SYLLABUS FOR B.Sc. Botany (Honours) & General

THE UNIVERSITY OF BURDWAN

[W.e.f.: B.Sc. Part I: Academic Session: 2010-2011; Part II: Academic Session: 2011-2012 & Part III: Academic Session 2012-2013]

HONOURS:

Part I : 200 marks
Theory : 125 marks
Practical : 75 marks

Part II: 200 marks
Theory : 125 marks
Practical : 75 marks

Part III: 400 marks

Theory : 250 marks
Practical : 150 marks

Duration of Theory Examinations : 4 Hours for 75 & 100 Marks and 2 Hours for 50 Marks

Duration of Practical Examination : 6 Hours

GENERAL:

Part-I : 100 marks
Theory : 100 marks

Part – II: 200 marks
Theory : 100 marks
Practical : 100 marks

Part–III: 100 marks

Theory : 65 marks
Practical: 35 marks

Duration of theory examinations: 3 Hours for 100 marks & 65 marks

Duration of practical examinations: 6 Hours for 100 marks & 3 Hours for 35 marks

B.Sc. (General) Three Year Degree Course - Botany

Marks distribution:

Part-I

Paper –I

Theoretical-100

Group A -50 marks

1. Algae – 20
2. Fungi – 20
3. Bryophytes– 10

Group B – 50 marks

1. Pteridophytes – 15
2. Paleobotany – 10
3. Gymnosperms – 15
4. Morphology – 10

Part – II

Paper – II

Theoretical – 100

1. Anatomy – 20
2. Taxonomy – 30
3. Cytology and Genetics – 25
4. Plant Physiology and Ecology – 25

Paper – III

Practical - 100 marks

Part – III

Paper IV A

Theoretical – 65

Paper IV B

Practical – 35

B.Sc (General) Three Year Degree Course

Botany

Part-I

Total Marks: 100 (Paper-I)

Part-II

Theoretical: 100 (Paper-II)

Practical: 100 (Paper-III)

COURSE CONTENTS

Paper – I

Group-A

ALGAE

1. Range of vegetative structures, asexual and sexual reproduction, economic importance.
2. Life histories of the following: *Oedogonium, Chara, Fucus* and *Polysiphonia.*
3. Cyanophyceae: General account, cell structure.

FUNGI & PLANT PATHOLOGY

1. General characters of Phycomycetes, Ascomycetes, Basidiomycetes & Deuteromycetes. Economic importance of fungi with special reference to mushroom cultivation.
2. Life histories, symptoms and control measures (where applicable) of the following: *Phytophthora* (disease), *Ascobolus, Puccinia, Agaricus, Helminthosporium* (disease).

BRYOPHYTES

1. General characters of Hepaticopsida, Anthocerotopsida and Bryopsida.
2. Life histories of the following: *Riccia, Marchantia, Anthoceros and Funaria*.

Group-B

PTERIDOPHYTES

1. General characters of pteridophytes.
2. Vegetative and reproductive organography of: *Rhynia, Lycopodium, Selaginella, Equisetum, Pteris* and life cycle patterns of homosporous and heterosporous pteridophytes (*Lycopodium* and *Selaginella).*

PALAEOBOTANY

Definition, types of fossil (Fossilisation and the mode of their preservation excluded). Geologic Time Scale (Outline); Appearance of major classes of vascular plants through geologic Eras.

GYMNOSPERMS

1. General characters of Gymnosperms.
2. Life histories of *Cycas, Pinus* and *Gnetum.* Angiospermic features in *Gnetum*.

MORPHOLOGY

1. Leaf: Types, modifications of lamina and petioles, phyllotaxy
2. Inflorescence: Types with examples.
3. Flower: Morphology of different parts and their adhesion and cohesion; pollination: Types and contrivances.
4. Fruit: Different types with examples.

Part-II

Paper-II

Group-A

ANATOMY

1. Plant tissue and tissue system (ground and vascular).
2. Anatomy of primary body - stem, root (monocot and dicot).
3. Normal secondary growth of stem.

TAXONOMY

1. Systems of classification of plants by Linnaeus; Benthum & Hooker; Takhtajan (1997).
2. General characters and economic importance of the following families (range of floral structure excluded): Magnoliaceae, Cruciferae (Brassicaceae), Malvaceae, Euphorbiaceae. Leguminosae (Fabaceae), Apocynaceae, Labiatae (Lamiaceae), Solanaceae, Rubiaceae, Compositae (Asteraceae), Gramineae (Poaceae), Orchidaceae.

Group –B

CYTOLOGY

1. Ultrastructure and function of mitochondrion, chloroplast, rhibosome and nucleus. Physical structure of chromosome and organization of chromatin (nucleosome), structure of DNA, Euchromatin and Heterochromatin.
2. Mitotic and meiotic cell division and their significance.

GENETICS

1. Mendel's laws, monohybrid and di-hybrid ratios (deviation of Mendel's laws excluded).
2. General account of linkage and crossing over .
3. Numerical changes in chromosome (Euploidy and Aneuploidy).
4. Mutation: definition and significance, mutagens.

PHYSIOLOGY

1. Water relation: Water absorption, mechanism and factors. Ascent of sap: Definition, path of ascent of sap, cohesion tension theory. Transpiration: Definition, types, mechanism and factors.
2. Enzymes: Definition, properties, classification and cofactors.
3. Respiration: Definition of aerobic respiration, anaerobic respiration and fermentation. Mechanism of Glycolysis and Krebs Cycle. Electron Transport Chain and Oxidative Phosphorylation. Factors affecting respiration. Definition of RQ. Photorespiration: Definition and occurrence.

4. Protein synthesis: Transcription and Translation in prokaryotes.

5. Photosynthesis: Definition, light reaction and Calvin cycle in C_3 plants. Factors affecting photosynthesis; C_4 plants - definition and occurrence.

6. Mineral nutrients: Criteria of essentiality of mineral elements and their roles. Macro - (N, P, K,, Mg, Ca) and Micro (Zn, Mo, B) elements.

7. Nitrogen fixation: Examples of biological nitrogen fixers and symbionts. Significance of nitrogen fixation in agriculture, nitrogen cycle, mechanism of biological N_2 fixation.

8. Growth hormones: Definition of plant hormone. Classification of hormones (Natural, synthetic/artificial, postulated), preliminary role of auxins, gibberellins, cytokinins and ethylene (in brief), application of plant hormones in agriculture.

9. Growth and development: Definition, short account of photoperiodism, vernalization & phytochrome

ECOLOGY

1. Definition of autecology and synecology, energy flow in ecosystem.

2. Ecological adaptations and characteristics of hydrophytes, xerophytes and halophytes.

3. Water and air pollution.

4. Characteristic vegetation of Eastern Himalayas and Sunderbans.

Part-II

Paper-III Practical-100

1. A. Dissection (where necessary), mounting, description, drawing and identification of the following genera (10 marks):
   a. Algae: *Nostoc, Oedogonium, Chara.*

   b. Fungi: *Ascobolus, Puccinia* (Uredosorus and teleutosorus).

   c. Bryophytes: *Riccia, Marchantia and Funaria.*

   B. Dissection, mounting, description, drawing, labeling and identification of the following genera (12 marks):

   a. Pteridophytes: *Lycopodium* (stem), *Selaginella* (stem) and *Pteris (*leaflet).

   b. Gymnosperms: *Cycas* leaflet*, Pinus* needle.

2. Study of vegetative and reproductive organs, description, drawing and labeling, floral diagram, floral formula and identification of the following families (14 marks):

   Malvaceae, Rubiaceae, Papilionaceae, Caesalpiniaceae, Apocynaceae, Labiatae (Lamiaceae), Solanaceae.

3. Section cutting and temporary preparation using acqueous safranine, description with labeled sketches and comments on the anatomical structure of the following (10 marks):

   Sunflower stem *Cucurbita* stem, Maize stem, Pea root, *Nerium* leaf, *Canna* root.

4. Physiological experiments including procedure and precaution (11 marks: requisition-3, theory and experiment setting – 4, result – 2 and precautions -2).

i. Determination of isotonic concentration of cell sap by plasmolysis method (using supplied solution).

ii. To find out the essentiality of CO_2 for photosynthesis.

iii. Determination of the rate of transpiration by using conical flask.

iv. To find out the rate of respiration by germinating seeds (result should be expressed as CO_2 released and O_2 consumed in unit time).

[students should know the requirements for the experiments and to write down the results and comments together with the precaution to be taken].

3. Identification with comments of the following from prepared slides and specimens (22 marks):

i. Cryptogams and gymnosperms as prescribed in the theoretical syllabus.

ii. Cystoliths, raphides, sphaeraphides, starch grain, stomata, lenticels and stone cells.

iii. Stages of mitosis.

iv. Local common plants of the families included in the practical syllabus.

v. Different types of fruits, inflorescences and stipules.

4. There shall be one excursion for field study and collection as part of curriculum. Students should submit field record and collected specimens (at least 10) during examination with proper field data (date of collection, place, relevant ecological notes etc.).

5. Submission of prepared slides – 2 marks.

6. Practical Note Books – 4 marks

7. Viva-vice -10 marks

Part – III

Paper – IV

Group-A 65 marks

THEORY

MICROBIOLOGY:

1. General structure of Bacteria (morphology and ultrastructure).

2. Economic uses of Bacteria (useful and harmful Bacteria).

3. Antibiotics: Definition, sources and uses.

4. General structure of Viruses, structure of TMV and T_2 phage and multiplication (Lytic cycle, mention lysogeny).

PLANT BREEDING AND TISSUE CULTURE:

1. Introduction, selection and methods of hybridization.

2. General idea about tissue culture and its application.

3. Vegetative plant propagation.

ECONOMIC BOTANY AND MEDICINAL PLANTS:

1. Economic importance of rice, jute and tea.

2. Preliminary idea about the folk medicine,pharmacognosy, pharmacopoeia, use of *Adhatoda vasica, Andrographis paniculata, Rauwolfia serpentina, Cinchona* sp., *Ocimum sanctum , Datura* sp.

Paper IV

Group-B – 35 marks

Practical:

1. Microbiology: Simple staining of Bacteria with methylene blue/Carbol Fuchsin – Curd

2. Medicinal plants: Identification of medicinal plants, parts used and medicinal values of: *Adhatoda vasica, Andrographis paniculata, Catharanthus roseus Ocimum sanctum, Datura* sp and *Eclipta alba.*.

Distribution of marks:

Microbiology – Preparation of slides., method of staining, drawing and labeling	13
Medicinal plants – Identification, parts used and medicinal values of three plants	12
Practical Records	5
Viva-voce	5

Total:	35

Suggested Readings :

1. College Botany Vol. – I. - Gangulee, Das & Datta, New Central Book Agency. Kolkata.
2. College Botany Vol. –II.- Gangulee and Kar, New Central Book Agency, Kolkata.
3. College Botany Vol. –III. – S. K. Mukherjee , New Central Book Agency, Kolkata.
4. Studies in Botany, Vol. I. - Mitra, Mitra, Choudhury. Moulik Library, Kolkata.
5. Studies in Botany, Vol. II. - Mitra, Guha, Choudhury. Moulik Library, Kolkata.
6. College Botany (Practical). Vol. I & II - Santra, Chatterjee, Das, New Central Book Agency.
7. Botany – A. C. Datta, Oxford Univ. Press