West Bengal State University

Berunanpukuria, Barasat, North 24 Parganas,
KOLKATA-700126

SYLLABI

FOR

THREE YEARS B. Sc. DEGREE COURSE

(3 years 1+1+1 Examination System)

BOTANY

(WBSU Code 121)

2009

West Bengal State University

Barasat

Syllabi for 3 year - B. Sc. Degree Course

[3 years 1+1+1 Examination System]

BOTANY

(GENERAL)

[WBSU Code - 1212]

2009

[Syllabus to be effective from 2010 – 2011 Session]

[Mode of internal assessment is to be made as per the directive given in the respective pages vide page No. 34 & 37]

Distribution of Marks

<table>
<tr><td colspan="5">Total Allotment – 400 Marks</td></tr>
<tr><td rowspan="2">Terminal Examinations</td><td rowspan="2">Theoretical Assessment</td><td colspan="2">Practical Assessment</td><td rowspan="2">Total Marks</td></tr>
<tr><td>External</td><td>Internal</td><td>External</td></tr>
<tr><td>Part - I
(Paper I)
First Year</td><td>Paper I [100]
121201</td><td>Shall start and continue till the 2nd Yr. Part II examination *</td><td>Nil</td><td>100</td></tr>
<tr><td rowspan="3">Part – II
(Paper II & III)
Second Year</td><td rowspan="3">Paper II [100]
121202</td><td colspan="2">Paper III Practical**</td><td rowspan="3">200</td></tr>
<tr><td colspan="2">121203</td></tr>
<tr><td>80</td><td>20</td></tr>
<tr><td rowspan="3">Part – III
(Paper IV & V)
Third Year</td><td rowspan="3">Paper IV [70]
121204</td><td colspan="2">Paper V Practical</td><td rowspan="3">100</td></tr>
<tr><td colspan="2">121205</td></tr>
<tr><td>20</td><td>10</td></tr>
<tr><td>Total Marks</td><td>270</td><td>100</td><td>30</td><td>400</td></tr>
</table>

***/** It is very important to note that the <u>Practical Classes</u> for the topics included in the Paper III (Scheduled for Part II Exam / 2nd year Terminal Exam), <u>should be started from First Year</u> so as to complete the curriculum in time (see detailed syllabus).**

BOTG

PART - I [First Year Terminal] : 100 Marks

Paper - I Theoretical 100 Marks [3hr.]
(Code - 121201)

Group A: - Algae, Fungi & Lichen, Plant Pathology & Microbiology..... 40 Marks
Group B: - Bryophyta, Pteridophyta, Gymnosperms & Palaeobotany..... 30 Marks
Group C: - Morphology & Taxonomy of Angiosperms, and Palynology..... 30 Marks

Group A: - [40 Marks / 25 Periods]

Algae - [10 Marks / 6 Periods] General account.// Morphology, Reproduction & Examples of Cyanophyceae, Chlorophyceae, Bacillariophyceae, Phaeophyceae & Rhodophyceae.//Alternation of Generations in Chlorophyceae and Phaeophyceae.// Sources and uses of edible algae, agar, algin & diatomite.

Fungi & Lichen - [10 Marks / 6 Periods] General characters & types of spores.// Primary features and examples of Oomycota, Chytridiomycota, Zygomycota, Ascomycota and Basidiomycota.// Concept of Anamorph & Teleomorph.// Fungal symbiosis - Mycorrhiza, Lichens and their importance.// Sources and uses of ethanol, alpha amylase, penicillin & Griseofulvin.

Plant Pathology - [10 Marks / 6 Periods] Terms & Definitions - Pathogen, Propagule, Vector, Inoculum, Infection, Symptoms (necrosis, wilt, spot, blight, hypoplastic & hyperplastic).// Disease & Disease Cycle, Disease Triangle, Disease Management // Koch's postulates // Phytoalexins.// Symptoms, Causal organisms, Disease cycle & Control measures of - (a) Tungro virus disease of rice & (b) Late blight of potato.

Microbiology - [10 Marks / 7 Periods] Three Domains of Life.// Prokaryote & Eukaryote.// Binary fission & Exponential Growth.// Bacterial Cell Wall.// Salient features of Plant Virus & Phage.// Lytic (by T_4 phage) cycle & Lysogeny (with Phage).// Horizontal gene transfer and gene recombination through - Transformation, conjugation & Transduction.// Sources & Uses of Amylase & Streptomycin.

Group B: - [30 Marks / 15 Periods]

Bryophyta - [8 Marks / 4 Periods] General character (the amphibian nature).// Characters and examples of Hepaticopsida, Anthocerotopsida & Bryopsida.// Reproductive Structures and Sporophytes of ***Riccia***, ***Anthoceros*** and ***Funaria***.

Pteridophyta - [8 Marks / 4 Periods] Characters and examples of Psilophyta, Lycophyta, Sphenophyta & Filicophyta.// Structure of reproductive organs in the Sporophytes of ***Lycopodium***, ***Selaginella*** and ***Dryopteris***.

Gymnosperms - [8 Marks / 4 Periods] Concept of Progymnosperms.// Characters and examples of Cycadophyta, Coniferophyta & Gnetophyta.// Structures of Microsporangia and Ovules of ***Cycas***, ***Pinus*** & ***Gnetum***.

Palaeobotany - [6 Marks / 3 Periods] Importance of fossil study.// Definitions and Examples of Impression, Cast and Amber // Organization of Reconstructed ***Williamsonia Sewardiana***.

Group C: - [30 Marks / 15 Periods]

Morphology - [5 Marks / 3 Periods] Types of Inflorescences and Flowers with Examples.// Aestivation // Cohesion and Adhesion of floral parts.

Palynology - [5 Marks / 2 Periods] Definition.// Pollen Types.// Various Branches & Applications.

Taxonomy - [20 Marks / 10 Periods] Objectives & Functions.// Alpha & Omega taxonomy, Phylogenetic Classification & Data source.// ICBN - Principles, Binomial, Authors' citations, Suffixes for major taxa & sub-groups.// Definitions of Artificial, Natural and Phylogenetic systems of classification // Classification of Dicotyledonous angiosperms, following Bentham & Hooker, upto series with characters.// Diagnostic features of the following families - **Malvaceae, Leguminosae (Fabaceae), Solanaceae, Lamiaceae, Cucurbitaceae, Asteraceae, Poaceae & Orchidaceae.**

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PART - II [Second Year Terminal] : 100 Marks

Paper - II Theoretical 100 Marks [3 hr.]
(Code - 121202)

Group A: - Anatomy, Embryology, Economic Botany & Ecology.....40 Marks
Group B: - Cell Biology and Genetics .....30 Marks
Group C: - Biochemistry and Plant Physiology.....30 Marks

Group A: - [40 Marks / 25 Periods]

Anatomy - [10 Marks / 8 Periods] Cell wall - chemistry, ultrastructure & function.//Stomatal types.// Evolution of stelar types.// Shoot apex (Tunica-Corpus) and root apex (Körper-Kappe).// Secondary growth in the stem of ***Tecoma***.

Embryology - [10 Marks / 6 Periods] Sporogenesis and Gametogenesis.// Embryo development in ***Capsella bursa-pastoris***.// Endosperm development.

Economic Botany - [10 Marks / 5 Periods] Study of the following economically important plants [only binomials, families, parts used and uses] - rice & wheat // sugarcane // mung & gram // ginger & cumin // onion & garlic // tea & coffee // cinchona, neem, ipecac & vasak // mustard, ground nut & coconut // potato, pumpkin & carrot // cotton & jute // sal & teak // mango, litchi & jack fruit.

Ecology - [10 Marks / 6 Periods] Ecotype and microclimate.// Plant community.// Plant succession - Hydrosere & Xerosere.// Adaptive features of Hydrophytes, Halophytes & Xerophytes.// Biodiversity - definition & levels of biodiversity (genetic, species & ecosystem).// Methods of ***in situ*** & ***ex situ*** conservation.

Group B: - [30 Marks / 25 Periods]

Cell Biology - [10 marks / 8 Periods] Endomembrane system & Cytoskeleton.// Ultrastructure of nuclear membrane & nucleolus.// Nucleosome, euchromatin & heterochromatin.// cell cycle, interphase & cell division with reference to meiosis.// Chromosomal aberration - deletions, duplications, inversion and translocation.// Aneuploydy and polyploidy – types, importance, and role in evolution.

Genetics - [20 Marks / 17 Periods] Central dogma.// DNA replication – Meselson and Stahl's experiment & mechanism of replication.// Transcription and translation (Protein synthesis).// Genetic code – Properties.// Mendelian basis of inheritance, predicting Mendelian ratios, sex determination, sex linked inheritance, gene concept, gene interactions (allele interactions) & epistasis.// Linkage group and genetic map (three point test cross).// Test cross and back cross.// Mutation, point mutation (tautomerization, transition, transversion and frame shift).// Mutagen – examples of physical & chemical mutagens.// Brief concept of split gene, transposons & repetitive DNA.

Group C: - [30 Marks / 25 Periods]

Biochemistry - [10 marks / 8 Periods] Carbohydrates - chemistry and importance of ribose, glucose, fructose, sucrose, maltose, starch, cellulose & dextran.// Protein - primary, secondary, tertiary & quaternary structures.// Enzyme- Definition, Types and examples, co-factors, co-enzymes.

Plant Physiology - [20 Marks / 17 Periods] Transpiration - transpiration stream and pathway of water movement.// Role sugar and K^+ ion in stomatal movement.// Xylem cavitation & embolism.// Source-sink relation in phloem transport.// Photosynthesis – Absorption and action spectra, enhancement effect, PS-I & PS-II, Z-scheme and photo -phosphorylation.// Calvin cycle & RUBISCO.// Significance of photorespiration, C4 cycle & CAM.// Respiration – Glycolysis, Role of ATP, Krebs cycle, ETS & oxidative phosphorylation.// N_2 fixation and amino acid synthesis (GS - GOGAT system).//Specific role of auxine, gibberellins, cytokinin, ethylene and abscisic acid in the biological cycle of a plant.// Photomorphogenesis - physiology of flowering, phytochrome, cryptochrome & Florigen concept.

Paper - III Practical 100 Marks

(Code - 121203)

[Internal - 80 Marks] & [External - 20 Marks]

Regular & Daily Internal Assessment [60 Marks]

Topics	Marks [Completion & Performance]
1. Cryptogams - Algae/Fungi.....	8
2. Angiosperms.....	10
3. Anatomy.....	8
4. Plant Physiology.....	10
5. Study of Mitotic Chromosome.....	8
6. Field Work.....	6
7. Attendance.....	10

Field record - stating date, types of vegetation & predominant plant species present in the area visited [**Two local excursions (3 x 2 = 6 Marks)** are to attended by the students]

Centralized Internal Assessment [20 Marks]

8. Identification..... [10 specimens x 2 marks each]..... 20

Centralized External Assessment [20 Marks]

To be scheduled by the **W. B. State University**

9. Laboratory note books, Slides, Field records, Herbarium sheets..... [5+3+3+3]..... 14

10. *Viva Voce*..... **6**

Laboratory note books [must regularly be checked and signed with date]; **Slides** [permanent slides prepared in the class]; **Herbarium** [at least 10 (ten) herbarium specimens (sheets) of common angiospermic weeds are to be prepared by the students, stating details of the specimens].

[The materials included under Topic No. 9 are to be submitted, as and when required, at the time of external centralized examination]----------

Internal Assessment System

Pro-forma of Log Book cum Attendance Register for continuous Internal Assessment of Paper III: Effective & Valid from 2008 -09 Session

College Roll	Name	WBSU ID No.	Students' Signature with Date								Remarks (Performance) & Teachers' Signature		

Number of Columns can be adjusted to accommodate maximum dates per page; Number of Rows must be increased to accommodate maximum number of students per page and Cell Space should be increased to adjust signature with date in the Log Book cum Attendance Register

Internal Assessment System

To be effective from 2008-2009 Session

Paper - III Practical 100 Marks

(Code - 121203)

[Internal - 80 Marks & External - 20 Marks]

Regular & Daily Internal Assessment [60 Marks]

Performance Calculation: Percent Achievement = $\frac{\mathbf{A}}{\mathbf{B}}$ **x 100 = C % Achievement**

Marks to be Awarded = C % of the marks allotted to specific topic / part/ portion Symbols used: - **A** = The Number of - Classes Attended / Field Work Attended / Specimens Worked out / Tests & Experiments Completed by the student etc.; **B** = The Number of - Classes Held / Scheduled Field Work / Number of Specimens or Test or Experiment Scheduled etc.; **C** = Percent Achievement of a student or examinee.

[or, $\frac{\mathbf{A}}{\mathbf{B}}$ **x C where C is marks allotted to the part]**

Centralized Internal Assessment [20 Marks]

8. Identification..... [10 specimens x 2 marks each] 20

As per the syllabus prescribed above.

Detailed Syllabus [To be effective from 2010 - 2011 Session]

1. Cryptogams - Microscopic preparation, drawing, labeling, description and identification o the following - ***Nostoc***, ***Oedogonium***, ***Chara***, ***Rhizopus*** & ***Penicillium***.

2. Angiosperms - Dissection, drawing, labeling, description, floral diagram, floral formula & identification of the family of the specimens from the following families - **M**alvaceae, **L**eguminosae (**C**aesalpinioideae & **P**apilionoideae), **B**rassicaceae, **S**olanaceae & **L**amiaceae.

3. Anatomy - Double staining & preparation of permanent slides of T. S. s of the following - Stem - ***Cucurbita*** & Maize,
Root - Arum & Gram,
& Leaf - ***Nerium*** & Tube rose.

4. Plant Physiology -

a) Demonstration of plasmolysis,

b) Measurement of leaf area (graphical method) and determination of transpiration rate per unit area by weighing method,

c) Imbibitions of water by dry, proteinaceous and fatty seeds,

d) Evolution of O_2 (Vol. / unit time) during photosynthesis &

e) Evolution of CO_2 (Vol. / gram of material) during aerobic respiration.

5. Study of Chromosome - staining with aceto - orcein stain and squash preparation of onion (***Allium cepa***) root tips (pre-treated and untreated) to study mitotic chromosome and mitotic index.

6. <u>Identification</u>: - **A: - [<u>With reason</u>: <u>Identification 1 + Reason 1 = 2 x 8 specimens (to be set in the exam.) = 16</u>]** - [To study from preserved specimens and permanent slides] - **Cryptogams** [***Nostoc*** with heterocysts & akinetes, ***Oedogonium*** with oogonia, ***Chara*** with globules and nucules, ***Ectocarpus*** with plurilocular sporangia, Pennate diatom, ***Rhizopus*** with sporangiophores and sporangia, ***Penicillium*** with conidiophores and conidia, ***Agaricus*** - the V.L.S. of gills showing trama, hymenium, basidia & basidiospores, ***Riccia*** - V.T.S. of Thallus through archegonium & sporophyte, ***Anthoceros*** - L.S. of sporophyte, ***Funaria*** - L.S. of capsule, ***Lycopodium*** - L.S. of strobilus, ***Selaginella*** - L.S. of strobilus, ***Dryopteris*** - T.S. of pinnule through sorus] **; Gymnosperms** [***Cycas*** - mega - & micro - sporophylls, ***Pinus*** - male & female cones, ***Gnetum*** - L.S. of ovule] **; Anatomy** [haplostele, plectostele, transfusion tissue, sunken stomata, bicollateral vascular bundle, velamen] **; Morphology** [Inflorescence types] **; Cytology** [Different stages of mitotic & meiotic metaphase] **;**

B: - [<u>No reasoning</u>] Angiosperms [Binomials & Families**] [**Genus ½ + Species ½ + Family **1 = <u>2 x 2 specimens (to be set in the exam.) = 4</u>]** - ***Sida acuta, Abutilon indicum, Cassia sophera, Tephrosia purpurea, Crotalaria pallida, Coccinia grandis, Nicotiana plumbaginifolia, Leucas aspera, Leonurus sibiricus, Parthenium hysterophorus, Tridax procumbens, Chrysopogon aciculatus, Setaria glauca***, ***Eclipta alba*****].**

PART - III [Third Year Terminal] : 100 Marks

Paper - IV Theoretical - 70 Marks // Paper - V Practical - 30 marks
(Code - 121204) // (Code - 121205)

Paper - IV Theoretical 70 Marks [3 hr.]
(Code - 121204)
(To be effective from 2010-2011)

1. Biofertilizer: - **[10 marks / 5 Periods]** Types of Sources, Production and Application - with reference to Rhizobium, Azotobacter, Cyanobacteria, Azolla and Mycorrhiza.
2. Mushroom: - **[10 marks / 5 Periods]** Food value and cultivation technique of ***Pleurotus***.
3. Plant Breeding: - **[10 marks / 5 Periods]** Aims and Objectives; Mass and Pure line selection; Heterosis and Hybrid seed production; Maintenance of germplasm; Seed storage.
4. Measures of Central Tendency: - **[9 marks / 5 Periods]** Mean, Mode & Median, and their utility; Goodness of fit (Chi-square test).
5. Plant Tissue Culture: - **[9 marks / 5 Periods]** Callus culture and plant regeneration; Somatic embryogenesis and artificial seed; Protoplast culture; Application in agriculture, horticulture & forestry.
6. Recombinant DNA Technology: - **[9 marks / 5 Periods]** Recombinant DNA & restriction enzymes; Plasmid as vector; Gene cloning; Transgenic plant.
7. Pharmacognosy: - **[9 marks / 5 Periods]** Scope & importance; Organoleptic evaluation of crude drugs (with reference to ***Alstonia*** and ***Rauvolfia***).
8. Bioinformatics- **[4 marks / 2 Periods]** A brief knowledge about application.

Paper - V Practical 30 Marks

(Code - 121205)

[Internal- 20 Marks and External - 10 Marks]

The Assessment System to be effective from 2010- 2011 session

(For New Syllabus)

Internal Assessment-

Topics	Marks
1. Bacterial Staining	**7**
2. Biometry	**7**
3. Medicinal plant Identification .... [2 specimens x 3 marks]	**6**
[Genus ½ + Species ½ + Family **1**+ part used ½ **+** uses ½ **= 3]**	

External Assessment-

Topics	Marks
4. Laboratory note book & Herbarium	**5**
5. *Viva voce* ... [4 Qs x 1 mark each]	**5**

Internal Assessment System

Pro-forma of Log Book cum Attendance Register for continuous Internal

Assessment of Paper V : Effective & Valid from 2010 -2011 Session

College Roll	Name	WBSU ID No.	Students' Signature with Date								Remarks (Performance) & Teachers' Signature		

(Number of Columns can be adjusted to accommodate maximum dates per page; Number of Rows must be increased to accommodate maximum number of students per page and Cell Space should be increased to adjust signature with date in the Log Book cum Attendance Register)

Detailed Syllabus [To be effective from 2010 - 2011 Session]

Paper - V Practical 30 Marks

(Code - 121205)

[Internal- 20 Marks and External - 10 Marks]

The Assessment System to be effective from 2009- 2010 session

Internal Assessment-

Topics	Marks
1. Instrumentations……..…….. 4	
2. Bacterial Staining.....	**5**
3. Biometry.....	**5**
4. Medicinal plant Identification .... **[2 specimens x 3 marks]**	**6**
[Genus ½ + Species ½ + Family **1**+ part used ½ **+** uses ½ **= 3]**	

External Assessment-

Topics	Marks
4. Laboratory note book & Herbarium	**5**
5. ***Viva voce*** **... [4 Qs x 1 mark each]**	**5**

1. Instrumentations: Demonstration of:- Incubator, Autoclave, Hot Air Oven, Centrifuge, Colorimeter, pH Meter.

1. Bacterial Staining: - Staining of bacteria present in curd sample (**as available in the market / not home made**) and in the sample prepared from pure culture (**must be non-pathogenic**) by Methylene Blue and Ziel's Carbol Fuchsin stains.

2. Biometry: - Determination of Goodness - of - fit of normal monohybrid and dihybrid ratios (3:1 and 1:1 ratios) by Chi-square analysis.

3. Medicinal plant Identification [Genus ½ + Species ½ + Family **1**+ part used ½ **+** uses ½ **= 3]**: - To be acquainted with, to know the binomials and the families they belong to, and to have a brief knowledge about the medicinal uses of their parts, of the following common medicinal plants - ***Centella asiatica*** [thankuni], ***Herpestis monnieria*** [brahmi], ***Terminalia arjuna*** [arjun], ***Vitex negundo*** [nishinda], ***Saraca asoca*** [asoke], ***Adhatoda vasica*** [vasak], ***Andrographis paniculata*** [kalmegh], ***Rauvolfia serpentina*** [sarpagandha], ***Azadirachta indica*** [neem], ***Holarrhena antidysenterica*** [kurchi], ***Boerhaavia repens*** [punarnava], and ***Aegle marmelos*** [bel].

4. Laboratory note book & Herbarium: - The laboratory note books, signed with date by respective teachers, and Herbarium specimens of the medicinal plants examined (plant parts press-dried and attached on a sheet of art paper with a pasted slip detailing the taxonomic, vernacular and medicinal identities of the plant) must be submitted at the time of examination.

5. ***Viva voce*****..... [4 Qs x 1 mark each]**:- Questions from practical portions only.

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References

(In English)

1. Mitra, JN, Mitra, D & Chaudhuri, SK..... Studies in Botany Vol. I [Moulik Library]
2. Mitra, D, Guha, J, & Chaudhuri, SK..... Studies in Botany Vol. II [Moulik Library]
3. Gangulee, HC, Das, KS & Datta, CT ..... College Botany Vol. I [New Central Book Agency]
4. Gangulee, HC, & Kar, AK .....College Botany Vol. II [New Central Book Agency]
5. Ignamuthu, S Plant Biotechnology [Oxford IBH]
6. Kumar, HD ..... Molecular Biologyand Biotechnology [Vikas Publication]
7. Mukherjee, S ..... College Botany Vol. III [New Central Book Agency]

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1. Ghosh, S ..... Udvid Vidya Prayog [Bharatiya Book Stall]

2. Samajpati, N.....&Kumar,N Udvid Vidya [Bharatiya Book Stall]
3. Nandi, B, Nandi,.....S&Nandi,D Udvid Vidya Vol. I & II [NCBA]
4. Mitra, D, Guha,.....J,Chaudhuri,SK&Dutta,N Udvid Vignyan [Moulik Library]