

# SYLLABUS

## B.Sc. (Botany) Part-I (Semester-I and II)

(Session 2020-21, 2021-22 and 2022-23)

### Semester-I

#### THEORY

	External Marks	Internal Assessment
<b>Paper-I</b> : Diversity of Microbes	40	15 (Attendance: 3 + Assignment: 6 + House Test 6)
<b>Paper-II</b> : Diversity of Cryptogams	40	15 (Attendance: 3 + Assignment: 6 + House Test 6)

#### PRACTICAL

Pertaining to Theory Paper-I:	40
Pertaining to Theory Paper-II:	

#### Total Marks (Semester-I)

Theory	80 Marks
Practical	40 Marks
Internal Assessment Pertaining to Theory Paper I & II	30 Marks
<b>Total</b>	<b>: 150 Marks</b>

### Semester-II

#### THEORY

	External Marks	Internal Assessment
<b>Paper-III</b> : Cell Biology	40	15 (Attendance: 3 + Assignment: 6 + House Test 6)
<b>Paper-IV</b> : Genetics and Evolution	40	15 (Attendance: 3 + Assignment: 6 + House Test 6)

#### PRACTICAL

Pertaining to Theory Paper-III:	40
Pertaining to Theory Paper-IV :	

#### Total Marks (Semester-II)

Theory	80 Marks
Practical	40 Marks
Internal Assessment Pertaining to Theory Paper III & IV	30 Marks
<b>Total</b>	<b>: 150 Marks</b>

#### Note:

- 1) The number of teaching hours per week will be three for each theory paper and three for each practical in every semester. In all, there will be 12 teaching hours per week covering both theory and practical requirements. (Six teaching hours for theory and Six teaching hours for practical per week)
- 2) Practical paper in each semester will be of 3 hours. The timing of practical examination will be 9.00 am to 12.00 noon.

## **B.Sc. (BOTANY) PART-I (SEMESTER-I)**

### **PAPER- I: DIVERSITY OF MICROBES**

Max. Marks: 55 marks

Pass Marks: 35% in Theory and Practical Separately

Theory Paper: 40 marks

Internal Assessment: 15 marks

Total Teaching hours: 45

Time Allowed: 3 Hours

#### **INSTRUCTIONS FOR THE PAPER SETTER**

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective section of syllabus and will carry 6 marks each. Section C will consist of 8 short-answer type questions (8-10 lines) of 2 marks each which will cover the entire syllabus uniformly and will carry 16 marks in all.

#### **INSTRUCTIONS FOR CANDIDATES**

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

#### **Section-A**

1. Viruses: General characters, structure, classification and replication of viruses; importance of viruses, a brief account of Mycoplasma.
2. Bacteria- A general account with particular reference to ultra structure, classification, mode of reproduction, nutritional types and economic importance; General account of cyanobacteria with emphasis on *Oscillatoria*.

#### **Section-B**

3. Fungi and Fungi like organisms: General characters. Classification and economic importance; important features and life history of members of Kingdom Chromista: *Phytophthora*. Kingdom Fungi: Zygomycota-*Mucor*; Ascomycota-*Saccharomyces*, *Penicillium* and *Peziza*.
4. Important features and life history of Basidiomycota, Mitosporic Fungi and Lichens – *Puccinia*, *Ustilago*, *Agaricus*; *Cercospora*, *Colletotrichum*. Lichens: Structure, morphology, reproduction and economic importance.

#### **RECOMMENDED REDINGS**

1. Alexopolus, C.J., Mims, C.W. and Blackwell, M. 1996. *Introductory Mycology*. John Willey & Sons. Inc., Singapore.
2. Black, J.G. 1999. *Microbiology – Principles and Explorations*. John Wiley & Sons. Inc. Singapore.
3. Clifton, A. 1958. *Introduction to Bacteria*. McGraw Hills & Co., New York.
4. Deacon, J.W., 1997. *Modern Mycology* 3<sup>rd</sup> Edition, Blackwell Science, Ltd. U.K.
5. Dube, H.C.1990. *An Introduction to Fungi*. Vikas Publishing House Pvt. Ltd., New Delhi.
6. Sharma, P.D. 2001. *The Fungi*. Rastogi Co., Meerut.
7. Stainer, R.Y., Ingraham, J.L., Wheelis, M.L. and Painter, P.R. 1989. *General Microbiology*. Macmillan.

## **B.Sc. (BOTANY) PART-I (SEMESTER-I)**

### **PAPER-II: DIVERSITY OF CRYPTOGRAMS**

Max. Marks: 55 marks

Total Teaching hours: 45

Pass Marks: 35% in Theory and Practical Separately

Time Allowed: 3 Hours

Theory Paper: 40 marks

Internal Assessment: 15 marks

#### **INSTRUCTIONS FOR THE PAPER SETTER**

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective section of syllabus and will carry 6 marks each. Section C will consist of 8 short-answer type questions (8-10 lines) of 2 marks each which will cover the entire syllabus uniformly and will carry 16 marks in all.

#### **INSTRUCTIONS FOR CANDIDATES**

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

##### **Section-A**

1. Basic characteristics of algae; habitat, range of thallus, algal cell structure, photosynthetic pigments, cell wall, flagella, reserves food materials and nutrition; lifecycle pattern, classification and economic importance of algae.
2. Important features and life history of Chlorophyceae – *Volvox*, *Oedogonium*; Xanthophyceae- *Vaucheria*; Phaeophyceae- *Ectocarpus*, *Sargassum*; Rhodophyceae- *Batrachospermum*.

##### **Section-B**

3. Bryophyta: Amphibians of Plant Kingdom displaying alternation of generations; structure, reproduction and affinities of *Marchantia* (Hepaticopsida); *Anthoceros* (Anthocerotopsida); *Funaria* (Bryopsida) - developmental stages are excluded. Evolution of sporophytes in Bryophytes.
4. Pteridophyta: The first vascular plants: important characteristics, structure and reproduction of Psilopsida (*Rhynia*); Lycopsida (*Selaginella*); Sphenopsida (*Equisetum*) and Pteropsida (*Pteris* and *Marsilea*) – developmental stages are excluded. Evolution of stellar system in Fern-allies and Ferns.

#### **RECOMMENDED REDINGS**

1. Kumar, H.D. 1999. *Introductory Phycology (Second Edition)*. Affiliated East West Press Ltd., New Delhi.
2. Parihar, N.S. 1996. *Biology and Morphology of Pteridophytes*. Central Book Depot., Allahabad.
3. Rashid, A. 1998. *An Introduction to Bryophyta*. Vikas Pub. House Pvt. Ltd., New Delhi.
4. Rashid, A. 1999. *An Introduction to Pteridophyta*. Vikas Publ. House, Pvt.Ltd., New Delhi.
5. Sharma, O.P. 2001. *Text Book of Pteridophytes*. MacMillan India Ltd.

6. Sporne, K.R.1991. *The Morphology of Pteridophytes*. B. I. Publishing Pvt. Ltd., Bombay.
7. Vasishta, P.C. 1996. *Bryophyta*. S. Chand & Co. Ltd., New Delhi.
8. Vasishta, P.C. 2000. *Pteridophyta*. S. Chand & Co. Ltd., New Delhi.
9. Singh, S.K. 2008. *Bryophyta*, Compus Book, International, New Delhi.
10. Lec., R.E. 2008. *Phycology*. Combridge University, Press, U.K.
11. Sharma, O.P. (2011). *Diversity of Microbes and Cryptogams-Algae*. Tata McGraw Hill, New Delhi.
12. Vashishta, B.R., Sinha, A.K. and Singh, V.P. (2011). *Botany for Degree Students-Algae*. S. Chand Publisher, New Delhi

### **SUGGESTED LABORATORY EXCERCISES**

Teachers may select plants/material available in their locality/institution.

1. Study of the genera included under algae and fungi indicating their systematic position.
2. Study of morphology, reproductive structures and anatomy of the examples cited in theory under Bryophyta and Pteridophyta indicating their systematic position.
3. Observation of disease symptoms in hosts infected by bacteria – (Citrus canker), fungi – (Late blight of potato, loose smut of wheat, brown rust of wheat, yellow stripe rust of wheat, tikka disease of groundnut, red rot of sugarcane), viruses – (Yellow vein mosaic of bhindi) and mycoplasma – (little leaf disease of brinjal). Examination of diseased material and identification of pathogens.
4. Gram staining of bacteria.
5. Study of crustose, foliose and fruiticose lichen thalli.

### **SUGGESTED READING (FOR LABORATORY EXCERCISES)**

**Books:**

1. Bendre, A. and Kumar, A. 1990-91, *Practical Botany*, Rastogi Publications, Meerut.
2. Kashyap, S.R. 1972. *Liverworts of the Western Himalayas*. New Delhi.
3. Singh, R.S. 1998. *Plant Diseases*. Oxford IBH Publishing Co. Pvt. Ltd., New Delhi.

### **INSTRUCTIONS FOR PAPER SETTER**

#### **Practical Paper-I (Pertaining to Theory Paper-I & II)**

	Marks
1. Section cutting and preparation of permanent slide of material pertaining to Bryophytes/Pteridophytes.	8
2. Identification, classification and morphological note on specimens from Algae, Fungi, Lichen Bryophyta and Pteridophyta.	4 x 5 = 20
3. Study of diseased plant material	4
4. Practical note book.	4
5. Viva-voce.	4
	40

## **B.Sc. (BOTANY) PART-I (SEMESTER-II)**

### **PAPER-III: CELL BIOLOGY**

Max. Marks: 55 marks

Total Teaching hours: 45

Pass Marks: 35% in Theory and Practical Separately

Time Allowed: 3 Hours

Theory Paper: 40 marks

Internal Assessment: 15 marks

#### **INSTRUCTIONS FOR THE PAPER SETTER**

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective section of syllabus and will carry 6 marks each. Section C will consist of 8 short-answer type questions (8-10 lines) of 2 marks each which will cover the entire syllabus uniformly and will carry 16 marks in all.

#### **INSTRUCTIONS FOR CANDIDATES**

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

#### **Section-A**

1. General Structure of Cell: Structure and function of nucleus: Ultrastructure of nuclear membrane, nuclear pore; nucleolus
2. Structure and function of cell organelles: Mitochondria, Plastids, Ribosomes, Golgi Body, Endoplasmic Reticulum, Peroxisomes, Vacuoles. Extranuclear genome: Presence and function of mitochondrial and plastid DNA.

#### **Section-B**

3. Chromosome organization: Morphology; centromere and telomere; chromosome alterations – deletions, duplications, translocations, inversions. Variations in chromosome number – aneuploidy, polyploidy. Sex chromosomes.
4. The cell envelope: Structure, composition and functions of cell wall and plasma membrane in microbes and plants.

#### **RECOMMENDED READINGS**

1. Alberts, B., Bray, D., Lewis, J., Raf. T.M., Roberts, K. and Watson, I.D.1999. *Molecular Biology of Cell*. Garland Publishing Co., Inc., New York, USA.
2. Bhatia, K.N. and Neelam, Dhand. *Cell Biology & Genetics*. Atruman's Pub., Jalandhar.
3. Gupta, P.K. 1999. *A text Book of Cell and Molecular Biology*. Rastogi Publicatons, Meerut, India.
4. Kleinsmith, L.J. and Kish, V.M. 1995. *Principles of Cell and Molecular Biology* (2<sup>nd</sup> Edition) Harper Colins College Publishers, New York, USA.
5. Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Bltimore, D. and Darnell, J. 2000. *Molecular Cell Biology*. W.H. Freeman & Co., New York, USA.
6. De Roberts, E.D.P. and De Robertis, Jr. E.M.F. 2006, *Cell and Molecular Biology*, Lippincott Williams & Wilkins, USA.

## **B.Sc. (BOTANY) PART-I (SEMESTER-II)**

### **PAPER-IV: GENETICS AND EVOLUTION**

Max. Marks: 55 marks

Total Teaching hours: 45

Pass Marks: 35% in Theory and Practical Separately

Time Allowed: 3 Hours

Theory Paper: 40 marks

Internal Assessment: 15 marks

#### **INSTRUCTIONS FOR THE PAPER SETTER**

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective section of syllabus and will carry 6 marks each. Section C will consist of 8 short-answer type questions (8-10 lines) of 2 marks each which will cover the entire syllabus uniformly and will carry 16 marks in all.

#### **INSTRUCTIONS FOR CANDIDATES**

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

#### **Section-A**

1. DNA the genetic material: DNA structure; replication; DNA – protein interaction; the nucleosome model. Genetic code; satellite and repetitive DNA; Cell division: Mitosis; meiosis.
2. Genetic inheritance: Mendelism; laws of segregation and independent assortment; linkage analysis; allelic and non-allelic interactions.

#### **Section-B**

3. Gene expression: Structure of gene; transfer of genetic information–transcription, translation, protein synthesis; regulation of gene expression in prokaryotes and eukaryotes. Proteins structure; Genetic Variations: Mutations – spontaneous and induced; transposable genetic elements.
4. Brief account of origin of life, evolutionary theories of Lamarck, Darwin and DeVries, evidences for organic evolution

#### **RECOMMENDED READINGS**

1. Bhatia, K.N. and Neelam, Dhand. *Cell Biology & Genetics*. Atruman's Pub., Jalandhar.
2. Gupta, P.K. *Cytology, Genetics & Evolution*. Rastogi Publications, Meerut.
3. Gupta, P.K. 1999. *A text Book of Cell and Molecular Biology*. Rastogi Publications, Meerut, India.
4. Kleinsmith, L.J. and Kish, V.M. 1995. *Principles of Cell and Molecular Biology* (2<sup>nd</sup> Edition) Harper Colins College Publishers, New York, USA.
5. Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell, J. 2000. *Molecular Cell Biology*. W.H. Freeman & Co., New York, USA.
6. Snustud, D.P. and Simmons, M.J. 2000. *Principles of Genetics*. John Wiley & Sons. Inc., USA.
7. Karp, G. 1999, *Cells and Molecular Biology: Concepts and Experiments*, John Wiley & Sons Inc. USA.
8. De Roberts, E.D.P. and De Robertis, Jr. E.M.F. 2006, *Cell and Molecular Biology*, Lippincott Williams & Wilkins, USA.

## SUGGESTED LABORATORY EXERCISES

Teachers may select plants/material available in their locality/institution.

1. To study cell structure from onion leaf peels.
2. Examination of electron micrographs of eukaryotic cells with special reference to organelles.
3. Examination of various stages of mitosis and meiosis using appropriate plant material (e.g. onion root tips, onion flower buds).
4. Preparation of karyotypes from dividing root tip cells of *Allium*.
5. Study of pollen mitosis of *Impatiens balsamina*.
6. Study of special types of chromosomes from slides/photographs.
7. Working out the laws of inheritance using seed mixture data provided using Chi-square methods.

## SUGGESTED READINGS (FOR LABORATORY EXERCISES)

1. Fukui, K. and Nakayama, S. 1996. *Plant Chromosomes Laboratory Methods*. CRC Press, Boca Raton, Florida.
2. Gunning, B.E.S. and Steer, M.W. 1996. *Plant Cell Biology: Structure and Function*. Jones and Barlett Publishers, Boston, Massachusetts.
3. Harris, N. and Oparka, K.J. 1994. *Plant Cell Biology: A Practical Approach*. IRL Press at Oxford University Press, Oxford, UK.
4. Sharma, A.K. and Sharma, A. 1999. *Plant Chromosomes: Analysis Manipulation and Engineering*. Harwood Academic Publishers, Australia.

## INSTRUCTIONS TO PAPER SETTER

### Practical Paper-II (Pertaining to Theory Paper-III & IV)

	Marks
1. Preparation of squash mount to show a cell division stage from onion root tip/flower.	10
2. Experiment on laws of inheritance using seed mixtures.	8
3. Preparation of temporary slide of onion peel to study cell structure.	5
4. Identification of three slides/Electron microphotographs.	9
5. Practical Note Book.	4
6. Viva-voce.	4
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