

Narasinha Dutt College, Howrah
ACADEMIC CALENDAR 2019-2020
DEPARTMENT OF BOTANY

FACULTY LIST-

1. SKS- Sanjib Kumar Saha
2. T.D- Dr. Tandra Das
3. AS- Dr. Aditi Saha
4. PC- Dr. Pampa Chakraborty
5. SB- Dr. Subhajit Bandyopadhyay
6. SSS- Sk. Salek Sohel
7. TNB- Tenzing Ngoden Bhutia
8. AKC- Asim Kumar Chaudhuri
9. AM- Apurba Mahanti

Course Details

Core courses (CC-Total 14 courses to be studied in semesters. All theoretical papers i.e., BOT-A...TH are of 4 credits each and the respective practical papers i.e., BOT-A....P of 2 credits each)

SEM I

1. Phycology and Microbiology (BOT-A-CC-1-1-TH, BOT-A-CC-1-1-P)
2. Mycology and Phytopathology (BOT-A-CC-1-2-TH, BOT-A-CC-1-2-P)

SEM II 3. Plant anatomy (BOT-A-CC-2-3-TH, BOT-A-CC-2-3-P)

4. Archegoniate (BOT-A-CC-2-4-TH, BOT-A-CC-2-4-P)

SEM III

5. Palaeobotany and Palynology (BOT-A-CC-3-5-TH, BOT-A-CC-3-5-P)
6. Reproductive biology of Angiosperms (BOT-A-CC-3-6-TH, BOT-A-CC-3-6-P)
7. Plant systematic (BOT-A-CC-3-7-TH, BOT-A-CC-3-7-P)

SEM IV

8. Plant geography, Ecology and Evolution (BOT-A-CC-4-8-TH, BOT-A-CC-4-8-P)
9. Economic Botany (BOT-A-CC-4-9-TH, BOT-A-CC-4-9-P)
10. Genetics (BOT-A-CC-4-10-TH, BOT-A-CC-4-10-P)

SEM V

11. Cell and Molecular biology (BOT-A-CC-5-11-TH, BOT-A-CC-5-11-P)
12. Biochemistry (BOT-A-CC-5-12-TH, BOT-A-CC-5-12-P)

SEM VI

13. Plant Physiology (BOT-A-CC-6-13-TH, BOT-A-CC-6-13-P)
14. Plant Metabolism (BOT-A-CC-6-14-TH, BOT-A-CC-6-14-P)

Skill enhancement courses (SEC- 2, two papers to be selected from the list taking 1 from SEC A in 3rd SEM and 1 from SEC B in 4th SEM. Both the papers of 2 credits each and theoretical only)

SEC A (SEM III)

1. Applied Phycology, Mycology and Microbiology (BOT-A-SEC-A-3-1)
2. Biofertilizers (BOT-A-SEC-A-3-2)

SEC B (SEM IV)

3. Plant Breeding (BOT-A-SEC-B-4-3)
4. Mushroom Culture Technology (BOT-A-SEC-B-4-4)

Discipline specific elective courses (DSE, four courses to be selected from the 2 groups (A & B). A student shall choose any one paper from each of Group- A and Group- B in 5th AND 6th SEM. Each course comprises of theoretical component of 4 credits and practical ones of 2 credits)

DSE-A (Group- A)

SEM V

1. Biostatistics (BOT-A-DSE-A-5-1-TH, BOT-A-DSE-A-5-1-P)
2. Industrial and Environmental Biology (BOT-A-DSE-A-5-2-TH, BOT-A-DSE-A-5-2-P)

SEM VI

3. Medicinal and Ethnobotany (BOT-A-DSE-A-6-3-TH, BOT-A-DSE-A-6-3-P)
4. Stress Biology (BOT-A-DSE-A-6-4-TH, BOT-A-DSE-A-6-4-P)

DSE-B (Group-B)

SEM V

5. Plant Biotechnology (BOT-A-DSE-B-5-5-TH, BOT-A-DSE-B-5-5-P)
6. Horticultural practices and Post Harvest Technology (BOT-A-DSE-B-5-6-TH, BOT-A-DSE-B-5-6-P)

SEM VI

7. Research Methodology (BOT-A-DSE-B-6-7-TH, BOT-A-DSE-B-6-7-P)
8. Natural resource management (BOT-A-DSE-B-6-8-TH, BOT-A-DSE-B-6-8-P)

DISSERTATION/PROJECT: A Dissertation / Project may be given in lieu of a DSE. This is considered as a special course and will be of 6 credits. (Vide page 4 of CUS/268(CIR/18, dated 07.05.2018)). However, the details of the topics, modalities of evaluation etc. to be notified latter on.

SEME STER	COURSE OPTED	COURSE NAME	CREDIT
I	Core Course 1-BOT-A-CC-1-1-TH	Phycology and microbiology	4
	Core Course 1- BOT-A-CC-1-1-P	Phycology and microbiology Practical	2
	Core Course 2-BOT-A-CC-1-2-TH	Mycology and phytopathology	4
	Core Course 2- BOT-A-CC-1-2-P	Mycology and phytopathology Practical	2
II	Core Course 3-BOT-A-CC-2-3-TH	Plant anatomy	4
	Core Course 3- BOT-A-CC-2-3-P	Plant anatomy Practical	2
	Core Course 4-BOT-A-CC-2-4-TH	Archegoniate	4
	Core Course 4- BOT-A-CC-2-4-P	Archegoniate Practical	2
III	Core Course 5-BOT-A-CC-3-5-TH	Palaeobotany and palynology	4
	Core Course 5- BOT-A-CC-3-5-P	Palaeobotany and palynology Practical	2
	Core Course 6-BOT-A-CC-3-6-TH	Reproductive biology of angiosperms	4
	Core Course 6- BOT-A-CC-3-6-P	Reproductive biology of angiosperms Practical	2
	Core Course 7-BOT-A-CC-3-7-TH	Plant systematics	4
	Core Course 7- BOT-A-CC-3-7-P	Plant systematics Practical	2
	SEC A – BOT-A-SEC-A-3-1/ BOT-A-SEC-A-3-2	Only ONE paper to be selected	2
IV	Core Course 8-BOT-A-CC-4-8-TH	Plant geography, ecology and evolution	4
	Core Course 8- BOT-A-CC-4-8-P	Plant geography, ecology and evolution Practical	2
	Core Course 9-BOT-A-CC-4-9-TH	Economic botany	4
	Core Course 9- BOT-A-CC-4-9-P	Economic botany Practical	2
	Core Course 10- BOT-A-CC-4-10-TH	Genetics	4
	Core Course 10- BOT-A-CC-4-10-P	Genetics Practical	2
	SEC B – BOT-A-SEC-B-4-3/BOT-A-SEC-B-4-4	Only ONE paper to be selected	2
V	Core Course 11- BOT-A-CC-5-11-TH	Cell and molecular biology	4
	Core Course 11- BOT-A-CC-5-11-P	Cell and molecular biology Practical	2
	Core Course 12- BOT-A-CC-5-12-TH	Biochemistry	4
	Core Course 12- BOT-A-CC-5-12-P	Biochemistry Practical	2
	DSE A: BOT-A-DSE-A-5-1 & 2-TH & P	Only ONE paper to be selected from Group A	4 & 2
	DSE B: BOT-A-DSE-B-5-5 & 6-TH & P	Only ONE paper to be selected from Group B	4 & 2

VI	Core Course 13- BOT-A-CC-6-13-TH	Plant physiology	4
	Core Course 13- BOT-A-CC-6-13-P	Plant physiology practical	2
	Core Course 14- BOT-A-CC-6-14-TH	Plant metabolism	4
	Core Course 14- BOT-A-CC-6-14-P	Plant metabolism Practical	2
	DSE A: BOT-A-DSE-A-6-3&4-TH & P	Only ONE paper to be selected Group A	4 & 2
	DSE B: BOT-A-DSE-B-6-7&8 -TH & P	Only ONE paper to be selected Group B	4 & 2

C.U. B.Sc. BOTANY (HONOURS)
SEMESTER I
CORE COURSE 1
PHYCOLOGY AND MICROBIOLOGY (BOT-A-CC-1-1-TH)
THEORETICAL
(Credits 4)

PHYCOLOGY

1. General account :

1.1. Thallus organization, Structure of algal cell, 1.2. Ultrastructure of Plastids and Flagella, 1.3. Origin and evolution of sex, 1.4. Life cycle patterns, 1.5. Significant contributions of important phycologists (Fritsch, Smith, R. N. Singh, T.V. Desikachary, H.D. Kumar, M.O.P. Iyengar)

.....PC

2. Classification:

- 2.1. Criteria and basis of Fritsch's classification
- 2.2. Classification by Lee (2008) upto phylum with examples
- 2.3.** Salient features of Cyanobacteria, Rhodophyta, Chlorophyta , Charophyta, Bacillariophyta, Xanthophyta, Phaeophyta, Heterokantophyta

...AKC

3. Cyanobacteria:

- 1.. Ultrastructure of cell, 3.2. Heterocyst - structure and function, 3.3. Ecology.

.....AKC

3. Bacillariophyta:

- 3.1. Cell structure, 4.2. Cell division, 4.3. Auxospore formation in Centrales and Pennales.

..... PC

4. Life History:

- 3.2.** *Chlamydomonas*, 5.2. *Oedogonium*, 5.3. *Chara*,

PC

- 3.3. 5.4. *Ectocarpus*, 5.5. *Polysiphonia*, 5.6. Evolutionary significance of *Prochloron*.

.....AKC

SKS:

MICROBIOLOGY

1. Virus:

1.1. Discovery, 1.2. Plant virus- types, 1.3. Transmission and translocation of Plant virus, 1.4. TMV Physicochemical characteristics and Multiplication, 1.5. One step growth curve, 1.6. Lytic cycle (T4 phage) and Lysogenic cycle (Lambda phage), Significance of lysogeny, 1.7. Viroids and Prions.

... SKS

2. Bacteria:

2.1. Discovery, 2.2. Distinguishing features of Archaea and Bacteria, 2.3. Characteristics of some major groups: Proteobacteria (Enterobacteria), Firmicutes, Mollicutes, Actinobacteria, Spirochaetes, Chlamydiae, 2.4. Bacterial growth curve and generation time, 2.5. Flagella (ultrastructure) & Pili, 2.6. Cell wall – chemical structure and differences between Gram +ve & Gram – ve bacteria, 2.7. Bacterial genome and plasmid, 2.8. Endospore - formation, structure and function, 2.9. Genetic Recombination (a) Transformation – with special emphasis on Natural and Induced competence and DNA uptake, (b) Conjugation– F- factor, $F^+ \times F^-$, Hfr $\times F^-$, concept of F', chromosome mobilization, (c) Transduction– Generalised and specialized.

.....SKS

PRACTICAL- PHYCOLOGY AND MICROBIOLOGY (BOT-A-CC-1-1-P)
(Credits 2)

ALGAE

1. Work out of the following algae with reproductive structure (Free hand drawing and drawing under drawing prism with magnification): *Oedogonium, Chara, Ectocarpus*.
2. Study of (a) Permanent slides : *Gloeotrichia, Volvox, Vaucheria, Coleochaete, Polysiphonia*, Centric and Pennate diatom; (b) Macroscopic specimens : *Laminaria, Sargassum*.

.....PC

MICROBIOLOGY

1. Preparation of bacterial media – (a) Nutrient agar and nutrient broth, (b) Preparation of slants and pouring Petri-plates.
2. Sub-culturing of bacterial culture.
3. Gram staining from bacterial culture.
4. Microscopic examination of bacteria from natural habitat (curd) by simple staining.

.....SKS

CORE COURSE 2
MYCOLOGY AND PHYTO-PATHOLOGY (BOT-A-CC-1-2-TH)
THEORETICAL
(Credits 4)

MYCOLOGY

1. General Account:

1.1. Hyphal forms, 1.2. Fungal spore forms and mode of liberation, 1.3. Sexual reproduction and degeneration of sex, 1.4. Parasexuality and sexual compatibility, 1.5. Life cycle patterns.

.....AS

2. Classification:

2.1. Classification of Fungi (Ainsworth, 1973) upto sub-division with diagnostic characters and examples. 2.2. General characteristics of Myxomycota, Oomycota, Zygomycota, Ascomycota, Basidiomycota, Deuteromycota.

.....AS

3. Life history:

3.1. *Synchytrium*, 3.2. *Rhizopus*, 3.3. *Ascobolus*, 3.4. *Agaricus*.

4. Mycorrhiza:

....AS

4.1. Types with salient features, 4.2. Role in Agriculture & Forestry.

..... AS

5. Lichen:

5.1. Types, 6.2. Reproduction, 6.3. Economic and ecological importance

.....AS

PHYTO-PATHOLOGY

1. Terms and Definitions :

1.1. Disease concept, 1.2. Symptoms, 1.3. Etiology & causal complex, 1.4. Primary and secondary inocula, 1.5. Infection, 1.6. Pathogenecity and pathogenesis, 1.7. Necrotroph and Biotroph, 1.8. Koch's Postulates, 1.9. Endemic, Epidemic, Pandemic and Sporadic disease, 1.10. Disease triangle, 1.11. Disease cycle (monocyclic, polycyclic and polyetic).

...T.D

2. Host – Parasite Interaction:

2.1. Mechanism of infection (Brief idea about Pre-penetration, Penetration and Post-penetration), 2.2. Pathotoxin (Definition,criteria and example), 2.3. Defense mechanism with special reference to Phytoalexin, 2.4. Resistance- Systemic acquired and Induced systemic.

.....T.D

3. Plant Disease Management :

3.1. Quarantine, 3.2. Chemical, 3.3. Biological, 3.4. Integrated.

....TD

4. Symptoms , Causal organism, Disease cycle and Control measures of:

4.1. Late blight of Potato, 4.2. Brown spot of rice, 4.3. Black stem rust of wheat, 4.4. Stem rot of jute.

.....TD

PRACTICAL- MYCOLOGY AND PHYTO-PATHOLOGY
(BOT-A-CC-1-1-2-P)
(Credits 2)

MYCOLOGY AS

1. Work out of the following fungi with reproductive structures (including microscopic measurement of Reproductive structures): *Rhizopus* (asexual), *Ascobolus* , *Agaricus* .
2. Study from permanent slides: Zygosporangium of *Rhizopus*, Conidia of *Fusarium*, Conidiophore of *Penicillium*.
3. Morphological study of Fungi (fruit body of *Polyporus*, *Cyathus*), Lichens (fruticose and foliose).

PHYTO- PATHOLOGY SKS

1. Preparation of fungal media (PDA).
2. Sterilization process.
3. Isolation of pathogen from diseased leaf.
4. Inoculation of fruit and subculturing.
5. Identification : Pathological specimens of Brown spot of rice, Bacterial blight of rice , Loose smut of wheat, Stem rot of jute, Late blight of potato; Slides of uredial, telial, pycnial & aecial stages of *Puccinia graminis*.

SEMESTER- II

CORE COURSE 3

PLANT ANATOMY (BOT-A-CC-2-3-TH)

(Credits 4)

ANATOMY

1. Cell wall:

1.1. Ultrastructure & Chemical constituents, 1.2. Plasmodesmata- ultrastructure, 1.3. Concept of Apoplast and Symplast, 1.4. Growth and Thickening of cell wall.....SKS

Stomata:

Types (Metcalfe and Chalk, Stebbins and Khush).SKS

2. Stele:

3.1 Leaf-trace and leaf-gap, 3.2. Stellar types & evolutionSKS

3. Primary structure of stem and root- Monocot and Dicot. Leaf- dorsiventral and isobilateral.

..... **TD**

4. Secondary growth:

4.1. Normal (intra- & extra-stelar), 5.2. Anomalous (stem of *Bignonia*, *Boerhavia*, *Tecoma*, *Dracaena* and root of *Tinospora*).

..... **TD**

5. Mechanical tissues and the Principles governing their distribution in plants. **SB**

6. Developmental Anatomy:

..... Organisation of shoot apex (Tunica–Corpus) and Root apex (Korper-Kappe), 7.2. Plastochrone.

... **SKS**

7. Ecological Anatomy:

Adaptive anatomical features of 8.1. Hydrophytes, 8.2. Xerophytes.

.....4 **TD**

8. Scope of plant anatomy: application in systematics, forensics and pharmacognosy.

.....4 **SB**

PRACTICAL- PLANT ANATOMY (BOT-A-CC-2-3-P)
(Credits 2)

PLANT ANATOMY

1. Microscopic studies on: Types of stomata, sclereids, raphides (*Colocasia*), cystolith (*Ficus* leaf) starch grains, aleurone grains, laticiferous ducts, oil glands. **PC**
2. Study of anatomical details through permanent slides/ temporary stained mounts- a) Root- Monocot and dicot, b) Stem- Monocot and dicot, c) Leaf- Monocot and dicot. **SKS**
3. Study of anomalous secondary structure in stem of *Bignonia*, *Boerhaavia*, **SKS** *Tecoma*, *Dracaena* and root of *Tinospora* **PC**
4. Study of adaptive anatomical features: Hydrophytes (*Nymphaea* – petiole) and Xerophytes (*Nerium* – leaf). **SKS**

CORE COURSE 4 ARCHAEGONIATE (BOT-A- CC-2-4-TH)
THEORITICAL
(Credits 4)

BRYOPHYTES

1. General Account :

1.1 General characteristics and adaptations to land habit, 1.2. Classification (Strotler and Crandle Strotler, 2009) up to class with diagnostic characters and examples.

AKC

2. Life History: Gametophyte structure and Reproduction, Development and Structure of sporophyte, Spore dispersal in:

2.1 *Marchantia*, **TNB** 2.2. *Anthoceros*, 2.3. *Funaria*.

..... **AKC**

3. Phylogeny:

3.1 Unifying features of archaegoniates; transition to land habit, 3.2. Origin of Alternation of Generations (Homologous and Antithetic theory), 3.3. Evolution of Sporophytes (Progressive and Regressive concept), 3.4. Origin of Bryophytes.

..... **AKC**

4. Importance :

Role of bryophytes in: 4.1. Plant succession, 4.2. Pollution Monitoring, 4.3. Economic importance of bryophytes with special reference to *Sphagnum*..... **TNB**

PTERIDOPHYTES

1. General Account:

1.1. Colonisation and rise of early land plants, **PC** 1.2. Classification of vascular plants by Gifford & Foster (1989) upto division (Rhyniophyta to Filicophyta) with diagnostic characters and examples.

TNB

Life History:

Sporophyte structure, Reproduction and Structure of gametophyte in 2.1. *Psilotum*, 2.2. *Selaginella*,
2.2. *Equisetum*, 2.4. *Pteris*.

.....AS

23. Telome concept and its significance in the origin of different groups of Pteridophytes.

.....PC

2. Heterospory and Origin of Seed habit.

.....PC

3. Economic importance as food, medicine and Agriculture.

.....AS

GYMNOSPERMS

1. Classification of vascular plants by Gifford & Foster (1989) upto division
(Progymnospermophyta to Gnetophyta) with diagnostic characters and examples.....AS

2. Progymnosperms :
Diagnostic characters of the group, 2.2. Vegetative and reproductive features of Archeopteris, 2.3.
Phylogenetic importance.

.....PC

3. Life History :

Distribution in India; Vegetative and Reproductive structure of sporophyte, Development of
gametophyte in : 3.1. *Cycas* , 3.2. *Pinus* and 3.3. *Gnetum* PC

4. Economic Importance with reference to Wood, Resins, Essential oils, and Drugs.

.....TNB

PRACTICAL- ARCHAEGONIATE (BOT-A-CC-2-4-P)
(Credits 2)

BRYOPHYTES :

1. Morphological study of the plant body: Genera as mentioned in theoretical syllabus and *Riccia*, *Porella*.
2. Study from permanent slides : *Riccia* (V.S. of thallus with sporophyte), *Marchantia* (L.S. through gemma cup, antheridiophore , archegoniophore) , *Anthoceros* (L.S. of sporophyte) , *Funaria* (L.S. of capsule).....**AS**

PTERIDOPHYTES:

1. Morphological study of the sporophytic plant body: Genera as mentioned in the theoretical syllabus and *Lycopodium*, *Ophioglossum* and *Marsilea* **TNB**
2. Workout of the reproductive structures: *Selaginella*, *Equisetum*,**TD** *Pteris*..... **AS**.
3. Study from permanent slides: *Psilotum* (T.S. of synangium), *Lycopodium* (L.S. of strobilus), *Ophioglossum* (L.S. of spike), *Dryopteris* (gametophyte), *Marsilea* (L.S. of sporocarp)..... **TD**

GYMNOSPERMS

1. Morphological study: *Cycas* (microsporophyll and megasporophyll), *Pinus* (female and male cone), *Gnetum* (female and male cone).
2. Study from permanent slides: *Cycas* (L.S. of ovule), *Pinus* (L.S. of male and female cone), *Ginkgo* (L.S. of female strobilus), *Gnetum* (L.S. of male cone and ovule)..... **TNB**

SEMESTER- III

**CORE COURSE-5
PALAEOBOTANY AND PALYNOLOGY (BOT-A-CC-3-5-TH)
THEORETICAL
(Credits 4)**

PALAEOBOTANY & PALYNOLOGY

1. Geological time scale with dominant plant groups through ages.

.....PC

2. Plant Fossil:

2.1. Types: Body fossil (Micro- and Megafossils), Trace fossil, Chemical fossil, Index fossil, 2.2. Different modes of preservation (Schopf, 1975), 2.3. Conditions favouring fossilization, 2.4. Nomenclature and Reconstruction, 2.5. Principle of fossil dating (a brief idea), 2.6. Importance of fossil study.TNB

Fossil Pteridophytes:

Structural features, Geological distribution and Evolutionary significance of 3.1. *Rhynia*, 3.2. *Lepidodendron* (Reconstructed), 3.3. *Calamites* (Reconstructed).

.....PC

3. Fossil gymnosperms:

Structural features and Geological distribution of reconstructed genera: 4.1. *Lyginopteris*, 4.2. *Williamsonia*, 4.3. *Cordaites*.

.....TNB

4. **Indian Gondwana System** - Three fold division with major megafossil assemblages.

....PC

5. Palynology:

5.1. Spore and Pollen, 6.2. Pollen aperture types, 6.3. NPC classification (Erdtman). 6.4. Pollen wall- Sporopollenin, Stratification and Ornamentation (sculpturing)PC

6. Applied Palynology:

Basic concepts of: 7.1. Palaeopalynology, 7.2. Aeropalynology, 7.3. Forensic palynology, 7.4.

MelissopalynologyPC

PRACTICAL- PALAEOBOTANY AND PALYNOLOGY (BOT-A-CC-3-5-P)
(Credits 2)

PALAEOBOTANY AND PALYNOLOGY

1. Morphological study: *Ptilophyllum* and *Glossopteris* leaf fossils.
2. Study from permanent slides: T.S. of stem of *Rhynia*, *Lepidodendron*, *Calamites*, *Lyginopteris*, *Cordaites*.
3. Study of Pollen types (colpate, porate and colporate) from permanent slides.

Slides may be prepared from specimens: Colpate (*Leonurus sibiricus*/ *Brassica* sp.), Porate (*Hibiscus rosa-sinensis*), Colporate (*Cassia sophera*/ *C. tora*).....PC

CORE COURSE- 6
REPRODUCTIVE BIOLOGY OF ANGIOSPERMS (BOT-A-CC-3-6-TH)
THEORETICAL
(Credits 4)

MORPHOLOGY OF ANGIOSPERMS

1. Inflorescence types with examples.

.....TD

2. Flower, induction of flowering, flower development- genetic and molecular aspects.

....TD

3. Fruits and seeds - types with examples.

.....SB

EMBRYOLOGY

1. Pre-fertilisation changes :

- 1.1. Microsporogenesis and Microgametogenesis, 1.2. Megasporogenesis and Megagametogenesis (monosporic, bisporic and tetrasporic).

.....TD

2. Fertilisation:

- 2.1. Pollen germination, 2.2. Pollen tube- growth, entry into ovule and discharge, 2.3. Double fertilization.

..... TD

3. Post-fertilization changes :

- 3.1. Embryogenesis in Capsella, 3.2. Development of Endosperm (3 types).

..... SB

4. Apomixis & Polyembryony:

- 4.1. Apomixis- Apospory and Apogamy, 4.2. Polyembryony- different types.

.....SB

PRACTICAL- REPRODUCTIVE BIOLOGY OF ANGIOSPERMS (BOT-A-CC-3-6-P) (Credits 2)

REPRODUCTIVE BIOLOGY OF ANGIOSPERMS :

1. Inflorescence types- study from fresh/ preserved specimens TD
2. Flowers- study of different types from fresh/ preserved specimens TD
3. Fruits- study from different types from fresh/preserved specimens SB
4. Study of ovules (permanent slides/ specimens/photographs)- types (anatropous, orthotropous, amphitropous and campylotropous)SB
5. Field study desirable
6. A project supported along with photographs taken during field study to be submitted giving comprehensive idea about different types of inflorescence, flowers and fruits SB

CORE COURSE- 7
PLANT SYSTEMATICS (BOT-A-CC-3-7-TH)
THEORETICAL
(Credits 4)

TAXONOMY OF ANGIOSPERMS

1. Introduction: AS

1.1. Components of Systematic: Nomenclature, Identification, Classification; 1.2. Taxonomy and its phases - Pioneer, Consolidation, Biosystematic and Encyclopaedic; alpha- and omega- taxonomy.

2. Nomenclature: SB

Type method, Publication, Rank of taxa, Rules of priority, Retention and rejection of names, Author Citation, Effective and valid publication, Elementary knowledge of ICN- Principles.

3. Systems of classification: AS

Broad outline of Bentham & Hooker (1862-1883), Cronquist (1988), Takhtajan (1991) - system of classification with merits and demerits. Brief reference of angiosperm phylogeny group (APG III) classification.

3.1. Systematics in Practice: Herbaria and Botanical Gardens – their role in teaching and research; important Herbaria and Botanical Gardens of India and world (3 each); 3.2. Dichotomous keys – indented and bracketed.

4. Phenetics and Cladistics: SB

Brief idea on Phenetics, Numerical taxonomy- methods and significance; Cladistics- construction of dendrogram and primary analysis; Monophyletic, polyphyletic and paraphyletic groups; Plesiomorphy and apomorphy.

5. Data sources in Taxonomy: AS+SB

Supportive evidences from: 5.1. Phytochemistry, 5.2. Cytology, 5.3. Palynology and 5.4. Molecular biology data (Protein and Nucleic acid homology).

6. Diagnostic features, Systematic position (Bentham & Hooker and Cronquist), Economically important plants (parts used and uses) of the following families:

6.1. Monocotyledons: Alismataceae, Gramineae (Poaceae), Cyperaceae, Palmae (Arecaceae), Liliaceae, Musaceae, Zingiberaceae, Cannaceae, Orchidaceae.... **SB**

6.2. Dicotyledons: Nymphaeaceae, Magnoliaceae, Leguminosae (subfamilies), Polygonaceae, Euphorbiaceae, Malvaceae, Umbelliferae (Apiaceae), Labiatae (Lamiaceae), Solanaceae, Scrophulariaceae, Acanthaceae, Rubiaceae, Cucurbitaceae, Compositae (Asteraceae).

..... **AS**

PRACTICAL- PLANT SYSTEMATICS (BOT-A-CC-3-7-P)
(Credits 2)

ANGIOSPERMS

1. Work out, description, preparation of floral formula and floral diagram, identification up to genus with the help of suitable literature of wild plants and systematic position according to Bentham Hooker system of classification from the following families: Malvaceae, Fabaceae (Papilionaceae), Solanaceae, Scrophulariaceae, Acanthaceae, Labiatae (Lamiaceae), Rubiaceae.

2. Spot identification (Binomial, Family) of common wild plants from families included in the theoretical syllabus (list to be provided)..... **AS**

1. Herbarium specimen: Preparation of 25 angiospermic specimens (identified with author citation, voucher number and arranged following Bentham & Hooker's system of classification) to be submitted during examination **AS**

SKILL ENHANCEMENT COURSE-ELECTIVE (SEC)

SEC-A

APPLIED PHYCOLOGY, MYCOLOGY AND MICROBIOLOGY (BOT-A-SEC-A-3-1)

THEORETICAL

(Credits 2)

APPLIED PHYCOLOGY : SKS

1. Algae as food and source of phycocolloid (Agar-agar, Algin, Carrageenan), 2. Diatomite, 3. Algal toxin,
4. Algal Biotechnology – potential of microalgae for SCP, β -carotene, Biodiesel, bioplastics from algae.

SKS

APPLIED MYCOLOGY

1. Fungi as food, 2. Cheese and Ethanol- Industrial production (brief outline), 3. Fungal sources and uses of Enzyme (Cellulase), Amino acid (Tryptophan), Vitamin (Riboflavin), Antibiotic (Griseofulvin), Pharmaceuticals (Cyclosporin-A).
4. Aflatoxin

..... **SKS**

APPLIED MICROBIOLOGY

1. Industrial Production of Vinegar and Streptomycin (brief outline), 2. Microbial sources and uses of Enzyme (Amylase, Protease), Amino acid (Glutamic acid, Lysine), Polysaccharides (Dextran), 3. Use of microbes as Biofertilizer and Biopesticides, 3.4. Use of microbes in mineral processing.

..... **SKS**

SEMESTER IV

CORE COURSE-8

PLANT GEOGRAPHY, ECOLOGY AND EVOLUTION

(BOT-A-CC-4-8-TH)THEORETICAL

(Credits 4)

PLANT GEOGRAPHY

1. Phytogeographical regions:

1.1. Phytogeographical regions of India (Chatterjee 1960); 1.2. Dominant flora of Eastern Himalaya, Western Himalaya and Sunderban.

.....SB

2. Endemism:

2.1 Endemic types and Factors; 2.2. Age & Area hypothesis and Epibiotic theory; 2.3. Endemism in Indian flora.

..... SB

ECOLOGY

1. Preliminary idea on:

1.1. Habitat and Niche, 1.2. Ecotone and edge-effect, 1.3. Microclimate, 1.4. Ecads, ecotype and ecoclines, 1.5. Carrying capacity.

..... PC

2. Community ecology:

2.1. Community- Characteristics and diversity, 2.2. Ecological succession –Primary and secondary, Seral stages (with reference to Hydrosere), autogenic and allogenic succession.

..... PC

3.1. Plant indicators (metallophytes); 3.2. Phytoremediation.

..... PC

4. Conservation of Biodiversity:

4.1. Level of Biodiversity: genetic, species & ecosystem diversity, 4.2. Biodiversity hot spots- criteria,

Indian hotspots, 4.3. *In-situ* and *ex-situ* conservation, 4.4. Seed-banks, 4.5. Cryopreservation

..... PC

EVOLUTION

1.1 Introduction, 1.2. Theories of evolution: Natural selection, Group selection, Neutral theory of molecular evolution, 1.3. Phyletic gradualism, Punctuated equilibrium and Stasis

..... SSS

2.1 Brief idea on: Stabilizing directional, disruptive and sexual selection; Speciation: Sympatric and allopatric speciation; Coevolution, Adaptive radiation, Reproductive isolation

..... SSS

3.1. Simplified phylogeny of bacteria, algae, fungi, bryophyte, pteridophyte and gymnosperm, 3.2. Phylogenetic tree.

..... SSS

PRACTICAL- PLANT GEOGRAPHY, ECOLOGY AND EVOLUTION (BOT-A-CC-4-8-P) (Credits 2)

ECOLOGY

1. Study of community structure by quadrat method and determination of (i) Minimal size of the quadrat, (ii) Frequency, density and abundance of components (to be done during excursion/ field visit).

PC

2. Comparative anatomical studies of leaves from polluted and less polluted areas. PC

3. Measurement of dissolved O₂ by azide modification of Winkler's method. SSS

4. Comparison of free CO₂ from different sources.

SSS

CORE COURSE- 9 ECONOMIC BOTANY
(BOT-A-CC-4-9-TH)
THEORETICAL
(Credits 4)

1. Origin of cultivated crops: Concepts of centre of origin, their importance with reference to Vavilov's work. Examples of major plant introductions; crop domestication and loss of genetic diversity; evolution of new crops/ varieties, importance of germplasm diversity.

..... **AKC**

2. Cereals: Rice and wheat (origin, morphology, processing and uses).

..... **AKC**

3. Legumes: Origin, morphology and uses of gram and mung bean. Importance to man and environment.

..... **AKC**

4. Sugar and starches: Morphology and processing of sugarcane, products and byproducts of sugarcane industry. Potato- morphology, propagation and uses.

..... **AS**

5. Spices: Listing of important spices, their family and part used.

6. Beverages: Tea (morphology, processing and uses).

..... **TNB**

7. Oil and fats: General description, classification, extraction, their uses and health implications of mustard, soybean, coconut (Botanical name, family and uses). Essential oils- general account, extraction methods, comparison with fatty oils and their uses.

..... **AS**

8. Drug-yielding plants: Therapeutic and habit forming drugs with special reference to Cinchona, Digitalis, Papavar, Cannabis and Tobacco (morphology, processing, uses and health hazards).

..... **AS**

9. Timber: general account with special reference to Sal and Teak.

..... **TNB**

10. Fibers: Cotton and Jute (Morphology, extraction and uses).

..... **TNB**

PRACTICAL- ECONOMIC BOTANY (BOT-A-CC-4-9-P)
(Credits 2)

ECONOMIC BOTANY

1. Cereals: Wheat (habit sketch, L.S./T.S. of grain, starch grains, micro-chemical tests); rice (habit sketch, study of paddy and grain, starch grains, micro-chemical tests)
2. Legume: Soybean, ground nut (habit, fruit, seed structure, micro-chemical tests)
3. Source of sugars and starches: Sugarcane (habit sketch; cane juice- micro-chemical tests); potato**AS**
4. (habit sketch, tuber morphology, T.S. of tuber to show localization of starch grains, W.M. of starch grains, micro-chemical tests.
5. Tea- tea leaves, tests for tannin..... **TNB**
6. Mustard- plant specimen, seeds, tests for fat in crushed seeds
7. Habit sketch of *Digitalis*, *Papaver* and *Cannabis*.
8. Sal, Teak- section of young stem.
9. Jute- specimen, transverse section of stem, tests for lignin on T.S. of stem and study of fibre following maceration technique.....**SB**

CORE COURSE 10
GENETICS (BOT-A-CC-4-10-TH)
THEORETICAL
(Credits 4)

1. Introduction: Mendelian genetics and its extension
.....**AM**
2. Linkage, Crossing over and Gene Mapping...:
.....**TD**

2.1. Complete and incomplete linkage (example), linked gene does not assort independently (example), linkage group, 2.2. Crossing over, crossing over produces recombination (example), detection of crossing over (McClintock's experiment), and 2.3. Molecular mechanism of crossing over (Holliday model), 2.4. Gene mapping with three point test cross, detection of middle gene in three point test cross, calculation of recombination frequencies, 2.5. Co-efficient of coincidence and interference, mapping function, 2.6. Problems on gene mapping, 2.7. Molecular mapping – ISH, FISH (brief idea).

..... **TD**

3. Epistasis and Polygenic inheritance in plants.

..... **AM**

4. Aneuploidy and Polyploidy: Types, examples, meiotic behaviour and importance of: 4.1. Aneuploidy, 4.2. Polyploidy, 4.3. Speciation and evolution through polyploidy.

..... **AS**

5. Chromosomal aberration: Types and meiotic behaviour of: 5.1. Deletion, 5.2. Duplication, 5.3. Translocation, and 5.4. Inversion.

..... **AS**

6. Mutation :

6.1. Point mutation-Transition, Transversion and Frame shift mutation, 6.2. Molecular mechanisms (tautomerisation, alkylation, deamination, base analogue incorporation, dimerisation), 6.3. DNA repair (brief idea).

..... **TD**

7. Structural organisation of Gene:

7.1. One Gene–one polypeptide concept, 7.2. Split gene, 7.3. Overlapping gene, 7.4. Repetitive DNA-tandem and interspersed, 7.5. Transposon (Ac-Ds system), 7.6. Homoeotic gene in plants (ABCE Quartet model of flowering).

..... **TD**

PRACTICAL- GENETICS (BOT-A-CC-4-10-P)

(Credits 2)

GENETICS

1. Introduction to chromosome preparation: Pre-treatment, Fixation, Staining, Squash and Smear preparation, Preparation of permanent slides.
2. Determination of mitotic index and frequency of different mitotic stages in pre-fixed root tips of *Allium cepa*.
3. Study of mitotic chromosome: Metaphase chromosome preparation, free hand drawing under high power objective, drawing with drawing prism under oil immersion lens, determination of $2n$ number, and comment on chromosome morphology of the following specimens from root tips: *Allium cepa*, *Aloe vera*, *Lens esculenta*.
4. Study of chromosomal aberrations developed due to exposure to any two pollutants/ pesticides etc.
5. Study of meiotic chromosome: Smear preparation of meiotic cells, identification of different stages and free hand drawing of the following specimens from flower buds: *Allium cepa* and *Setcreasea* sp.
6. Identification from permanent slides : Meiosis – (i) normal stages (ii) abnormal stages – laggard, anaphase bridge, ring chromosome (*Rhoeo discolor*); Mitosis – (i) normal stages, (ii) abnormal stages-early separation, late separation, multipolarity, sticky bridge, laggard, fragmentation, (ii) pollen mitosis.

..... TD

SEC-B
PLANT BREEDING (BOT-A-SEC-B-4-3)
THEORITICAL
(Credits 2)

1. **Plant breeding:** introduction and objectives, breeding systems- modes of reproduction in crop plants, important achievements and undesirable consequence of plant breeding. **SSS**
.....
2. **Methods of crop improvement:** Introduction- centres of origin and domestication of crop plants, plant genetics resources; acclimatization, selection methods- for self pollination, cross pollinated and vegetatively propagated plants, hybridization- for self, cross and vegetatively propagated plants, procedure, advantages and limitations.
..... **SSS**
3. Maintenance of germplasm, 3.1. Mass selections and Pure line selection, 3.2. Back cross method.
..... **SSS**
4. Heterosis and hybrid seed production, 4.1. Male sterility and its use in plant breeding.
..... **SKS**
5. Inbreeding and inbreeding depression, effect of outcrossing- a very briefidea.
.....**SKS**
6. Molecular Breeding (use of DNA markers in plant breeding).
..... **SKS**
7. Role of mutations, polyploidy, distant hybridization and role of biotechnology in crop improvements.
.....**SKS**

B.SC BOTANY (GENERAL COURSE)

UNDER CHOICE BASED CREDIT SYSTEM

BOTANY

Syllabus for three-year B.Sc. Botany Programme

(With effect from 2018-2019)

SEMESTER I

CORE COURSE 1

PLANT DIVERSITY I (PHYCOLOGY, MYCOLOGY, PHYTOPATHOLOGY, BRYOPHYTES AND ANATOMY) (BOT-G-CC-1-1-TH)

THEORETICAL

(Credits 4)

1. Introduction to different plant groups

.....SSS

2. Phycology

2.1. Diagnostic characters and examples of Cyanophyceae, Rhodophyceae, Chlorophyceae, Charophyceae and Phaeophyceae, 2.2 Classification: Criteria and system of Fritsch, 2.3. Life histories of *Chlamydomonas*, *Chara* and *Ectocarpus*, 2.4. Role of algae in the environment, agriculture, biotechnology and industry.

.....AS

3. Mycology

3.1 Diagnostic characters and examples of Oomycotina, Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina, Deuteromycotina (Ainsworth, 1973). 3.2 Life histories of *Rhizopus* and *Ascobolus*, 3.3. Economic importance of fungi, 3.4 Fungal symbioses: *Mycorrhiza*, Lichen and their importance.

.....SD

4. Phytopathology

4.1 Symptoms - necrotic, hypoplastic and hyperplastic, 4.2 Koch's postulates, 4.3 Biotrophs and Necrotrophs, 4.4 Disease triangle, 4.5 Pathotoxins and phytoalexins (brief concept), 4.6 Symptoms, causal organism, disease cycle and control measures of plant diseases (Late blight of potato, Brown spot of Rice, Stem rot of jute).

.....AKC

5. Bryophytes

5.1 Unifying features of archaegoniates and transition to land habit, 5.2 Amphibian nature of bryophytes, 5.3 Diagnostic characters and examples of Hepaticopsida, Anthocerotopsida and Bryopsida (Proskauer 1957), 5.4 Life histories of *Marchantia* and *Funaria*, 5.5 Ecological and economic importance.

.....SSS

Anatomy:

6.1 Stomata - Types (Metcalf & Chalk), 6.2 Anatomy of root, stem and leaf of monocots and dicots, 6.3 Stelar types and evolution, 6.4 Secondary growth – normal in dicot stem and anomaly in stem of *Tecoma* & *Dracaena*.

.....SB

PRACTICAL- PLANT DIVERSITY I
(PHYCOLOGY, MYCOLOGY, PHYTOPATHOLOGY, BRYOPHYTES AND ANATOMY) (BOT-G-CC-1-1-P)
(Credits 2)

1. Work out: Microscopic preparation, drawing and labeling of *Chlamydomonas*, *Chara*, *Ectocarpus*, *Rhizopus* and *Ascobolus* .

2. Anatomical studies (following double staining method) of: 2a. Stem- *Cucurbita*, sunflower and maize. 2b. Root- *Colocassia*, gram and orchid. 2c. Leaf- Nerium

3. Identification with reasons: 3a. Cryptogamic specimens (macroscopic/microscopic as prescribed in the theoretical syllabus. 3b. Pathological specimens (herbarium sheets) of Late blight of potato, Brown spot of rice and stem rot of jute..... **SB+AKC+SSS+TNB+AM+SD**

SEMESTER II

CORE COURSE 2

PLANT DIVERSITY II (PTERIDOPHYTES, GYMNOSPERMS, PALAEOBOTANY, MORPHOLOGY AND TAXONOMY) (BOT-G-CC-2-2-TH)

THEORETICAL

(Credits 4)

1. Pteridophytes

1.1 Diagnostic characters and examples of Psilophyta, Lycophyta, Sphenophyta & Filicophyta (Gifford & Foster 1989). 1.2 Life histories of *Selaginella* and *Pteris*, 1.3 Economic importance.

..... **PC**

2. Gymnosperms

2.1 Progymnosperms (brief idea), 2.2 Diagnostic characters and examples of Cycadophyta, Coniferophyta and Gnetophyta (Gifford & Foster 1989), 2.3 Life histories of *Cycas* and *Pinus*, 2.4 *Williamsonia* (reconstructed), 2.5 Economic importance of Gymnosperms.

..... **TD**

3. Paleobotany & Palynology

3.1 Fossil, fossilization process and factors of fossilization, 3.2 Importance of fossil study. 3.3

Geological time scale..... **PC**

3.2 , 3.4 Palynology - Definition, spore & pollen (brief idea), Applications.

..... **PC**

4. Angiosperm Morphology

4.1 Inflorescence types with examples, 4.2 Flower, 4.3 Fruits and seeds- type and examples.

..... **AKC**

5. Taxonomy of Angiosperms

5.1 Artificial, Natural and Phylogenetic systems of classification with one example each, 5.2 Diagnostic features of following families- Malvaceae, Leguminosae (Fabaceae), Cucurbitaceae,

Rubiaceae, Compositae (Asteraceae), Solanaceae, Acanthaceae, Labiatae (Lamiaceae), Orchidaceae, Gramineae (Poaceae).

..... SB

**PRACTICAL- PLANT DIVERSITY II (PTERIDOPHYTES, GYMNOSPERMS, PALAEOBOTANY,
MORPHOLOGY AND TAXONOMY) (BOT-G-CC-2-2-P)
(Credits 2)**

1. Dissection, drawing and labelling, description of angiospermic plants and floral parts, floral formula and floral diagram, identification (family) from the following families: Leguminosae (Fabaceae), Malvaceae, Solanaceae, Labiatea (Lamiaceae), Acanthaceae.

2. Identification with reasons:

Macroscopic specimens of *Selaginella* and *Pteris*, male and female strobilus of *Cycas* and *Pinus*, Anatomical slides (stellar types, transfusion tissue, sieve tube, sunken stomata, lenticels), inflorescence types.

3. Spot identification of the following Angiospermic plants (scientific names and families): *Sida rhombifolia* (Malvaceae), *Abutilon indicum* (Malvaceae), *Cassia sophera* (Fabaceae), *Tephrosia halimtonii* (Fabaceae), *Crotolaria palida* (Fabaceae), *Coccinia grandis* (Cucurbitaceae), *Solanum indicum* (Solanaceae), *Nicotiana plumbagenifolia* (Solanaceae), *Leucas aspera* (Lamiaceae), *Leonurus sibiricus* (Lamiaceae), *Parthenium hysterophorus* (Asteraceae), *Tridax procumbense* (Asteraceae), *Eclipta prostrate* (Asteraceae), *Eragrostis tenella* (Poaceae), *Chrysopogon aciculatus* (Poaceae), *Eleusine indica* (Poaceae), *Vanda taesellata* (Orchidaceae).

AS+AKC +SSS+TNB

SEMESTER III

**CORE COURSE 3
CELL BIOLOGY, GENETICS AND MICROBIOLOGY (BOT-G-CC-3-3-TH)
THEORETICAL
(Credits 4)**

1. Cell Biology and Genetics

1.1 Ultrastructure of nuclear envelope, nucleolus and their functions, 1.2 Molecular organisation of metaphase chromosome (Nucleosome concept).

.....

.....SB

2. Chromosomal aberrations- 2.1 deletion, duplication, inversion & translocation, 2.2 Aneuploidy & Polyploidy-types, importance and role in evolution.

..... SB

3. Central Dogma, 3.1 Transcription and Translation.

..... TNB

4. Genetic Code- properties.

.....SB

5. Linkage group and Genetic map (three-point test cross).

.....SSS

6. Mutation – 6.1 Point mutation (tautomerisation; transition, transversion and frame shift), 6.2 Mutagen-physical and chemical.

..... AM

7. Brief concept of Split gene, Transposons.

..... AM

2. Microbes

2.1 Viruses- Discovery, general structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance; 2.2 Bacteria- discovery, general characteristics and cell structure; reproduction- vegetative, asexual and recombination (conjugation, transformation and transduction); Economic importance.

.....AKC

PRACTICAL- CELL BIOLOGY, GENETICS AND MICROBIOLOGY (BOT-G-CC-3-3-P) (Credits 2)

1. Cell Biology:

Staining (Aceto-orcein) and squash preparation of onion root tip: study of mitotic stages.

Determination of mitotic index (from onion root tip).

2. Microbiology:

Workout gram staining (curd/any natural source)

3. Identification with reasons:

Cytological slides of different mitotic and meiotic stages.

Different forms of bacteria (*Coccus*, *Bacillus*, *Spiral*)

SB+ TD+SSS+TNB+AM+SD

SEC A
PLANT BREEDING AND BIOMETRY (BOT-G-SEC-A-3/5-1)
(Credits 2)

BIOFERTILIZERS (BOT-G-SEC-A-3/5-2)

1. **Biofertilizers:** General account about microbes used as biofertilisers; *Rhizobium*-identification, mass multiplication. Actinorrhizal symbiosis.

.....TNB

2. ***Azospirillum***- identification, mass multiplication, associative effect of different microorganisms. *Azotobacter* and crop response to *Azotobacter* inoculums.

.....TNB

3. Cyanobacteria, *Azolla*, *Anabaena* and *Azolla* association, blue green algae and *Azolla* in rice cultivation.

.....SB

4. **Mycorrhizal association:** 4.1 Types of Mycorrhizal association- Brief idea, 4.2 Its influence on growth and yield of crop plants.

.....SB

5. **Organic farming:** 5.1 Green manuring and organic fertilizers, 5.2 Biocompost and vermicompost- making methods and field applications. 5.3 Recycling of biodegradable municipal, industrial and agricultural wastes.

... SB

SEMESTER IV

CORE COURSE 4 PLANT PHYSIOLOGY AND METABOLISM (BOT-G-CC-4-4-TH) THEORETICAL (Credits 4)

1. Proteins

1.1 Primary, secondary and tertiary structure, 1.2 Nucleic acid- DNA structure, RNA types, 1.3 Enzyme- Classifications with examples (IUBMB), Mechanism of action.

..... SKS

2. Transport in plants

2.1 Ascent of sap and Xylem cavitation , 2.2 Phloem transport and source-sink relation.

..... SKS

3. Transpiration

3.1 Mechanism of stomatal movement, significance.

..... SB

4. Photosynthesis

4.1 Pigments, Action spectra and Enhancement effect, 4.2 Electron transport system and Photophosphorylation, 4.3 C₃ and C₄ photosynthesis, CAM- Reaction and Significance.

..... SB

5. Respiration

5.1 Glycolysis & Krebs cycle— Reactions and Significance, 5.2 ETS and oxidative phosphorylation.

..... SSS

6. Nitrogen metabolism

6.1 Biological dinitrogen fixation, 6.2 Amino acid synthesis (reductive amination and transamination).

..... SSS

7. Plant Growth regulators

7.1 Physiological roles of Auxin, Gibberellin, Cytokinin, Ethylene, ABA.

..... TD

8. Photoperiodism (Plant types, Role of phytochrome and GA in flowering) and Vernalization.

..... TD

9. Senescence (brief idea).

..... SKS

PRACTICAL- PLANT PHYSIOLOGY AND METABOLISM (BOT-G-CC-4-4-P)
(Credits 2)

Plant Physiology:

- i) Experiment on Plasmolysis.
- ii) Measurement of leaf area (graphical method) and determination of transpiration rate per unit area by weighing method.
- iii) Imbibition of water by dry seeds - proteinaceous and fatty seeds.
- iv) Evolution of O₂ during photosynthesis (using graduated tube).
- v) Evolution of CO₂ during aerobic respiration and measurement of volume. **SB+AKC+SSS+TNB+AS**

SEC B

MUSHROOM CULTURE TECHNOLOGY (BOT-G-SEC-D-4/6-4)
(Credits 2)

- 1. **Mushroom**- nutritional and medicinal value of mushrooms. Poisonous mushrooms...**TNB**
- 2. Cultivation techniques/ technology of edible mushrooms in India: *Volvarealla volvacea*, *Pleuretus citrinopyrineatus*, *Agaricus bisporus*.
.....**TNB**
- 3. **Storage**- short term and long term, storage, drying.
.....**AM**
- 4. **Food preparation**- types of foods prepared from mushroom. Cost and benefit ratio.
.....**TNB**
- 5. **Research centres**- national and regional.