cell cycle: Interphase nucleus: euchromatin and heterochromatin, mitosis, meiosis; genetic significance of meiosis

3. Basic tenets of cytogenetics: Terminologies: Cytology, genetics, cytogenetics, cell and cell theory, germplasm theory, genotype-phenotype concept

4. Mendel's laws of inheritance: Law of dominance, law of segregation, law of independent assortment, deviations from Mendel's laws (Neo-Mendelism)

5. Interaction of genes: Intragenic and intergenic interactions, incomplete dominance, lethal genes, complementary genes, supplementary genes, inhibitory genes, duplicate genes, epistatic genes

6. Linkage and crossing over: Interrelationships and importance, crossing over and meiosis, cytological basis of crossing over, crossing over and linkage maps, linkage groups, interference

7. Sex determination: Bases of sex determination, chromosome theory of sex determination, sex determination in plants

8. Theories of organic evolution: Theory of inheritance of acquired characters (Lamarckism), theory of natural selection (Darwinism), de Vries Mutation theory, synthetic theory

BSHB202 Lab. work based on Course

SEMESTER III

BSHB301: PHANEROGAMS

Gymnosperms:

(a) Classification (Sporne) (b) Morphology, anatomy, reproduction and economic importance of:

Cycas, Pinus, Ephedra

Angiosperms:

(a) Taxonomy:

1. Bentham and Hooker's system of classification: Principles, outline, merits and demerits
2. Distinguishing characteristics of the following families and their economic importance: Ranunculaceae, Papaveraceae, Rosaceae, Myrtaceae, Apiaceae, Cucurbitaceae, Rubiaceae, Asclepiadaceae, Apocynaceae, Acanthaceae, Solanaceae, Lamiaceae, Amaranthaceae, Poaceae
3. Brief account of Plant collection and herbarium techniques and important herbaria of world

(b) Anatomy of stems and roots with special reference to plants showing anomalies:

Stem: Nyctanthes, Bignonia, Strychnos, Boerhaavia, Laptadenia, Dracaena, and root: Vanda

(c) Embryology - General Account

1. Microsporangium and Microsporogenesis
2. Megasporangium and Megasporogenesis
3. Male gametophyte
4. Female gametophyte (monosporic, bisporic and tetrasporic embryosac)
5. Double fertilization
6. Endosperm (Different modes of development, functions of endosperm)
7. Embryogeny: (Classification, development of any typical dicot and monocot embryo)

BSHB302 Lab. work based on Course

SEMESTER IV

BSHB401: ECOLOGY, PHYSIOLOGY and BIOCHEMISTRY

Section A: Ecology

1. Introduction to ecology

2. Environment: Abiotic and biotic environment; plant adaptations in response to water, temperature and light

3. Population ecology: Population characteristics; ecotypes and ecads

4. Community ecology: Community characteristics; frequency, density, cover, IVI; life forms and biological spectrum

5. Ecosystem ecology: Ecosystem structure (abiotic and biotic components, food chain, food web, ecological pyramids); ecosystem function (energy flow, biogeochemical cycles of carbon and phosphorus)

6. Ecological succession: Types and pattern

7. Biogeographical regions of India

Section B: Physiology and Biochemistry

1. Water relation of plants: Water potential, water absorption, loss of water

2. Cell Membrane: Structure, transport/Ion transport

3. Transport of solutes: Sugar translocation

4. Mineral nutrition of plants: Role of micro-and macronutrients, deficiency symptoms of nutrients

5. Photosynthesis: Structure of chloroplast, absorption of light, transfer of light energy, electron transport, photophosphorylation, C3, C4 and CAM pathways of carbon fixation, photorespiration

6. Respiration: Structure of mitochondria, glycolysis, TCA cycle, electron transport, oxidative phosphorylation

7. Nitrogen metabolism: Forms of nitrogen, assimilation of nitrate

8. Protein Synthesis: Types of RNA, transcription, translation

9. Enzymes: Classification, nomenclature, mechanism of action (binding to substrate, lowering of activation energy), factors controlling enzyme activity

10. Plant growth hormones: Physiological role of auxins, gibberellins, cytokinins, abscisic

acid and ethylene

11. Phytochrome: Structure and function

BSHB402: Lab. work based on Course

SEMESTER V

BSHB501: COMPARATIVE STUDIES OF CRYPTOGAMS

Section A: Algae

1. Classification (Fritsch's system) of algae and general characteristics of major classes
2. Pigmentation and storage products
3. Thallus organization and evolutionary tendencies
4. Reproduction and life history types with reference to Chlorophyceae, Phaeophyceae, Rhodophyceae and Cyanophyceae
5. Economic importance of algae

Section B: Fungi

1. General features of fungi and their classification (Ainsworth's system)
2. Structure, reproduction and life cycle of representative classes of fungi
3. Types of fungal spores and mode of their liberation
4. Evolutionary trends in fungi
5. Economic importance of fungi

Section C: Bryophytes

1. General features and classification of Bryophyta (Smith's system)
2. Life histories of bryophytes with reference to Cyathodium, Pellia, Notothylus, Sphagnum and Polytrichum
3. General account of evolution of sporophyte

Section D: Pteridophytes

1. General features and contemporary system of classification of Pteridophyta
2. Stelar evolution in Pteridophyta
3. Evolutionary tendencies in sporangia
4. Life histories of Psilotum, Isoetes, Adiantum, Ophioglossum, Marselia

BSHB502: COMPARATIVE STUDIES OF PHANEROGAMS

Section A: Gymnosperm

1. Classification of Gymnosperms and general account of morphology and reproduction of the following: Cycadales (Zamia), Ginkgoales (Ginkgo), Coniferales (Biota) and Gnetales (Gnetum)

2. General account of Williamsonia and Pentaxylon

3. Phylogenetic trends in Gymnosperms

4. Distribution of living Gymnosperms in India

Section B: Angiosperm

1. Classification of Angiosperms (Takhtajan) and general account of numerical and chemotaxonomy

2. Distinguishing characters of the following families and their economic importance: Annonaceae, Rutaceae, Meliaceae, Asteraceae, Convolvulaceae, Scrophulariaceae, Verbenaceae, Polygonaceae, Euphorbiaceae, Moraceae, Zingiberaceae, Liliaceae, Cyperaceae

3. Embryology: General account of polyembryony, apomixis and experimental embryology with reference to anther and embryo culture

BSHB503: PLANT ECOLOGY

1. Population: Patterns and concepts, population growth, mechanisms of population differentiation

2 Community: Community characteristics and their analyses, species diversity, niche

3. Ecosystem: Concept, components and organisation; primary productivity and its measurement; energy flow; nutrient cycling within ecosystems (C, N and P)

4. Mechanisms of ecological succession; concept of climax

5. Environmental pollution: Water Pollution: Sources and kinds, impact of pollution on aquatic ecosystems, eutrophication of water bodies; Air Pollution: Sources and kinds, impact of air pollution on plants; acid rain, causes and effects; Soil Pollution: Sources and kinds, impact on plants and ecosystems

6. Ecotoxicology: Concept of toxicity and its ecological implications, important toxicants; dose

response relationship; role of ecological factors in modifying toxicity, biomagnification

BSHB504: Lab. work based on Course BSHB501

BSHB505: Lab. work based on Course BSHB502

BSHB506: Lab. work based on Course BSHB503

SEMESTER VI

BSHB601: PLANT METATBOLISM, BIOCHEMISTRY and BIOTECHNOLOGY

1. Biosynthesis of carbon compounds: Sucrose, Starch, Cellulose, Lipids

2. Sulphur and phosphorus metabolism: Activation and assimilation of sulphur, energy-rich phosphorus compounds; ATP synthesis

3. Nitrogen metabolism: Biological nitrogen fixation: The enzyme nitrogenase, substrate for nitrogenase, mechanism; Nitrate metabolism: Uptake and reduction into ammonia, ammonia assimilation

4. Nucleic acids: Structure and properties of different forms of DNA and RNA, DNA replication

5. Protein structure and synthesis: Basic aspects of protein conformation, protein synthesistranscription (mRNA processing), translation (activation of amino acids, initiation, elongation, termination & release of peptides), post-translational modification of proteins

6. Enzymes: Mechanism of enzyme action, coenzymes, allosteric enzyme, isozymes

7. Biosynthesis and mode of action of: Auxins, Gibberellins, Cytokinins, Abscisic acid, Ethylene

8. Biotechnological tools and techniques: Cloning vectors, recombinant DNA techniques, transgenic plant production

BSHB602: MICROBIOLOGY and PLANT PATHOLOGY

Section A Microbiology:

1. Introduction and scope of Microbiology

2. General account of: Methanococcus, Halobacterium, Agrobacterium, Mycoplasma and Thermoplasma

3. Growth of microorganisms in batch culture

4. General account of structure and replication of viruses with special reference to cyanophage LPP1, TMV and retroviruses

5. Mechanisms of transformation, conjugation and transduction in bacteria

6. Fermentation technology for production of lactic and acetic acid

7. Role of microorganisms in degradation of aromatic hydrocarbons

8. Nitrogen fixation by free-living and symbiotic microorganisms; ammonification; nitrification and denitrification

9. Role of microorganisms in genetic engineering

Section B Plant Pathology:

1. History and scope of plant pathology

2. Modes of infection and physiology of parasitism

3. Mechanisms of host - pathogen interactions

4. Transmission and spread of plant diseases

5. Methods of plant disease control

6. Causal organism, symptoms, disease cycle and control measures of the following plant diseases: Green ear disease of bajra, downy mildew of crucifers, powdery mildew of sheesham, rusts of pea and linseed, smut of bajra, wilt of tomato, bacterial blight of rice, mosaic of sugarcane and little leaf of brinjal

BSHB603: CYTOGENETICS and EVOLUTIONARY PROCESSES

1. Chromosome structure: Physical architecture, chemical composition, ultrastructural organisation

2. Chromosome structural aberrations: Deletion, duplication, inversion, translocation, origin, cytological and genetical consequences, permanent translocation heterozygosity

3. Genomic variations: Aneuploidy: monosomics, trisomics, nullisomics, polyploidy: autopolyploidy, allopolyploidy, segmental allopolyploidy, autoallopolyploidy, sources and consequences of chromosomal anomalies

4. Evolution of karyotype and its importance: Concept and components of karyotype, trends of karyotype evolution, karyotype in systematics and evolution of species

5. Mapping of genes on chromosomes: Physical and Genetic maps, deletion mapping, linkage analysis, somatic cell fusion, In situ hybridization

6. Multiple alleles and multiple factors: multiple allelism, ABO and Rh blood groups in man, eye colour in Drosophila, self sterility in plants, quantitative inheritance, kernel colour in wheat, skin colour in human beings, enhancer and suppresser genes

7. Non-Mendelian inheritance and organellar genetics: Maternal influence, coiling in snail shells, plastid inheritance in Mirabilis jalapa, petites in fungi, kappa particles in Paramecium, sex factor in bacteria

8. Mutation and mutagens: Types of mutation, molecular basis of mutation, physical and chemical mutagens and mechanism of their action

9. Hybridization and its role in evolution: Heterosis, theories of hybrid vigour, evolutionary significance

BSHB604: Lab. work based on Course BSHB601

BSHB605: Lab. work based on Course BSHB602

BSHB606: Lab. work based on Course BSHB603

BSHB607: FIELD STUDY