Curriculum and Syllabus

For B. Sc. Botany (General)

Submitted to

THE UNIVERSITY OF BURDWAN

Under

Choice Based Credit System (CBCS)

(*w.e.f.* Academic Year 2017-2018)

Details of Courses

Core Courses –Botany

1. Biodiversity (Microbes, Algae, Fungi and Archegoniate)
2. Plant Ecology and Taxonomy
3. Plant Anatomy and Embryology
4. Plant Physiology and Metabolism

Discipline Specific Electives (DSE)-Botany (Any two)

DSE 1 **(Any one)**

1. Economic Botany and Biotechnology

or

2. Analytical Techniques in Plant Sciences

or

3. Bioinformatics

DSE-2 **(Any one)**

1. Cell Biology, Genetics and Molecular Biology

or

2. Research Methodology

or

3. Dissertation

Ability Enhancement Compulsory Courses

1. Environmental Studies (ENVS)
2. English Communication/MIL

Skill Enhancement Courses (SEC) - Botany

SEC 1 **(Any one)**

1. Biofertilizers

or

2. Herbal Technology

SEC 2 **(Any one)**

1. Medicinal Botany

or

2. Floriculture

SEC 3 **(Any one)**

1. Nursery and Gardening

or

2. Plant Diversity and Human Welfare

SEC 4 **(Any one)**

1. Ethnobotany

or

2. Mushroom Culture Technology

or

3. Intellectual Property Right

Proposed scheme for choice based credit system in B. Sc. with Botany

	DISCIPLINE CORE COURSE (12)	**Ability Enhancement Compulsory Course (AECC) (2)**	**Skill Enhancement Course (SEC) (2)**	**Discipline Specific Elective DSE (6)**
SEM-I	Discipline 1 (Botany) Paper I: Biodiversity (Microbes, Algae, Fungi and Archegoniate) Discipline 2 (other) Paper I: Discipline 3 (other) Paper I:	ENVS		
SEM-II	Discipline 1 (Botany) Paper II: Plant Ecology and Taxonomy Discipline 2 (other) Paper II: Discipline 3 (other) Paper II:	English Communication/MIL		
SEM-III	Discipline 1 (Botany) Paper III: Plant Anatomy and Embryology Discipline 2 (other) Paper III: Discipline 3 (other) Paper III:		SEC – 1	
SEM-IV	Discipline 1 (Botany) Paper IV:Plant Physiology and Metabolism Discipline 2 (other) Paper IV: Discipline 3 (other) Paper IV:		SEC - 2	
SEM-V			SEC – 3	DSE (BOT) – P 1 - Economic Botany and Biotechnology/ Analytical Techniques in Plant Sciences/ Bioinformatics DSE (Other) – P1 DSE (Other) – P1
SEM-VI			SEC – 4	DSE (BOT) – P 2 - Cell and Molecular Biology/ Research Methodology/ Dissertation DSE (Other) – P2 DSE (Other) – P2

CREDIT DISTRIBUTION

SEMESTER	COURSE OPTED	COURSE NAME	CREDIT
SEM – I Total Credit - 22	AECC – I	ENVS	4
	Discipline 1 Core Course -1 (BOTANY) – TH	Biodiversity (Microbes, Algae, Fungi and Archegoniate) -THEORY	4
	Discipline 1 Core Course -1 (BOTANY) – PR	Biodiversity (Microbes, Algae, Fungi and Archegoniate) - PRACT	2
	Discipline 2 Core Course -1 (OTHER) – TH	Paper – I - TH	4
	Discipline 2 Core Course -1 (OTHER) – PR	Paper – I - PR	2
	Discipline 3 Core Course -1 (OTHER) – TH	Paper – I - TH	4
	Discipline 3 Core Course -1 (OTHER) – PR	Paper – I - PR	2
SEM – II Total Credit - 20	AECC – II	English Communication/MIL	2
	Discipline 1 Core Course -2 (BOTANY) – TH	Plant Ecology and Taxonomy- THEORY	4
	Discipline 1 Core Course -2 (BOTANY) – PR	Plant Ecology and Taxonomy - PRACT	2
	Discipline 2 Core Course -2 (OTHER) – TH	Paper – II - TH	4
	Discipline 2 Core Course -2 (OTHER) – PR	Paper – II - PR	2
	Discipline 3 Core Course -2 (OTHER) – TH	Paper – II - TH	4
	Discipline 3 Core Course -2 (OTHER) – PR	Paper – II - PR	2
SEM – III Total Credit - 20	Discipline 1 Core Course -3 (BOTANY) – TH	Plant Anatomy and Embryology - THEORY	4
	Discipline 1 Core Course -3 (BOTANY) – PR	Plant Anatomy and Embryology - PRACT	2
	Discipline 2 Core Course -3 (OTHER) – TH	Paper – III - TH	4
	Discipline 2 Core Course -3 (OTHER) – PR	Paper – III - PR	2
	Discipline 3 Core Course -3 (OTHER) – TH	Paper – III - TH	4
	Discipline 3 Core Course -3 (OTHER) – PR	Paper – III- PR	2
	Skill Enhancement Course – 1	SEC – 1	2

Cont…

SEM – IV Total Credit - 20	Discipline 1 Core Course -4 (BOTANY) – TH	Plant Anatomy and Embryology - THEORY	4
	Discipline 1 Core Course -4 (BOTANY) – PR	Plant Anatomy and Embryology - PRACT	2
	Discipline 2 Core Course -4 (OTHER) – TH	Paper – IV - TH	4
	Discipline 2 Core Course -4 (OTHER) – PR	Paper – IV - PR	2
	Discipline 3 Core Course -4 (OTHER) – TH	Paper – IV - TH	4
	Discipline 3 Core Course -4 (OTHER) – PR	Paper – IV - PR	2
	Skill Enhancement Course – 2	SEC – 2	2
SEM – V Total Credit - 20	Discipline Specific Elective DSE(1) - BOT – TH – Paper I	DSE (1) – Botany – Paper I Theory	4
	Discipline Specific Elective DSE(1) - BOT – PR – Paper I	DSE (1) – Botany – Paper I Practical	2
	Discipline Specific Elective DSE(2) - OTH – TH – Paper I	DSE (2) – Other – Paper I Theory	4
	Discipline Specific Elective DSE(2) - OTH – PR – Paper I	DSE (2) – Other – Paper I Practical	2
	Discipline Specific Elective DSE(3) - OTH – TH – Paper I	DSE (3) – Other – Paper I Theory	4
	Discipline Specific Elective DSE(3) - OTH – PR – Paper I	DSE (3) – Other – Paper I Practical	2
	Skill Enhancement Course – 3	SEC – 3	2
SEM – VI Total Credit - 20	Discipline Specific Elective DSE(1) - BOT – TH – Paper II	DSE (1) – Botany – Paper II Theory	4
	Discipline Specific Elective DSE(1) - BOT – PR – Paper II	DSE (1) – Botany – Paper II Practical	2
	Discipline Specific Elective DSE(2) - OTH – TH – Paper II	DSE (2) – Other – Paper II Theory	4
	Discipline Specific Elective DSE(2) - OTH – PR – Paper II	DSE (2) – Other – Paper II Practical	2
	Discipline Specific Elective DSE(3) - OTH – TH – Paper II	DSE (3) – Other – Paper II Theory	4
	Discipline Specific Elective DSE(3) - OTH – PR – Paper II	DSE (3) – Other – Paper II Practical	2
	Skill Enhancement Course – 4	SEC – 4	2
TOTAL			**122**

Core Courses

Semester I

Core Course: Botany Paper I
Biodiversity (Microbes, Algae, Fungi and Archegoniate)

(Credits: Theory-4, Practicals-2)

THEORY

Lectures: 60

Unit 1: Microbes (10 Lectures)

Viruses – Discovery, general structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance; Bacteria – Discovery, General characteristics and cell structure; Reproduction – vegetative, asexual and recombination (conjugation, transformation and transduction); Economic importance.

Unit 2: Algae (12 Lectures)

General characteristics; Ecology and distribution; Range of thallus organization and reproduction; Classification of algae; Morphology and life-cycles of the following: *Chlamydomonas*, *Oedogonium*, *Chara*, *Fucus* and *Polysiphonia*. Economic importance of algae

Unit 3: Fungi (12 Lectures)

Introduction- General characteristics, ecology and significance, range of thallus organization, cell wall composition , nutrition, reproduction and classification; True Fungi- General characteristics, ecology and significance, life cycle of *Rhizopus* (Zygomycota) *Ascobolus* (Ascomycota), *Puccinia* and *Agaricus* (Basidiomycota); Symbiotic Associations-Lichens:
General account, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance

Unit 4: Introduction to Archegoniate (**2 Lectures)**

Unifying features of archegoniates, Transition to land habit, Alternation of generations.

Unit 5: Bryophytes (10 Lectures)

General characteristics, adaptations to land habit, Classification, Range of thallus organization.
Classification (up to family), morphology, anatomy and reproduction of *Marchantia* and *Funaria*. (Developmental details not to be included). Ecology and economic importance of bryophytes with special mention of *Sphagnum*.

Unit 6: Pteridophytes (8 Lectures)

General characteristics, classification, Early land plants (*Rhynia*). Classification (upto family), morphology, anatomy and reproduction of *Lycopodium*, *Selaginella*, *Equisetum* and *Pteris*. (Developmental details not to be included). Heterospory, stelar evolution. economic importance of Pteridophytes.

Unit 7: Gymnosperms (6 Lectures)

General characteristics, classification. Classification (up to family), morphology, anatomy and reproduction of *Cycas* and *Pinus*. (Developmental details not to be included). Economic importance.

Practical

1. Dissection (where necessary), mounting, description, drawing and identification of the following genera:

a. Algae: *Nostoc*, Oedogonium and Chara.

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

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

2. Dissection, mounting, description, drawing, labeling and identification of the following genera:

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

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

3. Identification of all above mentioned genera in theoretical syllabus from permanent slides

4. Microbiology: Sterilization techniques.; Simple staining of Bacteria with methylene blue/Carbol Fuchsin – Curd

Suggested Readings

1. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.
2. Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition.
3. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
4. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition.
5. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R., (2005). Biology. Tata McGraw Hill, Delhi, India.
6. Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India.
7. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
8. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.

Semester II

Core Course Botany –Paper II
Plant Ecology and Taxonomy
(Credits: Theory-4, Practicals-2)
THEORY
Lectures: 60

Unit 1: Introduction **(2 Lectures)**
Plant Ecology and Taxonomy

Unit 2: Ecological factors **(10 Lectures)**
Soil: Origin, formation, composition, soil profile. Water: States of water in the environment, precipitation types. Light and temperature: Variation Optimal and limiting factors. Adaptation of hydrophytes, halophytes and xerophytes.

Unit 3: Plant communities **(6 Lectures)**
Characters; Ecotone and edge effect; Succession; Processes and types.

Unit 4: Ecosystem **(8 Lectures)**
Structure; energy flow trophic organisation; Food chains and food webs, Ecological pyramids production and productivity; Biogeochemical cycling; Cycling of carbon, nitrogen and Phosphorous

Unit 5: Phytogeography **(4 Lectures)**
Principle biogeographical zones; Endemism

Unit 6 Plant taxonomy **(2 Lectures)**
Identification, Classification, Nomenclature.

Unit 7 Identification **(4 Lectures)**
Functions of Herbarium, important herbaria and botanical gardens of the world and India;
Documentation: Flora, Keys: single access and multi-access

Unit 8 Taxonomic evidences **(6 Lectures)**
Taxonomic evidences from palynology, cytology, phytochemistry and molecular data.

Unit 9 Taxonomic hierarchy **(2 Lectures)**
Ranks, categories and taxonomic groups

Unit 10 Botanical nomenclature **(6 Lectures)**
Principles and rules (ICN); ranks and names; binominal system, typification, author citation, valid publication, rejection of names, principle of priority and its limitations.

Unit 11 Classification **(6 Lectures)**
Types of classification-artificial, natural and phylogenetic. Classification Bentham and Hooker (upto series), Takhtajan.

Unit 12 Biometrics, numerical taxonomy and cladistics **(4 Lectures)**
Characters; variations; OTUs, character weighting and coding; cluster analysis; phenograms, cladograms (definitions and differences).

Practical

1. Study of vegetative and reproductive organs, description, drawing and labeling, floral diagram, floral formula and identification of the following families: Malvaceae, Rubiaceae, Papilionaceae, Caesalpiniaceae, Apocynaceae, Labiatae (Lamiaceae), Solanaceae.

2. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).

3. Ecological adaptations of some species: *Ipomoea aquatica* stem, Phyllode of *Acaccia auriculiformis*, *Nerium* leaf and *Vanda* root

Suggested Readings

1. Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall, U.S.A. 4th edition.

2. Sharma, P.D. (2010). Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.

3. Simpson, M.G. (2006). *Plant Systematics.* Elsevier Academic Press, San Diego, CA, U.S.A.

4. Singh, G. (2012). *Plant Systematics:* Theory and Practice. Oxford & IBH Pvt. Ltd., New Delhi. 3rd edition.

NOTE:- Details of Syllabus for SEM – III, IV,V, VI under revision.