

B.Sc. BOTANY PROGRAMME – Course Structure Under CBCS
(For the candidates admitted from the academic year 2015-2016 onwards)

SL. No	Sem	Paper	Hrs/Week	Credit	Exam Hrs.	Marks		
						Internal	External	Total
1	I	Part - I	6	3	3	25	75	100
2	I	Part - II	6	3	3	25	75	100
3	I	Major Paper – I – Plant Diversity - I	6	5	3	25	75	100
	I	Major Practical – I *	3		3			
	I	Allied Paper – I (Bot for Zoology Students)	3		3	25	75	100
	I	Allied Practical – II * (Bot for Zoology Students)	2					
4	I	Environmental Studies	2	2	3	25	75	100
	I	Soft Skill Paper – I* Mushroom Culture	2					
5	II	Part - I	6	3	3	25	75	100
6	II	Part - II	6	3	3	25	75	100
7	II	Major Paper – II- Plant Diversity - II	6	5	3	25	75	100
8	II	Major Practical – I* - Plant Diversity - I	3	4	3	40	60	100
9	II	Allied Paper – I (Bot for Zoology Students)	3	5	3	25	75	100
10	II	Allied Practical – II * (Bot for Zoology Students)	2	5		40	60	100
11	II	Value Education	2	2	3	25	75	100
12	II	Soft Skill Paper – I* Mushroom Culture	2	4	3	25	75	100
13	III	Part - I	6	3	3	25	75	100
14	III	Part - II	6	3	3	25	75	100
15	III	Major Paper – III - Cytology, Anatomy, Embryology and microbiology	5	4	3	25	75	100
	III	Major Practical – II*	3					
	III	Allied Paper – III*(Bot for Chemistry Students)	3					
	III	Allied Practical – IV* (Bot for Chemistry Students)	3					
16	III	Non Major Elective Paper – I Computer Application in Biological Science (Botany Students)	4	2	3	25	75	100
17	IV	Part – I	6	3	3	25	75	100
18	IV	Part – II	6	3	3	25	75	100
19	IV	Major Paper – IV- Microbiology	5	4	3	25	75	100
20	IV	Major Practical – II*	3	4	3	40	60	100
21	IV	Allied Paper – III* (Bot for Chemistry Students)	3	5	3	25	75	100
22	IV	Allied Practical – IV* (Bot for Chemistry Students)	3	5	3	40	60	100
23	IV	Soft Skill Paper – II- Biofertilizer	4	4	3	25	75	100
24	V	Major Paper – V-Morphology, Taxonomy & Economic Botany	4	4	3	25	75	100
25	V	Major Paper – VI- Ecology, Biodiversity, Remote Sensing	4	4	3	25	75	100
26	V	Major Paper – VII-Nursery Technology & Horticulture	5	4	3	25	75	100
	V	Major Practical – III*	3					
	V	Major Practical – IV*	3					
27	V	Elective Paper – I – Forestry	5	5	3	25	75	100
28	V	Non Major Elective Paper – II – Medical Botany For Zoology Students	2	2	3	25	75	100
29	V	Soft Skill Paper – III Bio-resources and Human Welfare	4	4	3	25	75	100
30	VI	Major Paper – VIII – Plant Breeding, Genetics and Evolution	5	5	3	25	75	100
31	VI	Major Paper – IX-Plant Physiology, Biochemistry and Biophysics	5	5	3	25	75	100
32	VI	Major Paper – X Biotechnology & Tissue culture	4	4	3	25	75	100
33	VI	Major Practical – III*	3	4	3	40	60	100
34	VI	Major Practical – IV*	3	4	3	40	60	100
35	VI	Elective Paper – II- Biostatistics and	5	5	3	25	75	100

		Bioinformatics							
36	VI	Elective Paper - III-Bioinstrumentation	4	4	3	25	75	100	
37	VI	Gender Studies	1	1	3	25	75	100	
		Extension Activities		1					
			180	140					
		* Exams will be held at the end of even semester							3700

Semester – I
CORE COURSE I – PLANT DIVERSITY I

(Algae, Fungi, Lichen and Plant Pathology)

Course code	: JSBTA1
Hours per week	: 6
Credit	: 5
Internal Marks	: 25
External Marks	: 75

Unit I

General characteristic features of algae, classification (Fristch, 1935), Salient features of Cyanophyceae – life cycle of *Oscillatoria*. Chlorophyceae, life cycle of *Chlamydomonas*, *Oedogonium*.

Unit II

Salient features of Xanthophyceae and life cycle of *Vaucheria* – Salient features of Phaeophyceae and life cycle of *Sargasum* – Salient features of Rhodophyceae and life cycle of *Polysiphonia*.

Unit III

General characteristics features of fungi – Alexopoulos and Mims classification – Salient features of Oomycetes and life cycle of *Albugo*, Salient features of Ascomycetes and life cycle of *Peziza*, Salient features of Basidiomycetes and life cycle of *polyporus*.

Unit IV

Lichen : Habit- Salient features – types – reproduction and importance – Ascocarp – type study: *Usnea*

Unit V

Plant disease : definition and terminologies – red rot of sugarcane – brown spot of rice – tikka disease of ground nut – citrus canker disease – Tobacco Mosaic Virus.

REFERENCES:

- Fritsch FE – The structure and reproduction of Algae, Vol. I & II, Cambridge University Press, Cambridge, UK.
- Vashista BR – Botany for degree students –Algae, S Chand & Co. (P) Ltd., New Delhi
- Alexopoulos CJ, Mims CW and Blackwell M – Introductory Mycology, John Wiley & Sons, Singapore.
- Rangaswami G and Mahadevan A – Diseases of crop plants in India, Prentice Hall of India (P) Ltd., New Delhi.
- Mehrothra RS – Plant Pathology, TaTa MacGraw Hill Publishing Co., New Delhi.

Semester – I & II

SKILL BASED COURSE I – MUSHROOM CULTURE

Course code	: JSBBTEC1
Hours per week	: 2
Credit	: 4
Internal Marks	: 25
External Marks	: 75

Unit I

Characters and taxonomy of edible fungi – nutritive value and importance of mushroom culture – poisonous mushrooms.

Unit II

Production of Oyster mushroom and *Pleurotus*: Pure culture production – media preparation, sterilization methods and culture room maintenance

Unit III

Isolation of mushroom fungus – spawn preparation – methods of inoculation – multiplication of spawn from mother spawn.

Unit IV

Commercial production – straw cutting shed – straw sterilization – preparation of cylindrical beds – weed moulds, pests and diseases on mushroom – harvesting of mushroom and post harvest techniques.

Unit V

Long term storage: drying – canning – freezing – liquid preservation. Marketing potential: urban – rural – domestic – food industries.

REFERENCES:

- Sharma PD *The fungi*. Rastogi Co., Ahmedabad.
- Krishna kumar P *Kalanvalarppom*. New Centaury Book House Pvt. Ltd., Chennai.
- Dept. of Plant Pathology - project *Oyster mushroom production*. TNAU Coimbatore.

Semester – II

CORE COURSE III – PLANT DIVERSITY II

(Bryophytes, Pteridophytes, Gymnosperms and Paleobotany)

Course code	: JSBTC2
Hours per week	: 6
Credit	: 5
Internal Marks	: 25
External Marks	: 75

Unit I

General characteristics and classification (Rothmaler) of Bryophytes – salient features of Hepaticopsida and life cycle of *Marchantia* – salient features of Anthocerotopsida and life cycle of *Anthoceros* – salient features of Bryopsida and life cycle of *porella*

Unit II

General characteristics of Pteridophytes – Takhtajan & Zimmermann (1966) classification – theories of bryophytic origin of pteridophytes. – Stellar evolution.

Unit III

Salient features of Psilotopsida and life cycle of *Psilotum* – salient features of Lycopsidea and life cycle of *Lycopodium* – salient features of Sphenopsida and life cycle of *Equisetum* – salient features of Filicopsida and life cycle of *Marsilia*.

Unit IV

General characteristics of Gymnosperms – Sporne (1965) classification – Salient features of Cycadopsida and life cycle of *Cycas* – salient features of Coniferopsida and life cycle of *Pinus* – salient features of Gnetopsida and life cycle of *Gnetum*.

Unit V

Paleobotany – definition – fossil formation, types – geological time scale – *Rhynia* – *Lepidodendron* – *Williamsonia*.

REFERENCES:

- Vashista BR, Text Book of Botany-Bryophytes, S. Chand and Company.
- Parihar NS, An Introduction to Embryophyta Vol. II Bryophyta, Central Book Department, Allahabad.

Semester – IV
SKILL BASED COURSE II - BIOFERTILIZERS

Course code	: JSBBTEC2
Hours per week	: 4
Credit	: 4
Internal Marks	: 25
External Marks	: 75

Unit I

Biofertilizer : definition – classification – potentials and problems – agricultural importance over chemical fertilizers. Blue green algae : agriculture importance – large scale production.

Unit II

Azolla as biofertilizer – culture and utilization – methods of application – crop response. Mass production.

Unit III

Rhizobium as biofertilizer – characteristics – infection mechanism in legums – large scale production – methods of application – crop response. Vize – soil, root, folior, rootcut, Top leaf clipping.

Unit IV

Azetobacter and *Azospirillum* as biofertilizer – characteristics – preparation of inoculants – methods of application – field response of crop.

Unit V

Phosphate Solublising Bacteria (PSB) : Role in enrichment of soil fertility Production of mycorrhizal biofertilizers,- VAM fungi and its application.

REFERENCES:

- Sen SP and Palit P *Biofertilizers potentialities and problems*. Plant Physiology Forum, Culcutta
- Tilak KVBR *Bacterial fertilizers*. ICAR, New Delhi.
- Dubey RC *A textbook of Microbiology*. S. Chand & Co. Pvt. Ltd., New Delhi.
- Singh RN *The role of BGA in Nitrogen economy in Indian agriculture*. ICAR, New Delhi.
- Venkataraman GS *The algal biofertilizers and rice cultivation*. T & T Publications

Semester I & II

Core Course - II

PRACTICAL I – PLANT DIVERSITY I & II

(Algae, Fungi, Lichen, Plant pathology, Bryophytes, Pteridophytes, Gymnosperms and Paleobotany)

Course code	: JSBTB2P
Hours per week	: 3
Credit	: 4
Internal Marks	: 40
External Marks	: 60

Algae

- Microscopic observation of algal types and their slides included in the syllabus.
- Section cutting of *Polysiphonia* thallus.
- Identification of algal types in the algal mixture (only microscopic types).

Fungi

- Microscopic observation of slides of genera included in the syllabus.
- Section cutting of *Albugo* infected leaf, *Polyporus* infected leaf and apothecium of *Peziza*.

Lichen

- Observation of different thalli of Lichens.
- Microscopic observations of slides of *Usnea*.

Plant pathology

- Observation of host plants infected by the pathogens included in the syllabus and study of control measures

Bryophytes

- Section cutting of gametophytes of *Marchantia*, *Anthoceros*.
- Microscopic observation of slides of genera included in the syllabus.

Pteridophytes

A study of the morphology, anatomy of the vegetative and reproductive parts of the sporophyte and gametophytes (wherever available) of living genera included in the syllabus and analysis of their slides.

Gymnosperms

A study of the morphology, anatomy of the vegetative and reproductive parts of the sporophyte and gametophytes (wherever available) of living genera included in the syllabus and analysis of their slides.

Paleobotany

- Analysis of slides of fossil forms given in the syllabus

Semester III
CORE COURSE IV – CYTOLOGY, ANATOMY AND
EMBRYOLOGY

Course code	: JSBTD3
Hours per week	: 5
Credit	: 4
Internal Marks	: 25
External Marks	: 75

Unit I Microtechniques

Microscope – introduction and importance Microtechniques, micrometry, microtomes, fixation, dehydration, types of staining and microphotography

Unit II Cytology

Ultra structure of plant cell: cell wall, mitochondria, chloroplast, Nucleus, Chromosome: types of chromosome; Cell division – mitosis – meiosis – significance.

Unit III Anatomy

Meristem – types; meristems theories - Tissue – permanent tissues – mechanical tissues – vascular tissues – xylem and phloem – brief account on secondary tissues.

Unit IV Anatomy

Anatomical structure of dicot root, stem, leaf and monocot root, stem, leaf– Secondary growth in dicot root and stem – anomalous secondary growth - *Cucurbita*, *Boerhaavia*, *Bougainvallea*.

Unit V Embryology

Male gametophyte – morphology and development. Female gametophyte (*Polygonum* type) – structure and development, double fertilization, Triple fusion, endosperm types, development of embryo (dicot and monocot), polyembryony, apomixis.

REFERENCES:

- Easu K - Plant Anatomy, Wiley Eastern Ltd, New Delhi.
- Fahn A - Plant Anatomy, Pergoman press, Oxford.
- Maheswari P - An introduction to the Embryology of Angiosperms, Tata McGraw Hill Publishing Co, Ltd., New Delhi
- Bhojwani SS and Bhatnagar SP - The Embryology of Angiosperms, Vikas publishing house Pvt. Ltd., New Delhi
- Shukla RS and Chandel PS – Cytogenetics, Evolution and Plant breeding, S Chand and Co, New Delhi.

Semester IV
CORE COURSE VI – MICROBIOLOGY

Course code	: JSBTE4
Hours per week	: 5
Credit	: 4
Internal Marks	: 25
External Marks	: 75

Unit I

Whittaker's five kingdom concept – Prokaryotic and Eukaryotic microbes – general features of protozoa and viruses (classification, characteristics, ultra structure, economic importance)

Unit II

Bacteria – classification (Bergey's recent Edn.) General account, ultra structure, nutrition, growth, reproduction and economic importance.

Unit III

Food microbiology – milk and milk based products (Cheese), Food contamination and control measures (Fruits & vegetables; Meat and marine products).

Unit IV

Industrial microbiology – fermentation, types of fermentors and their applications. Large scale production of ethanol, vinegar and citric acid. Antibiotics – classification, sources and production of penicillin, vaccines and enzymes.

Unit V

Environmental microbiology – microbial remediation of industrial effluents– microbial preservation of raw materials, enzymatic treatment during industrial process, Waste treatment – solid (compost) and liquid (sewage).

REFERENCES:

- Casida LE *Industrial Microbiology*. Wiley Eastern, New Delhi.
- Martin Alexander *Introduction to Soil Microbiology*. Wiley Eastern, New Delhi.
- Subba Rao NS *Soil Microbiology*. Oxford & IBH Publishers, New Delhi
- Ketchum *Microbiology*. John Wiley & Son.
- Frazier NC *Food Microbiology*. Tata McGraw Hill, New Delhi.
- Pelezar J Chen ECS and Krieg R *Microbiology*. Tata McGraw Hill, New Delhi.

Semester IV
Core Course V
PRACTICAL II – CYTOLOGY, ANATOMY, EMBRYOLOGY AND
MICROBIOLOGY

Course code	: JSBTF4P
Hours per week	: 3
Credit	: 4
Internal Marks	: 40
External Marks	: 60

Cytology

- Study of cell structure of plants and its organelles using electron micro-graphs from standard publications.
- Study of mitosis by squash technique using onion root tips or study of smear technique using Rheo anthers.

Anatomy

Preparation of transverse section of the following plant parts to observe and record the internal structure:

- Monocot and dicot roots (primary structure)
- Monocot and dicot stems (primary structure)
- Monocot and dicot leaves (primary structure)
- Normal secondary thickening in Dicot stem and root
- Anomalous secondary thickening in *Cucurbita*, *Boerhaavia*, *Bougainvallea*.

Embryology

- T.S of anther at various stages of developments.
- Study of permanent slides showing developmental stages of female gametophyte.
- Monocot and dicot embryos.
- Embryo mounting (Dicot embryo only).

Microbiology

- Isolation of microbes from soil – serial dilution technique.
- Gram staining of bacteria found in curd and root nodules.

Semester V

CORE COURSE VII - MORPHOLOGY, TAXONOMY & ECONOMIC BOTANY

Course code	: JSBTG5
Hours per week	: 4
Credit	: 4
Internal Marks	: 25
External Marks	: 75

Unit I Vegetative Morphology:

General morphology of a flowering plant. Structure, type and modifications of root and leaf.

Unit II Reproductive Morphology:

Structure and type of Inflorescence and fruits.

Unit III General Taxonomy

Systematic botany – ancient systems of classification – binomial nomenclature - Bentham and Hookers system of classification – Hutchinson's system of classification – brief account on ICNAFP and herbarium techniques.

Unit IV Taxonomy & Economic Botany

Detailed study of following families and Economic Importance : *Annonaceae*, *Curciferaceae*, *Capparidaceae*, *Rutaceae*, *Anacardiaceae*, *Cesalpiniaceae*, *Myrtaceae*, *Cucurbitaceae*, *Apiaceae*, *Rubiaceae*, *Sapotaceae*.

Unit V Taxonomy & Economic Botany

Detailed study of following families and Economic Importance : *Apocynaceae*, *Scrophulariaceae*, *Acanthaceae*, *Verbinaceae*, *Amaranthaceae*, *Euphorbiaceae*, *Liliaceae*, *Poaceae*.

REFERENCES:

- Pandey BP *Taxonomy of Angiosperms*. S. Chand & Co. Pvt. Ltd., New Delhi
- Lawrence GH *Taxonomy of vascular plants*. MacMillan Co., New York.
- Krishnamurthy KV and Rao KN *Angiosperms*. S. Viswanathan Publications.
- Gamble JS *Flora of the Presidency of Madras*. Sri Gouranga Press, Calcutta.
- Rendle AB *The classification of Flowering plants*. Vikas Publishing House Pvt. Ltd., U.P.
- Vashista PC *Taxonomy of Angiosperms*. S. Chand & Co. Pvt. Ltd., New Delhi.
- Hill AF *Economic Botany*. Tata McGraw Hill, Bombay.
- Sambamoorthy AVVS and Subramanian NS *A Text Book of Economic Botany*. Wileyastern Ltd., New Delhi.
- Taxonomy of Angiosperms. Subramanian N.S. Textbook.

Semester V
CORE COURSE VIII - ECOLOGY, BIODIVERSITY, REMOTE SENSING

Course code : JSBTH5

Hours per week : 4

Credit : 4

Internal Marks : 25

External Marks : 75

Unit I

Definition, branches of ecology – environment – atmosphere – hydrosphere – lithosphere – abiotic environmental factors.

Unit II

Biotic environmental factors – community ecology, bio indicators – ecological succession – hydrosere – xerosere – ecosystem.

Unit III

Food chain and Food web ecosystem – energy flow and Pyramids – nutrient cycle – biomass – special characters of hydrophytes, xerophytes and halophytes.

Unit IV

Biodiversity – types of biodiversity – importance – biodiversity loss – biosphere resources floristic regions in India – biodiversity conservation.

Unit V

Remote sensing: definition, importance and needs, Indian remote satellites – GIS and GPS.

REFERENCES:

- Verma PS and Agarwal VK *Concept of Ecology*. S. Chand & Co. New Delhi.
- Shukla RS and Chandel PS *Plant Ecology and Soil science*. S. Chand & Co. New Delhi.
- Sharma PD *Ecology and Environment*. Rastogi Publications, Meerut.
- Kumar HD *General Ecology*. Vikas Publishing House Pvt. Ltd., New Delhi.
- Krishnamoorthy KV *Advanced Text Book of Biodiversity*. Oxford IBH Publishers. New Delhi
- CPR *Biodiversity*. Environmental Education centre, Chennai.

Semester - V
CORE COURSE IX – HORTICULTURE AND NURSERY
TECHNOLOGY

Course code	: JSBTI5
Hours per week	: 5
Credit	: 4
Internal Marks	: 25
External Marks	: 75

Unit I

Horticulture – importance, scope – classification – climate, soil, water and nutritional needs of horticultural crops.

Unit II

Garden – designs and types, lawn types, establishment and maintenance; floriculture – rose, chrysanthemum; cultivation of fruit trees – mango, banana.

Unit III

Plant propagation methods - Pruning, Cutting, Layering, Grafting - stock scion relationship of citrus and apple; Role of plant growth regulators in horticulture.

Unit IV

Nursery technology – introduction, scope, infrastructure, planning and seasonal activities - green house, mist chamber, glass house. Seed collection, storage, quality, drying, cleaning, seed record. Seed pretreatment – physical and chemical methods.

Unit V

Procurement of polypots, manure, clay and sand. Preparing seed beds – sowing seeds in poly pots and beds, transplanting, potting; irrigation, weeding, mulching, protection from pests and diseases.

REFERENCES:

- Edmand Musser and Andres *Fundamentals of Horticulture*. Tata McGraw Hill, New Delhi.
- Sundarajan JS, Muthuswamy JK, Shanmugavelu G and Balakrishnan R *A guide on horticulture*. Thiruvankadam Printers, Coimbatore.
- Lex Lauries and Victor H Rice *Floriculture-Fundamentals and practices*. Tata McGraw Hill, New Delhi.
- Gardener *Basic Horticulture*. Mac Millan, New York.
- Randawa *Ornamental horticulture in India*. Today & Tomorrow Publications, New Delhi.
- *Introduction to Horticulture*. TMH Publication.
- Chaturvedi AN *Technology of forest nurseries*. Khanna Bandhu Publications, Dehra Dun.
- Katoch CD *Forest Nursery Handbook*, Periodical Experts Book Agency, New Delhi.
- Siyag PR *Afforestation Manual*. Tree Craft Communications, Jaipur.

Semester – V
ELECTIVE COURSE I – FORESTRY

Course code	: JSBTEC1
Hours per week	: 5
Credit	: 5
Internal Marks	: 25
External Marks	: 75

Unit I

Forest cover – utilization and over exploitation of forest – deforestation – modes of deforestation – causes – impact of deforestation on environment.

Unit II

Forest resources – importance of forest – forest types in India and ecological significance.

Unit III

Utilization of forest products: Timber, Fire wood, Pulp. Wood - Eucalyptus, Teak, Red sandal, Sandal and its importance.

Unit IV

Forest Movement and people's participation Chipko movement,- tribal community. Forestry: Social forestry, Agroforestry. Integrated Forest Management, - Afforestation.

Unit V

Forest conservation – prevention of fire – regulation of tree felling, fencing, protection from wild animals, reserve forest – Forest conservation Act 1980

REFERENCES:

- Kormondy, E.J. 2005 Concept of Ecology. Prentice Hall of India, New Delhi.
- Clarke, GL 1954 Elements of Ecology, John Wiley and Sons, New York.
- Chapman, RN 1928 The quantitative analysis of environmental factors *Ecology* 9:111-122.
- Champion HG and Seth 1968 A revised Survey of the forest types of India, Government of India Press, Nasik

Semester V
SKILL BASED COURSE III - BIO-RESOURCES AND HUMAN WELFARE

Course code	: JSBBTEC3
Hours per week	: 4
Credit	: 4
Internal Marks	: 25
External Marks	: 75

Unit I

Application of micro organisms in industry - food, vitamins, enzymes, antibiotics and alcohol.

Unit II

Useful products of Algae (*Spirulina*), fungi (yeast), Gymnosperms- Wood (Pine), Drugs (Ephedrine), antioxidants, (*Green tea*.)

Unit III

Study of following plants and application of the following products: beverages (coffee), narcotics (poppy), fiber (cotton), oil-seeds (sesame), latex (rubber).

Unit IV

Medicinal plants: Bioactive compounds *Azadirachta*, *Withania*, *Rauwolfia*, and *Ocimum* - their pharmacological applications. Edible plants & their importance: Cereals (Wheat), Beverages (tea), Spices (Clove) fruits (mango)

Unit V

Traditional and economically important wood plants in India: *Bambusa*, *Dalbergia*, *Tectona*.

REFERENCES:

- Hill AW *Economic Botany*. Tata McGraw Hill, New Delhi.
- Puri GS *Indian Forest Ecology*. Oxford Books and Stationary & Co.,
- Rama Rao SV *Soil Conservation in India*. ICAR, New Delhi.
- Dastur JF *Useful plants of India*. Tarapore.
- Baker GS *Plants and Cultivation*. Mac Millan Co., London.
- Sambamurthy AWS *Economic Botany*.

Semester VI

CORE COURSE XII - GENETICS, PLANT BREEDING AND EVOLUTION

Course code	: JSBTJ6
Hours per week	: 5
Credit	: 5
Internal Marks	: 25
External Marks	: 75

Unit I – Genetics

Mendel's law's of inheritance, Incomplete dominance, lethal factor, complementary factor and epistasis, multiple factor.

Unit II – Genetics

Linkage, crossing over, recombination, mapping of genes on the chromosomes, sex linkage – Sex determination in plants. Functional units of gene – cistron, recon, muton, codon, operon.

Unit III Plant Breeding

Basic principles in plant breeding – selection of characters – selfing and crossing techniques - bulk and pedigree method of selection.

Unit IV Plant Breeding

Back crossing in breeding depression and heterosis. Genetic basis and application in plant breeding, induced polyploidy in plant breeding, role of auto and allo polyploidy

Unit V – Evolution

Origin of life, evolutionary concepts of life. Theories of Lamarck, Charles Darwin, Hugo de vries and modern synthetic of evolution.

REFERENCES:

- Winchester AM *Genetics*. Oxford & IBH Publishing House, New Delhi.
- Strickberger MW *Genetics*. MacMillan Publishing Co., New Delhi
- Jain HK *Genetics –Principles, concepts and implications*. Oxford & IBH Publishing House, New Delhi.
- Gupta PK *Genetics*. Rastogi Publications, Meerut.
- Savage JM *Evolution*. Amarimd Publishing Co. Pvt. Ltd., New Delhi.
- Gottlieb LD and Jain PS *Plant Evolutionary Biology*. Chapman & Hall, London.
- Verma PS and Agarwal VK *Concepts of Evolution*. S. Chand & Co., New Delhi.
- Bhaudai MM *Practical Plant Breeding*. Oxford & IBH Publishing House, New Delhi.
- Allard *Principles of Plant Breeding*. John Wiley Publication.
- Hayes HK Immer FR and Smith DC *Methods of Plant Breeding*, Reinhold Publication, New York.

Semester VI
CORE COURSE XIII – PLANT PHYSIOLOGY, BIOCHEMISTRY AND BIOPHYSICS

Course code	: JSBTK6
Hours per week	: 5
Credit	: 5
Internal Marks	: 25
External Marks	: 75

Unit I - Plant Physiology

Water relationships: Imbibition, diffusion, osmosis, plasmolysis. Ascent of sap – vital, root pressure and cohesive theories. Water loss – guttation, transpiration – mechanism of stomatal movement and translocation. minerals absorption.

Unit II - Plant Physiology

Photosynthesis – mechanism – light reaction. Photophosphorylation – (cyclic, non-cyclic) – Dark reaction – Calvin cycle, Hatch and slack cycle and CAM pathway. Respiration – Anaerobic, Aerobic mechanism – photorespiration.

Unit III - Plant Physiology

Growth and Development. Growth regulators – Auxin, Gibberellin, Cytokinins, Abscissic acids, and Ethylene. Physiology of flowering – photoperiodism – vernalization. Fruit ripening. Dormancy

Unit IV - Biochemistry

A brief study of structure, properties, classification of carbohydrates, fats, amino acids and proteins.

Unit V – Biophysics

Physical forces and chemical bonds – Bioenergetics – Thermodynamics laws - Nature of lights – Solar radiation – Absorption and emission of light by pigments .

REFERENCES:

- Bonner and Warner - Plant Biochemistry
- Doby, G. - Plant Biochemistry
- Plumber, D. - An Introduction to Practical Biochemistry, Mc.Graw Hill
- Achermaan, E. - Biophysical Science, Prentice hall of India
- Noggle and Fritz - Introductory Plant Physiology, Prentice hall of India
- Jain, V.K. - Plant Physiology, S. Chand and Co.,
- Devlin, R.M. - Plant Physiology, Reinhold Affiliated East
- Pandey and Sinha - Plant Physiology, Vikas Pub.

Semester VI
CORE COURSE XIV – BIOTECHNOLOGY

Course code	: JSBTL6
Hours per week	: 4
Credit	: 4
Internal Marks	: 25
External Marks	: 75

Unit I

Introduction to biotechnology: DNA structure – replication – regulation of gene expression in prokaryotes (Lac – operon model).

Unit II

Genetic engineering: Tools of genetic engineering – restriction enzymes, ligase, reverse transcriptase, polymerase; rDNA Technology – Vectors (Plasmid, Cosmid) Markers – (selectable) application of cloning, Bt.

Unit III

Plant cell, tissue and organ culture – micro propagation – organogenesis – somatic embryogenesis – protoplast isolation, culture and fusion – synthetic seeds.

Unit IV

Gene Transfer : transformation, conjugation and transduction. Direct gene transfer (particle - gun bombardment), Indirect gene transfer (Agrobacterium mediated gene transfer)

Unit V

Applications of biotechnology in Agriculture, Medicine, and Industry.

REFERENCES:

- Alen wisemen, Principles of Biotechnology
- Purohit, Biotechnology fundamentals and applications, Agrobios, Jhodpur
- Dubey RC, A text book of biotechnology, S. Chand and Company
- Watson, rDNA technology
- Rev. Fr.Dr.Ignachimuthu, Principles of Biotechnology, TATA Mc Grew Hill.

Semester - VI
ELECTIVE COURSE II - BIOSTATISTICS AND BIOINFORMATICS

Course code	: JSBTEC2
Hours per week	: 5
Credit	: 5
Internal Marks	: 25
External Marks	: 75

Unit I

Definitions, Scope of Biostatistics– variables in biology, collection, classification and tabulation of data.

Unit II

Graphical and diagrammatic representation of data, scale diagram, histogram, graph, line, bar and pie diagrams.

Unit III

Measures of central tendency – mean, median and mode - measures of dispersion – standard deviation standard error. Student ‘t’ test.

Unit IV

Basic computer concepts – computer peripherals (mouse and modem) – basic knowledge of networking, internet, world wide web, web browsing, and their uses in Botany.

Unit V

Biological resource databases – sequence analysis and structure visualization soft wares – pair wise alignment and multiple alignment - similarity searching – genomics, Proteomics.

REFERENCES:

- Ramakrishnan, P (2001) Biostatistics, Saras Publication, Nagercoil
- Arora PN and Malhon PK (1996) Biostatistics, Imalaya Publishing House, Mumbai
- Palanichami S and Manoharan M Statistical methods for biologists, Paramount publications.
- David W Mount (2001) Bioinformatics, Sequence and Genome Analysis, Cold Spring Harbor Laboratory Press.
- Baxevanis AD and Francis BF (2001) Bioinformatics - A practical guide to the analysis of genes and proteins, Wiley Interscience.
- Rashidi HH and Buchler LK (2002) Bioinformatics, Basics, Applications in Biological Sciences and Medicine, CRC Press, London.
- Higgins D and Taylor (2000) Bioinformatics – sequence, structure and databanks – a practical approach, Oxford University Press.

Semester – VI

ELECTIVE COURSE III – BIOINSTRUMENTATION

Course code	: JSBTEC3
Hours per week	: 4
Credit	: 4
Internal Marks	: 25
External Marks	: 75

Unit I

Principles and applications of Distillation unit, Autoclave, hot air oven.

Unit II

Principle and applications of Microscope – Compound Microscope and Electron microscope, scanning and transmission electron microscopy

Unit III

Principle, types and applications. of pH meter, centrifuge.

Unit IV

Principles, types and applications of paper chromatography, TLC.

Unit V

Principles and applications of Spectrophotometer, Electrophoresis, AGE and PAGE

REFERENCES:

- Christian GD, Atomic Absorption Spectroscopy, Wiley and sons, New York.
- Jayaraman J, Laboratory Manual in Biochemistry, Wiley Eastn Ltd., New Delhi.
- Gunasekaran P, Laboratory Manual in Microbiology, New Age India, New Delhi.
- Jensen WA, Botanical, Wiley Eastn Ltd., New Delhi.

Semester VI
Core Course X
PRACTICAL III – MORPHOLOGY, TAXONOMY, ECONOMIC
BOTANY, HORTICULTURE, GENETICS AND PLANT BREEDING

Course code	: JSBTM6P
Hours per week	: 3
Credit	: 4
Internal Marks	: 40
External Marks	: 60

Morphology

- Structure, Types and Modification of Leaf, root.
- Inflorescence: Structure, Types and modification.
- Fruits: Structure, Types and uses

Taxonomy

- Training in dissection, observation, identification, sketching of floral parts, construction of floral formula and sketching of floral diagram of plants belonging to the families mentioned in the theory syllabus.
- Description of the plants in technical terms.
- Field study of flora (local & outside) – submission of 25 herbarium specimens belonging to the families include in the theory syllabus.
- Study of economically useful plants in the theory part – their binomial, family name and morphology of useful parts are to be studied.

Economic Botany:

- Family, Genus, Species, useful parts mentioned and in the families included in the theory Syllabus

Horticulture

- Study of plant propagation techniques: cutting, layering, grafting and budding.

Genetics

- Monohybrid, dihybrid, Lethal Epitasis, Incomplete Dominance, Complementary Factors, Duplicate Factors, supplementary Factor,

Plant Breeding

- Bulk method, Emasculation, Bagging.

Semester VI
Core Course XI
PRACTICAL IV – PLANT PHYSIOLOGY, BIOCHEMISTRY,
BIOPHYSICS AND PHYTOGEOGRAPHY

Course code	: JSBTN6P
Hours per week	: 3
Credit	: 4
Internal Marks	: 40
External Marks	: 60

Physiology

Experiments to be performed by each student

- Determination of Osmotic pressure by plasmolytic method
- Measurement of rate of transpiration using Ganong's photometer
- Study of effect of wavelength of light on photosynthesis using Wilmott's bubbler
- Study of the effect of varying concentration of CO₂ on photosynthesis
- Separation of photosynthetically active pigments using paper chromatography / TLC method

Experiments for demonstration

- Ganong's respirometer
- Anaerobic respiration
- Clinostat

Biochemistry

- Colorimetric estimation of chlorophyll pigments
- Gravimetric estimation of lipids
- Colorimetric estimation of proteins

Biophysics

- Principle and applications of pH meter. Centrifuge. Colorimeter. Electrophoresis.
- Spectrophotometer.

Ecology

- Study of morphological and anatomical adaptations of Hydrophytes, Xerophytes.
- Diagrammatic presentation of Food chain, Food web, Ecological pyramids and Pond ecosystem.

NON-MAJOR ELECTIVE II – MEDICAL BOTANY (1 Year)
(For Zoology students)

Course code	: JSNMBTEC2
Hours per week	: 2
Credit	: 2
Internal Marks	: 25
External Marks	: 75

Unit I

History and scope and Classification of medicinal plants and properties – Ayurveda, Siddha, Homeopathy and Unani – Definition of medical terms – role .

Unit II

Herbal gardens – conservation – propagation of medicinal plants – chemical constituents and medicinal uses of the following medicinal plants - *Ocimum*, *Azadirachta*, *Aloe*, *Phyllanthus*. Cultivation – processing – storage – marketing and utilization of medicinal plants.

Unit III

Pharmacognosy – classification of drugs – chemistry of drugs – *Gingiber*, *Withania*, *Coriandrum*, *Cinchona*.

Unit IV

Drugs – type and classification - aromatherapy. Phytochemistry – active principles from the following medicinal plants: *Ricinus communis* (laxatives), *Datura metal* (drug acting on nervous system), *Cardiospermum halicacabam* (Anti rheumatics).

Unit V

Making infusion and decoctions, lotions and washes – insect repellents, tincture – herbal syrups, compresses and plasters, liniments, herbal oils and ointments.

REFERENCES:

- Kumar NC *An Introduction to Medical Botany*. Emkay Publications, New Delhi.
- Roberts *Pharmacognosy* K.M. Vergheese Co. Bombay.
- Wallis TE *Text Book of Pharmacognosy*. R.S. Publishers, New Delhi.
- Shah CS and Qudry JS *A text book of Pharmacognosy*. BS Shah Prakasm, Ahmedabad.
- Afol CK and Kapur BM *Cultivation and utilization of Medicinal Plants*. CSIR, Jammu.
- Jown SK *Glimpses of Ethnobotany* Oxford & IBH, New Delhi.
- Hartman HT and Kester DE *Plant propagation – principles and practices*. Prentice Hall, New Delhi.
- Bhattacharjee SK *Hand Book of Medicinal Plants*. Pointer Publications, Jaipur.

Semester I & II
ALLIED BOTANY (For Zoology Students)
Plant Diversity, Cytology, Genetics, Anatomy, Embryology, Ecology, Evolution,
Physiology And Biotechnology

Course code	: JSBOYA2
Hours per week	: 3
Credit	: 5
Internal Marks	: 25
External Marks	: 75

Unit I - Biodiversity

General characters of algae, fungi, bryophytes, pteridophytes and gymnosperm. Study of the structure and life history of the following genera – *Oscillatoria*, *Polyporus*, *Marchantia*, *Marsilea* and *Cycas*.

Unit II – Morphology and Taxonomy

Phyllotaxy, Inflorescence types – Bentham & Hooker system of classification, study of the following families and their economic importance – *Caesalpinaceae*, *Rubiaceae*, *Apocynaceae*, *Euphorbiaceae* and *Poaceae*.

Unit III – Anatomy, Embryology, Ecology and Evolution

Anatomy: Tissue (Simple, Complex) Anatomical structure monocot, dicot (Root and Stem)

Embryology : Structure of mature anther, structure of ovule, endosperm types

Ecology : Xerophytes – *Nerium*. Hydrophytes – *Hydrilla*,

Evolution: Origin of life, Lamarck, Darwin theories

Unit IV – Physiology

Physiology : Absorption water and minerals, transpiration, Photosynthesis, electron transport system – photophosphorylation (cyclic and non cyclic). Respiration – mechanism – glycolysis – Krebs' cycle anaerobic respiration.

Phytohormones : auxins, GA₃, cytokinins, photoperiodism and vernalization.

UNIT V – Cytogenetics and Biotechnology

Cytology : Ultrastructure of plant cell, mitochondria, chloroplast, nucleus, Cell division – mitosis and meiosis.

Genetics : Mendel's law of monohybrid and dihybrid. Plant tissue culture and its application.

Semester I & II
ALLIED BOTANY – PRACTICAL (For Zoology Students)
Morphology, Taxonomy, Cytology, Anatomy, Embryology, Ecology, Evolution,
Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms, Plant Physiology and
Biotechnology

Course code	: JSBOYB2P
Hours per week	: 3
Credit	: 5
Internal Marks	: 25
External Marks	: 75

Morphology

- Leaf : Study of phyllotaxy
- Inflorescence : Study of types included in the theory syllabus

Taxonomy

Training in dissection, observation, identification, sketching of floral parts, construction of floral formula and sketching of floral diagram of plants belonging to the families mentioned in the theory syllabus. Description of the plants in technical terms.

Cytology and Genetics

- Study of the cell structure of plants and its organelles using electron micro-graphs from standard publication.
- Study of mitosis stages using photographs.
- Study of Mendal's monohybrid cross, dihibrid cross using photographs.

Anatomy

- Preparation of transverse section of the following plant parts to observe and record the internal structure.
- Primary structure of monocots stem and root
- Primar;y structure of monocot stem and root

Embryology

- Study; of permanent slides showing T.S of anther ovule types

Ecology

- Study of morphological and anatomical features of the following: Hydrophytes and Xerophytes.

Algae and Fungi

- Microscopic observations of algal and fungal types and their slides included in the syllabus
- Section cutting of *polyporus* fruit body

Bryophytes

Microscopic observation of slides of genera included in the syllabus.

Pteridophytes

- A study; of the morphology, anatomy and structure of the vegetative and reproductive parts of the sporophytes and gametophytes (wherever available of polytrichum and marselia).

Gymnosperm

- Preparation of transverse section of the rachis and leaflet of cycas observe and record the internal structure.

Plant physiology

- Experiments included in the syllabus – demonstration only

Biotechnology

- Plant tissue culture techniques photographs from standard publications

Semester - III

NON MAJOR ELECTIVE I (For Botany Students)

Computer Application in Biological Science

Course code	: JSNMBTEC1
Hours per week	: 2
Credit	: 2
Internal Marks	: 25
External Marks	: 75

Unit I : Fundamental of Computers

History of computers – Types of Computers – Hardware (Input, Output, Storage Devices and Processing Unit) – Software –Types of Software. Used in Biological Sciences

Unit II : Internet

Email – Web Browsers – Search Engines – Web Sites – Video Conferencing

Unit III Multimedia in use

Multimedia Definition – Needs, Benefits and Problems – Multimedia Platforms – Sounds and Pictures.

Unit IV

E.book, E.Journals, Digital Library and their application in Botany

Unit V

Biological Data Bank: DNA, RNA sequence data bank, protein sequence Data Bank, Gene bank.

TEXT BOOK :

1. Bartee “Digital Computer Fundamentals” Tata McGrawHill1996.
2. Internet Programming – Kris Jamsa Ken Cope. Galgotia Publications PVT. Ltd., 1995
3. Judith Jeffcoate Multimedia in Practice Technology and Application Prentice
4. Simon J Gibbsand Dionysion C T sinchrikzis – Multimedia Programming.
5. David W Mount (2001) Bioinformatics, Sequence and Genome Analysis, Cold Spring Harbor Laboratory Press.
6. Higginns D and Taylor (2000) Bioinformatics – sequence, structure and databanks – a practical approach, Oxford University Press.