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DEEN DAYAL UPADHYAY GORAKHPUR UNIVERSITY, GORAKHPUR

**SYLLABUS**

B.Sc.-I

**BOTANY**

EFFECTIVE FROM 2010-2011 SESSION

There shall be three papers and practical examination as follows:

Paper- I	Bacteria, Viruses and Fungi	45 Marks
Paper- II	Algae and Bryophytes	45 Marks
Paper- III	Pteridophytes, Gymnosperms and Elementary Paleobotany	45 marks
	Practical	65 Marks
<b>Total</b>		<b>200 marks</b>

## Paper- I Bacteria, Viruses and Fungi

### Section: A-

- a) *Bacteria* Their fine structure, nutrition, reproduction, classification and economic importance.
- b) *Plant Virus*: General symptoms, transmission, Structure of TMV and its replication
- c) *Lichen*: Structure, nutrition, reproduction and economic importance.

### Section: B- Fungi

- a) Classification as given by Alexopoulos (1962)
- b) Habit and Habitat, Structure, reproduction, mode of nutrition and economic importance of Fungi Important features in the life-history of. *Saprolegnia*, *Albugo*, *Peziza Emotum*, *Ustilago*, *Puccinia*, *Agaricus*, *Colletrichum* and *Alternaria* (Developmental details are not required).

## Paper- II Algae and Bryophytes

### Section: A- Algae

- i. Classification as given by G.M. Smith (1955).
- ii. Habit and Habitat, Structure of thallus, reproduction and economic importance.
- iii. Important features in the life-history of:  
*Oscillatoria*, *Gloeotrichia*, *Seytonema*, *Chlamydomonas*, *Volvox*, *Oedogonium*, *Vaucheria*, *Chara*, *Sargassum*, *Ectocarpus*, *Batrachospemum* (Developmental details are not required)

### Section: B- Bryophytes

- i. General classification
- ii. Habit and Habitat, range of structure of gametophyte and sporophyte, important feature in the life-history of:  
*Riccia*, *Marchantia*, *Pellia*, *Porella*, *Anthoceros*, *Sphagnum*, *pogonatum* (Developmental details are not required)

## Paper- III

### Pteridophytes, Gymnosperms and Elementary Paleobotany:

#### Section A: Pteridophytes

Classification as given by K.R. Sporne (1970). Range of structure of sporophyte and gametophyte Important feature in the life-history of:

Lycopodium, Selaginella, Equisetum, Marsilea, (Developmental details are not required).

#### Section B: Gymnosperms:

- i. Classification of Gymnosperms up to order as given by D.D. Pant (1957)
- ii. Morphology and life-history including Development of:  
Cycas, Pinus, Ephedra

#### Section C: Elementary Palaeobotany:

- i. Introduction to Palaeobotany Geological eras; Processes of fossilization and types of fossils Method of study of fossils.
- ii. Rhyma

### Practical Examination:

Duration of Examination, 4½ hrs

The Practical Examination will comprise:

1	Preparation of double stained T.L. or L.S. of a Pteridophyte or a gymnosperm material to be done in glycerine.	14
2	Suitable minor preparation of a Pteridophyte or Gymnosperm not given in Question 1	06
3	Minor preparation of an Alga	06
4	Minor preparation of a Bryophyte	07
5	Minor preparation of a Fungus	06
6	Eight Spot representing various groups.	16
7	Viva-voce.	05
8	Class record and collection (2+3)	05
<b>Total</b>		<b>65</b>

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**SYLLABUS**

B.Sc.-II

BOTANY

EFFECTIVE FROM 2010-2011 SESSION

There shall be three papers and a practical examination as follows:

	<b>Marks:</b>
Paper –I Angiosperms and Economic Botany	45
Paper -II Ecology and Genetics	45
Paper –III Plant physiology and Plant Biochemistry	45
Practical	65
<b>Total</b>	<b>200</b>

**Paper -I Angiosperms and Economic Botany**

**SECTION: A**

**Taxonomy**

- 1. Study of Bentham and Hooker's system of classification.
- 2. A details study of the following families  
Ranunculaceae, Cucurbitaceae, Compositae, Scrophulariaceae, Libiatae, Euphorbiaceae, Palmae, and Gramineae.
- 3. A knowledge of the distinguishing feature of the following families  
Papaveraceae, Cruciferae, Capparidaceae, Caryophyllaceae, Malvaceae, Rutaceae, Acanthaceae, Verbenaceae, Apocynaceae, Rubiaceae, Asclepiadaceae, Amaranthaceae, Liliaceae and Musaceae

**SECTION. B**

**Anatomy, Embryology and Economic Botany.**

- 1. Anatomy.  
Anatomical anomalies and ecological variations in the primary structure of stems, Anomalous secondary growth Distribution of mechanical tissues in plants
- 2. Embryology  
The microsporangium Megasporangium, Female gametophyte, Male gametophyte, Fertilization, Endosperms, Embryo, Fertilization and seed formation, Practical applications of experimental embryology
- 3. Economic Botany.  
Botanical name, Family Part used mode of extraction, nature and economic importance of plants in relation to the following

- Timber.** Teak, Sal, Sheesham, Pine.
- Fiber:** Cotton, Jute Sunn hemp Cotton
- Oil:** Mustard, Castor, Groundnut, Coconut
- Medicine.** Rauwolfia, Opium
- Biodiesel.** Jatropha

## Paper II

### Ecology and Genetics

#### SECTION: A

##### Ecology

1. Introduction and scope of ecology, Environmental and ecological factors, Comparative morphology of xerophytes, hydrophytes and epiphytes.
2. Brief idea of population and community, Ecological succession, Concept of climax
3. Concept of ecosystem, Trophic structure of community and interaction of organisms
4. Energy flow through the ecosystem, Cycling of carbon and nitrogen
5. Brief idea pollution, B.O.D. and biological magnification.

#### SECTION: B

##### Genetics

Cellular and sub-cellular structure Morphology of Chromosomes, Cell division, Pre-Mendelian concept of heredity; Mendelism, Interaction of genes; Linkage and Crossing over, Chromosomal aberration, Polyploidy and Mutation Sex linked inheritance, Determination of sex, Cytoplasmic inheritance Gene concept Muton, Recon and Cistron, Chemistry of nucleus including chromosomes

## Paper III

### Plant Physiology and Plant Biochemistry:

#### SECTION: A

##### Plant Physiology:

1. Soil-water in Relation to Plants. Water potential of a cell, diffusion, permeability, wilting, Free and bound water, Absorption and loss of water in plants
2. Soil-minerals in relation to Plants, Micro and micronutrients and their absorption, Deficiency symptoms, Translocation of solutes and assimilates.
3. Photosynthesis Mechanisms of the light reaction; C-reduction in  $C_3$  and  $C_4$  plants, Factors affecting photosynthesis
4. Respiration. Mechanisms of anaerobic, aerobic and photo-respiration; Respiratory quotients, Factors governing respiration
5. Fat Metabolism Structure and properties of fats and fatty acids, their synthesis and break down
6. Growth. Elementary idea of growth regulators, their structure and role in plant growth, photoperiodism, Vernalisation

## SECTION: B

### Plant Biochemistry:

1. Proteins Chemical composition Primary, and tertiary structure of proteins. Biological significance of proteins Mechanism of protein synthesis
2. Carbohydrates General account of monosachharides, disachharides and polysachharides, structure and properties of ribose deoxy-ribose, glucose, fructose, sucrose, maltose, starch and cellulose
3. Nucleic acids Chemical composition, Structure of DNA and RNA, Biological significance.
4. Enzymes Structure General properties, Nomenclature, Mechanism of enzymatic reaction.
5. Vitamins Type and their role in plant metabolism

### PRACTICAL EXAMINATION

Duration of Examination - 4-30 hrs

The practical examination will comprise		Marks
1.	An angiospermic specimen for anatomical study with double staining Mounting to be done in glycerine	08
2	A) Description in semitechnical language of one plant belonging to families prescribed and referring it to its family giving reasons	06
	B) Comparative study of floral parts of two plants belonging to the families prescribed	04
3	To make squash preparation of the material provided and to show stages of mitotic division	05
4	To answer five question about one plant physiology experiment (From list-A)	05
5.	To perform one plant physiology/plant biochemistry experiment (From list-B)	07
6.	Comment on ecological anatomy of the material provided ( <i>Casuarina</i> a young stem, leaves of <i>Typha</i> , <i>Nerium</i> , <i>Eichhrnia</i> , grass).	04
7.	Eight spots including items of Economic Botany.	16
8.	Viva-Voce	05
9.	Class record and herbarium (3+2)	05
<b>Total =</b>		<b>65</b>



**LIST -A**

**Plant Physiology Experiments for Demonstration:**


1. To demonstrate osmosis using egg membrane
2. To demonstrate root pressure in plants
3. V suction due to transpiration
4. To demonstrate that O<sub>2</sub> is evolved during photosynthesis.
5. To demonstrate that light and CO<sub>2</sub> are necessary for photosynthesis
6. To demonstrate anaerobic respiration in germinating seeds.
7. To demonstrate the process of fermentation
8. To demonstrate respiration in aerial parts of plants
9. To demonstrate continuity of vessels in *Tinospora* stem.
- 10 To demonstrate continuity of intercellular spaces in *Nymphaea petiole*

**N.B.** These experiments may be modified in the examination

**LIST- B**

**Plant physiology/ Biochemistry Experiments: To be performed by students.**

1. To determine the osmotic concentration of plant cell sap By plasmolytic method using leaves of *Tradescantia/ Rhoec*
2. To measure the rate of transpiration per unit leaf area by photometer
3. To compare the differential rate of transpiration of the sides of a leaf by cobalt chloride method.
- 4 To study the structure of stomata and the stomatal movement due to osmotic changes
- 5 To measure the size and frequency of stomata in a mesophytic leaf
- 6 To determine transpiration/ absorption ratio in plants
- 7 To test the presence of PO<sub>4</sub> and iron in given plant tissue
- 8 To measure the effect of substrate concentration on the activity of the enzyme catalase extracted from potato of cabbage, by paper disc method
9. To extract and test reducing sugars and proteins in a given plant material.
10. To separate plant pigments by paper chromatograph
11. To separate amino acids by one dimensional paper chromatography from a given mixture of two or three amino acids and find out the R<sub>f</sub> value.
- 12 To study the structure of starch grain in potato and rice
- 13 To determine pH by pH paper and its confirmation by pH meter



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BOTANY

B.Sc. III

There shall be four papers and a practical examination as follows:

	Marks	
Paper-I	Microbiology and Plant Pathology	50
Paper-II	Experimental Embryology and Morphogenesis	50
Paper-III	Soil Science, Environmental Pollution and Conservation	50
Paper-IV	Molecular Genetics and Biotechnology	50
Practical (2)		50+50
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<b>Total</b>	<b>300</b>	

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PAPER-I

MICROBIOLOGY AND PLANT PATHOLOGY:

SECTION-A:

MICROBIOLOGY:

1. History and scope of Microbiology
2. Types of Micro-organisms.
3. Method of Isolation and Culturing of Micro-organisms, Micrometry
4. Nutrition of Micro-organisms (Chemoautotrophism, Photoautotrophism, Saprotrophism, Paratrophism)
5. Elementary idea of Microbiology of soil, water and air
6. Application of Microbiology in Dairy, Bakery, Brewing and Medicine

SECTION-B

PLANT PATHOLOGY:

1. General principles of plant pathology with special reference to symptoms of plant disease, Mode of infection; Disease resistance. Method of control of plant diseases
2. Study of symptoms disease cycle and control of the following plant diseases  
Linseed rust, Late blight of Potato, Tikka disease of Groundnut, Yellow vein mosaic, Bacterial blight of Rice, Little leaf of Bambara, Wilt of Chick Pea

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PAPER – II

EXPERIMENTAL EMBRYOLOGY, MORPHOGENESIS  
AND ELEMENTARY BIostatISTICS:

SECTION – A

EXPERIMENTAL EMBRYOLOGY

1. *In-vitro* culture technique – General principles, nutrition and hormonal requirement of excised plant parts, Sterilization, Inoculation, Maintenance of culture. Murashige and Skoog's medium for *in-vitro* culture
2. Elementary idea of control of fertilization sexual incompatibility and induced parthenocarpy
3. Application of experimental embryology with special reference to anther and embryo culture
4. Protoplast culture, Somatic hybridization – Cell culture for metabolite production

SECTION – B

MORPHOGENESIS:

1. Aims and scope of plant morphogenesis, Method of morphogenetic study
2. Characteristic feature and measurement of plant growth
3. Elementary idea of morphogenetic phenomena – Polarity, Correlation, Symmetry, Differentiation, Totipotency of plant cell
4. Photomorphogenesis – Role of light as a morphogenetic factor

SECTION. C

*ELEMENTARY BIostatISTICS:*

1. Introduction and Definition of Biostatistics
2. Application of biostatistics in Biology
3. Measures of Central Tendency - Mean, Median and Mode
4. Measures of dispersal - Standard Deviation, Standard Error

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PAPER - III

SOIL SCIENCE, ENVIRONMENTAL POLLUTION AND CONSERVATION

SECTION - A

SOIL SCIENCE:

Lithosphere, Soil forming rocks and minerals, weathering of parent rocks, Major processes of soil formation. Different types of soil degradation, Soil conservation and reclamation problem of soil

SECTION - B

ENVIRONMENTAL POLLUTION

Earth environmental Biosphere, Atmospheric pollution, CO<sub>2</sub> and ecosystems, Ozone depletion, Water pollution, BOD, eutrophication. Pesticides Pollution, Radioactive pollution. Problem of soil wastes, Monitoring and control of pollution. Recycle of wastes and technological fix

SECTION - C

CONSERVATION:

Bioethics and conservation. Ecology vs Economy, Natural resources, Major India biomass, Conservation of renewable resources. Causes of extinction, Endangered Indian flora, Natural reserves and Germ plasm bank



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PAPER – IV

MOLECULAR GENETICS AND BIOTECHNOLOGY:

1. Definition, origin, history and scope of molecular genetics and biotechnology.
2. Nucleic acids as genetic material. Structure and replication of nucleic acids. Different forms of DNA and RNA.
3. Genetic code, its properties, initiation and termination codons.
4. Gene expression. Brief idea of mechanisms of transcription and translation in prokaryotes.
5. Regulation of gene expression. Operon concept, *Lactose operon*
6. Chemical method of gene synthesis
7. Recombinant DNA, restriction and ligase enzymes, Vectors viz , plasmids bacteriophages and cosmids, gene cloning
8. Application of biotechnology with special reference to:
  - a) Synthesis of hormone
  - b) Monoclonal antibodies (Hybridoma Technology)
  - c) DNA finger printing (Solving disputed parentage)
  - d) Transgenic plants

बी० एस-सी० तृतीय वर्ष वनस्पति विज्ञान

प्रायोगिक प्रथम

1	Microbiology	06	Marks
2	Plant pathology	06	Marks
3	Experimental Embryology	06	Marks
4	Morphogenesis	06	Marks
5	Spotting	12	Marks
6	Viva- voce	10	Marks
7	Class records	04	Marks
<b>Total:</b>		<b>50</b>	<b>Marks</b>

प्रायोगिक द्वितीय

1	Environmental Pollution and Conservation	06	Marks
2	Soil science	06	Marks
3	Molecular Genetics (Major)	08	Marks
4	Biotechnology (Minor)	04	Marks
5	Spotting	12	Marks
6	Viva- voce	10	Marks
7	Class record	04	Marks
<b>Total:</b>		<b>50</b>	<b>Marks</b>

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**LIST OF EXPERIMENTS**

**A. Microbiology:**

1. Demonstration of preparation of Czapek's Dox medium and potato dextrose agar medium, sterilization of culture medium and pouring
2. Inoculation in culture tubes and Petri-plates
3. Gram staining of bacteria
4. Use of ocular and stage micrometer for measuring microbes
5. Microscopic examination of milk and curd
6. Isolation of micro-organisms from natural sources soil, water and air

**B. Plant Pathology:**

1. Study of plant disease listed in the theory paper

**C. Experimental Embryology and Morphogenesis:**

1. Demonstration of preparation of Murashige and Skoog's medium, pouring in culture tubes and sterilization
2. Inoculation of excised plant tissue in culture tubes.
3. Demonstration of callus formation from culture plant tissue.
4. Isolation of embryo from the given seed and its inoculation in culture tubes
5. Identification of anthers containing immature spores, by squash preparations.
6. Demonstration of apical dominance.
7. Plotting a sigmoid growth curve from the given data about diameter of Cucurbita fruit on different days
8. Test for cell viability using TTC/Evan's blue

**D. Soil Science, Environmental pollution and conservation exercises.**

1. Study of physical characteristics of soil- texture, colour etc
2. Study of chemical properties of soil- Acidity, Alkalinity, Cation- exchange capacity
3. Determination of pollution level- dissolved oxygen (for BOD), Alkalinity and hardness of water, dust pollution.
4. Conservation- Quantitative study on effects of grazing on grassland and of soil binding capacity (Conservation value) of different plant species