CITY COLLEGE
DEPARTMENT OF BOTANY
LESSON PLAN

The teachers of the Department of Botany are specialised in different areas of the subject. After a thorough discussion the department has assigned one teacher as "Lead Teacher" considering his/her specialisation and experiences on a particular CORE COURSE/SKILL ENHANCEMENT COURSE/DISCIPLINE SPECIFIC ELECTIVE COURSE to teach along with others and to look after the overall academic progression of the said course. To meet the demand of the CBCS Curricula we have also assigned a teacher as a MENTOR for a certain number students of a particular semester. The details of which are given below:

Semester wise assignment of Teachers as Mentor

Semester 1: Dr.Rupak Kumar Sengupta (RSG),
Dr.Arkajo Majumdar (AM),
Prof.SutapaGupta (SG)

Semester 2: Dr.Arghya K. Hait (AH),
Dr.Arkajo Majumdar (AM),
Prof. Saayela Choudhury (SC)

Semester 3: Dr.Arghya K. Hait (AH),
Dr.ParthaKarak (PK),
Prof. Sandhya Dutta (SD).

Semester 4: Dr. (Mrs.) Sujita Ghosh (SDG),
Dr.Rupak Kumar Sengupta (RSG),
Smt. Sutapa Gupta (SG)

Semester 5: Dr. (Mrs.) Sujita Ghosh (SDG),
Dr. (Ms.) Nandini Chakrabarti(NC),
Smt. Saayela Choudhury (SC)

Semester 6: Dr. (Ms.) Nandini Chakrabarti (NC),
Dr.ParthaKarak (PK),
Prof. Sandhya Dutta (SD)

Course wise assignment (Hons.) as Lead Teacher

Semester	Paper		Name of the Lead Teacher
Sem 1	**CC 1**	Phycology and Microbiology (BOT-A-CC-1-1-TH, BOT-A-CC-1-1-P)	Dr.Rupak Kumar Sengupta (RSG),
	CC 2	Mycology and Phytopathology (BOT-A-CC-1-2-TH, BOT-A-CC-1-2-P)	Prof. Sutapa Guha (SG)
Sem 2	**CC 3**	Plant anatomy (BOT-A-CC-2-3-TH, BOT-A-CC-2-3-P)	Dr.Arkajo Majumdar (AM)
	CC 4	Archegoniate (BOT-A-CC-2-4-TH, BOT-A-CC-2-4-P)	Dr.Arghya K. Hait (AH)
Sem 3	**CC 5**	Palaeobotany and Palynology (BOT-A-CC-3-5-TH, BOT-A-CC-3-5-P)	Dr.Arghya K. Hait (AH)
	CC 6	Reproductive biology of Angiosperms (BOT-A-CC-3-6-TH, BOT-A-CC-3-6-P)	Dr.Partha Karak (PK)
	CC 7	Plant systematic (BOT-A-CC-3-7-TH, BOT-A-CC-3-7-P)	Prof. Sandhya Dutta (SD)
	SEC A	Applied Phycology, Mycology and Microbiology (BOT-A-SEC-A-3-1)	Prof. Sutapa Guha (SG)
Sem 4	**CC 8**	Plant geography, Ecology and Evolution (BOT-A-CC-4-8-TH, BOT-A-CC-4-8-P)	Dr.Arghya K. Hait (AH)
	CC 9	Economic Botany (BOT-A-CC-4-9-TH, BOT-A-CC-4-9-P)	Dr.Rupak Kumar Sengupta (RSG),
	CC 10	Genetics (BOT-A-CC-4-10-TH, BOT-A-CC-4-10-P)	Dr. (Mrs.) Sujita Ghosh (SDG)
	SEC B	Plant Breeding (BOT-A-SEC-B-4-3)	Dr. (Mrs.) Sujita Ghosh (SDG)
Sem 5	**CC 11**	Cell and Molecular biology (BOT-A-CC-5-11-TH, BOT-A-CC-5-11-P)	Dr. (Mrs.) Sujita Ghosh (SDG)
	CC 12	Biochemistry (BOT-A-CC-5-12-TH, BOT-A-CC-5-12-P)	Dr.Arkajo Majumdar (AM)
	DSE A	Biostatistics (BOT-A-DSE-A-5-1-TH, BOT-A-DSE-A-5-1-P)	Smt. Saayela Choudhury (SC)
	DSE B	Plant Biotechnology (BOT-A-DSE-B-5-5-TH, BOT-A-DSE-B-5-5-P)	Dr.Rupak Kumar Sengupta (RSG)
Sem 6	**CC 13**	Plant Physiology (BOT-A-CC-6-13-TH, BOT-A-CC-6-13-P)	Dr. (Ms.) Nandini Chakrabarti(NC)
	CC 14	Plant Metabolism (BOT-A-CC-6-14-TH, BOT-A-CC-6-14-P)	Dr. (Ms.) Nandini Chakrabarti(NC)
	DSE A	Medicinal and Ethnobotany (BOT-A-DSE-A-6-3-TH, BOT-A-DSE-A-6-3-P)	Prof. Sandhya Dutta (SD)
	DSE B	Natural resource management (BOT-A-DSE-B-6-8-TH, BOT-A-DSE-B-6-8-P)	Dr.Partha Karak (PK)

CC 1 PHYCOLOGY AND MICROBIOLOGY (BOT-A-CC-1-1-TH, BOT-A-CC-1-1-P)

Lead Teacher : DR. RUPAK KUMAR SENGUPTA

DR. RUPAK KUMAR SENGUPTA

THEORETICAL **No of lectures allotted – Two (2)/ Week**

1.VIRUS

1.1. Discovery, 1.2.Plant virus- types, 1.3. Transmission and translocation of Plant virus, 1.4. TMV7 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.

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) & Pilli, 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+ X F−, Hfr X F−, concept of F',chromosome mobilization, (c) Transduction– Generalised and specialized.

PRACTICAL

DR. RUPAK KUMAR SENGUPTA and SMT. SANDHYA DUTTA

PHYCOLOGY **(No of Practical Classes allotted - Two (2) / week**

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.*

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.

FIELD WORK

One local excursion for study and collection of algae.

DR. NANDINI CHAKRABARTY

THEORETICAL

ALGAE **No of lectures allotted – One (1)/ Week**

1.General Account: 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)

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.

4. Bacillariophyta

4.1. Cell structure, 4.2. Cell division, 4.3. Auxospore formation in Centrales and Pennales. Life History**:** 5.1. *Chlamydomonas,Chara,Polysiphonia.*

DR.ARKAJO MAJUMDAR

THEORETICAL **No of lectures allotted – One (1) / Week**

1. General account: 1.1. Thallus organization.

3**. Cyanobacteria: 3.1**. Ultrastructure of cell, 3.2. Heterocyst - structure and function, 3.3. Ecology.

5.2. *Oedogonium*, *Ectocarpus*

CC 2 MYCOLOGY AND PHYTOPATHOLOGY (BOT-A-CC-1-2-TH, BOT-A-CC-1-2-P)

Lead Teacher : PROF. SUTAPA GUPTA

DR. SITAL CHATTERJEE

MYCOLOGY **No of lectures allotted – Two (2)/ Week**

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.

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.

3. Life history: 3.1. *Synchytrium*, 3.2. *Rhizopus*, 3.3. *Ascobolus*, 3.4. *Agaricus*.

4. *Mycorrhiza*: 4.1. Types with salient features, 4.2. Role in Agriculture & Forestry.

5. Lichen: 5.1. Types, 6.2. Reproduction, 6.3. Economic and ecological importance.

PROF. SUTAPA GUHA

THEORETICAL

1. Terms and Definitions : **No of lectures allotted – One (1)/ Week**

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).

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.

DR. PARTHA KARAK

THEORETICAL

PHYTO-PATHOLOGY **No of lectures allotted – One (1)/ Week**

3. Plant Disease Management :

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

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.

PRACTICAL **DR. PARTHA KARAK and PROF. SUTAPA GUPTA**

MYCOLOGY **No of lectures allotted – Two (2)/ Week**

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: Zygospore of *Rhizopus*, Conidia of *usarium*,Conidiophore of *Penicillium*.

3. Morphological study of Fungi (fruit body of *Polyporus*, *Cyathus*), Lichens (fruticose and foliose).

PHYTO- PATHOLOGY

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.

FIELD WORK

One local excursion for study and collection of macrofungi .

TRACKING ACADEMIC PROGRESSION THROUGH INTERNAL ASSESSMENT/EVALUATION

1. **METHOD : CLASS TEST – First during MID TERM and the second before the END TERM by each teacher concerned.**
2. **MENTOR – MENTEE APPROACH**
3. **One Parent – Teacher Meeting after the first MID TERM Test.**

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

Lead Teacher : DR.ARKAJO MAJUMDAR

DR. NANDINI CHAKRABARTY

Theoretical **No of l Classes allotted – One (2)/week.**

3. Stele
3.1 Leaf-trace and leaf-gap, 3.2. Stelar types & evolution
4. Primary structure of stem and root
- Monocot and Dicot. Leaf- dorsiventral and isobilateral.
5. Secondary growth
5.1. Normal (intra- & extra-stelar), 5.2. Anomalous (stem of *Bignonia*, *Boerhavia*, *Tecoma*, *Dracaena* and root of *Tinospora*).

DR.ARKAJO MAJUMDAR

Theoretical **No of Classes allotted – One (1)/week.**

8. Ecological Anatomy:
Adaptive anatomical features of 8.1. Hydrophytes, 8.2. Xerophytes.
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.
2. Stomata:
2.1. Types (Metcalfe and Chalk, Stebbins and Khush).
6. Mechanical tissues and the Principles governing their distribution in plants.
7. Developmental Anatomy:
7.1. Organisation of shoot apex (*Tunica–Corpus*) and Root apex (*Korper-Kappe*), 7.2. Plastochrone.
9. Scope of plant anatomy: application in systematics, forensics and pharmacognosy.

PRACTICAL **DR. NANDINI CHAKRABARTY and DR.ARKAJO MAJUMDAR**

PLANT ANATOMY **No of Practical Classes allotted – Two (2)/week.**

1. Microscopic studies on: Types of stomata, sclereids, raphides (*Colocasia*), cystolith (*Ficus* leaf) starch grains, aleurone grains, laticiferous ducts, oil glands.
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.
3. Study of anomalous secondary structure in stem of *Bignonia*, *Boerhaavia*, *Tecoma*, *Dracaena* and root of *Tinospora*
4. Study of adaptive anatomical features: Hydrophytes (*Nymphaea* – petiole) and Xerophytes (*Nerium* – leaf).

CC 4 ARCHAEGONIATE (BOT-A-CC-2-4-TH, BOT-A-CC-2-4-P)

Lead Teacher : DR. ARGHYA KUMAR HAIT

DR. SUJITA DATTA GHOSH

THEORETICAL **No of Classes allotted – One (1)/week.**

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.

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

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

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.

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*.

DR. ARGHYA KUMAR HAIT

THEORETICAL **No of Classes allotted – Two (2)/week.**

PTERIDOPHYTES

1. General Account:

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

2. Life History:

Sporophyte structure, Reproduction and Structure of gametophyte in 2.1. *Psilotum*, 2.2. *Selaginella*, 2.3. *Equisetum*, 2.4. *Pteris*.

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

4. Heterospory and Origin of Seed habit.

5. Economic importance as food, medicine and Agriculture.

PROF. SUTAPA GUPTA

THEORETICAL **No of Classes allotted – One (1)/week.**

GYMNOSPERMS

1. Classification of vascular plants by Gifford & Foster (1989) upto division (Progymnospermophyta to Gnetophyta) with diagnostic characters and examples.
2. Progymnosperms :Diagnostic characters of the group, 2.2.Vegetative and reproductive features of Archeopteris, 2.3. Phylogenetic importance
3. Life History :Distribution in India; Vegetative and Reproductive structure of sporophyte, Development ofgametophyte in : 3.1. *Cycas* , 3.2. *Pinus* and 3.3. *Gnetum*.
4. Economic Importance with reference to Wood, Resins, Essential oils, and Drugs.

PRACTICAL **DR. ARGHYA KUMAR HAIT and PROF. SUTAPA GUPTA**

No of Practical Classes allotted – Two (2)/week.

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).

PTERIDOPHYTES

1. Morphological study of the sporophytic plant body: Genera as mentioned in the theoretical syllabus and *Lycopodium, Ophioglossum* and *Marsilea*.

2. Workout of the reproductive structures: *Selaginella, Equisetum, Pteris*.

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).

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).

FIELD STUDY

Botanical excursion to familiarize the students with the natural habitat of byryophyte, pteridophyte and gymnosperm , if academic calendar permits.

TRACKING ACADEMIC PROGRESSION THROUGH INTERNAL ASSESSMENT/EVALUATION

1. **METHOD : CLASS TEST – First during MID TERM and the second before the END TERM by each teacher concerned.**
2. **MENTOR – MENTEE APPROACH**
3. **Oral and Poster presentation of students in the College Science Day Programme.**
4. **Publication of wall magazine/e magazine by the students.**

CC 5 PALAEOBOTANY AND PALYNOLOGY (BOT-A-CC-3-5-TH, BOT-A-CC-3-5-P)

Lead Teacher : DR. ARGHYA KUMAR HAIT

DR. ARGHYA KUMAR HAIT
THEORETICAL **No of Classes allotted Four (4)/week** PALAEOBOTANY & PALYNOLOGY **1.** Geological time scale with dominant plant groups through ages. **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. **3.** Fossil Pteridophytes: Structural features, Geological distribution and Evolutionary significance of 3.1. *Rhynia*, 3.2. *Lepidodendron* (Reconstructed), 3.3. *Calamites* (Reconstructed). **4.** Fossil gymnosperms: Structural features and Geological distribution of reconstructed genera: **4.1.** *Lyginopteris*, **4.2.***Williamsonia*, 4.3.*Cordaites*. **5.** Indian Gondwana System - Three fold division with major megafossil assemblages. **6.** Palynology: 6.1. Spore and Pollen, 6.2. Pollen aperture types, 6.3. NPC classification (Erdtman). 6.4. Pollen wall- Sporopollenin, Stratification and Ornamentation (sculpturing). **7.** Applied Palynology: Basic concepts of: 7.1. Palaeopalynology, 7.2. Aeropalynology, 7.3. Forensic palynology, 7.4. Melissopalynology.
PRACTICAL **No of Practical Classes allotted One (1)/week** **DR. ARGHYA KUMAR HAIT** 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*).

CC6 REPRODUCTIVE BIOLOGY OF ANGIOSPERMS (BOT-A-CC-3-6-TH, BOT-A-CC-3-6-P)

Lead Teacher : DR. PARTHA KARAK

PROF. SANDHYA DUTTA
THEORETICAL **No of Classes allotted Two (2)/week** MORPHOLOGY OF ANGIOSPERMS **1.** Inflorescence types with examples. **2.** Flower, induction of flowering, flower development- genetic and molecular aspects. **3.** Fruits and seeds - types with examples.

DR. PARTHA KARAK
THEORETICAL **No of Classes allotted Two (2)/week** **EMBRYOLOGY** 1. Pre-fertilisation changes : **1.1.** Microsporogenesis and Microgametogenesis, 1.2. Megasporogenesis and Megagametogenesis (monosporic, bisporic and tetrasporic) 2. Fertilisation: **2.1.** Pollen germination, 2.2. Pollen tube- growth, entry into ovule and discharge, 2.3. Double fertilization. 3. Post-fertilization changes : **3.1.** Embryogenesis in Capsella, 3.2. Development of Endosperm (3 types). 4. Apomixis & Polyembryony: **4.1.** Apomixis- Apospory and Apogamy, 4.2.Polyembryony- different types
PRACTICAL **No of Practical Classes allotted Two (2)/week** **PROF. SANDHYA DUTTA and Dr. PARTHA KARAK** REPRODUCTIVE BIOLOGY OF ANGIOSPERMS **1.** Inflorescence types- study from fresh/ preserved specimens **2.** Flowers- study of different types from fresh/ preserved specimens **3.** Fruits- study from different types from fresh/preserved specimens **4.** Study of ovules (permanent slides/ specimens/photographs)- types (anatropous, orthotropous, amphitropous and campylotropous) **5.** Field study and preparation of project supported along with photographs taken during field study.

CC7 Plant systematic (BOT-A-CC-3-7-TH, BOT-A-CC-3-7-P)

Lead Teacher : PROF. SANDHYA DUTTA

PROF. SANDHYA DUTTA
THEORETICAL **No of Classes allotted Two (2)/week** TAXONOMY OF ANGIOSPERMS 1. Introduction: 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: 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.

DR. SITAL CHATTERJEE

THEORETICAL **No of Classes allotted Two (2)/week**

3. Systems of classification:
Broad outline of Bentham & Hooker (1862-1883), Cronquist (1988), Takhatajan (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: 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: 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.
6.2. Dicotyledons: Nymphaeaceae, Magnoliaceae, Leguminosae (subfamilies), Polygonaceae, Euphorbiaceae, Malvaceae, Umbelliferae (Apiaceae), Labiatae (Lamiaceae), Solanaceae, Scrophulariaceae, Acanthaceae, Rubiaceae, Cucurbitaceae, Compositae (Asteraceae).

PRACTICAL **No of Practical Classes allotted Two (2)/week**

PROF. SANDHYA DUTTA

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 Benthum 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).
3. FIELD WORK : PREPARATION OF FIELD RECORDS and HERBARIUM SPECIMENS

TRACKING ACADEMIC PROGRESSION THROUGH INTERNAL ASSESSMENT/EVALUATION

1. **METHOD : CLASS TEST – First during MID TERM and the second before the END TERM by each teacher concerned.**
2. **MENTOR – MENTEE APPROACH**
3. **One Parent-Teacher Meeting after the declaration of MID TERM Result.**

CC8 PLANT GEOGRAPHY, ECOLOGY AND EVOLUTION (BOT-A-CC-4-8-TH, BOT-A-CC-4-8-P)

Lead Teacher: DR. ARGHYA KUMAR HAIT

DR. ARGHYA KUMAR HAIT

THEORETICAL **No of Classes Allotted – Three (3)/Week**

PLANT GEOGRAPHY

1. Phytogeographical regions:

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

2. Endemism:

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

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.

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

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.

PROF. SUTAPA GUHA

THEORETICAL **No of Classes Allotted – One (1)/Week**

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 2.1 Brief idea on: Stabilizing directional, disruptive and sexual selection; Speciation: Sympatric and allopatric speciation; Coevolution, Adaptive radiation, Reproductive isolation 3.1. Simplified phylogeny of bacteria, algae, fungi, bryophyte, pteridophyte and gymnosperm, 3.2. Phylogenetic tree.

PRACTICAL **DR ARGHYA KUMAR HAIT and DR. ARKAGO MAJUMDAR**

ECOLOGY **No of Practical Classes Allotted – Two(2)/Week**

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).

2. Comparative anatomical studies of leaves form polluted and less polluted areas.

3. Measurement of dissolved O_2 by azide modification of Winkler's method.

4. Comparison of free CO_2 from different sources.

CC 9 ECONOMIC BOTANY (BOT-A-CC-4-9-TH, BOT-A-CC-4-9-P)

Lead Teacher: DR. RUPAK KUMAR SENGUPTA

DR. RUPAK KUMAR SENGUPTA

THEORETICAL **No of Classes Allotted – Two (2)/Week**

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.
5. Spices: Listing of important spices, their family and part used.
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.
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).
9. Timber: general account with special reference to Sal and Teak.
10. Fibers: Cotton and Jute (Morphology, extraction and uses).

PROF. SANDHYA DUTTA

THEORETICAL **No of Classes Allotted – Two (2)/Week**

4. Sugar and starches: Morphology and processing of sugarcane, products and by products of sugarcane industry. Potato- morphology, propagation and uses.
2. Cereals: Rice and wheat (origin, morphology, processing and uses).
3. Legumes: Origin, morphology and uses of gram and mung bean. Importance to man and environment.
6. Beverages: Tea (morphology, processing and uses).

PRACTICAL **DR. RUPAK KUMAR SENGUPTA and PROF. SANDHYA DUTTA**

No of Practical Classes Allotted – Two(2)/Week

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 (habit sketch, tuber morphology, T.S. of tuber to show localization of starch grains, W.M. of starch grains, micro-chemical tests.
4. Tea- tea leaves, tests for tannin
5. Mustard- plant specimen, seeds, tests for fat in crushed seeds
6. Habit sketch of *Digitalis*, *Papaver* and *Cannabis*.
7. Sal, Teak- section of young stem.
8. Jute- specimen, transverse section of stem, tests for lignin on T.S. of stem and study of fibre following maceration technique.

CC 10 GENETICS (BOT-A-CC-4-10-TH, BOT-A-CC-4-10-P)

Lead Teacher : DR. SUJITA DATTA GHOSH

DR. SUJITA DATTA GHOSH

THEORETICAL

1. Introduction: Mendelian genetics and its extension.

2. Linkage, Crossing over and Gene Mapping:

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. **4.** Aneuploidy and Polyploidy: Types, examples, meiotic behaviour and importance of: 4.1.Aneuploidy, 4.2. Polyploid**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).y, 4.3. Speciation and evolution through polyploidyMolecular mapping – ISH, FISH (brief idea).

PROF. SAYELA GUHA

2. Linkage, Crossing over and Gene Mapping:

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),

3. Epistasis and Polygenic inheritance in plants.

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

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).

PRACTICAL DR. SUJITA DATTA GHOSH and PROF. SAYELA GUHA

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 stagesearly separation, late separation, multipolarity, sticky bridge, laggard, fragmentation, (ii) pollen mitosis.

SEC B PLANT BREEDING (BOT-A-SEC-B-4-3)

Lead Teacher: DR. SUJITA DATTA GHOSH

DR. SUJITA DATTA GHOSH

THEORETICAL **No of Classes Allotted – One (1)/Week**

1. Plant breeding**:** introduction and objectives, breeding systems- modes of reproduction in crop plants, important achievements and undesirable consequence of plant breeding.
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.
3. Maintenance of germplasm, 3.1. Mass selections and Pure line selection, 3.2. Back cross

PROF. SAYELA GUHA

THEORETICAL **No of Classes Allotted – One (1)/Week**

4. Heterosis and hybrid seed production, 4.1. Male sterility and its use in plant breeding.
5. Inbreeding and inbreeding depression, effect of outcrossing- a very brief idea.
6. Molecular Breeding (use of DNA markers in plant breeding).
7. Role of mutations, polyploidy, distant hybridization and role of biotechnology in crop Improvements.

TRACKING ACADEMIC PROGRESSION THROUGH INTERNAL ASSESSMENT/EVALUATION

1. **METHOD : CLASS TEST – First during MID TERM and the second before the END TERM by each teacher concerned.**
2. **MENTOR – MENTEE APPROACH**
3. **Presentation of students in the Departmental STUDENTS SEMINAR.**

CC11 CELL AND MOLECULAR BIOLOGY (BOT-A-CC-5-11-TH, BOT-A-CC-5-11-P)

Lead Teacher: DR. SUJITA DATTA GHOSH

DR. SUJITA DATTA GHOSH

THEORETICAL **No of Classes Allotted – Two (2)/Week**

3. Cell cycle and its regulation:

3.1. Kinetochore and spindle apparatus-structural organization and functions, 3.2.Microtubulesstructure, organization and function, 3.3. Mechanism of cell cycle control in Yeast (checkpoints and role of MPF)

MOLECULAR BIOLOGY

1. DNA Replication, Transcription and Translation (Prokaryotes & Eukaryotes):

1.1. Central Dogma, 1.2. Semiconservative DNA replication – mechanism, enzymes involved in DNA replication- DNA polymerase, DNA gyrase, Helicase, Ligase, primase and other accessory proteins, 1.3. Eukaryotic replication with special reference to replication licensing factor, assembly of new nucleosome, replication at the end chromosome telomere, telomerase concept, 1.4. Fidelity of DNA replication- prokaryote: nucleotide selection, proof reading, mismatch repair; eukaryote: through selection of error prone DNA polymerase, 1.5.Transcription, 1.6 RNA processing, 1.7. Aminoacylation of tRNA, 1.8. Translation.

2. Gene Regulation: 2.1 Concept of Lac-operon, 2.2. Positive and negative control.

3. Genetic Code: 3.1 Properties-evidences & exceptions, 3.2. Decipherence of codon (Binding technique).

DR. ARGHYA KUMAR HAIT

1. Origin and Evolution of Cells: **No of Classes Allotted – One (1)/Week**

1.1. Evolution of nucleic acid (from PNA to DNA), Concept of RNA world, Ribozymes, First cell, 1.2. Origin of eukaryotic cell (endosymbiotic theory), 1.3. Small RNA- riboswitch, RNA interference, si RNA, mi RNA- brief idea, 1.4.Organellar DNA (cp- and mt- DNA).

PROF. SAYELA GUHA

THEORETICAL **No of Classes Allotted One (1)**

2. Nucleus and Chromosome:

2.1. Nuclear envelope, Nuclear lamina and Nuclear pore complex, 2.2. Nucleolus-ultrastructure and ribosome biogenesis, 2.3. Chromatin ultrastructure and DNA packaging in eukaryotic chromosome, 2.4. Centromere: types, structure and function. Apoptosis (Brief idea).

4. Recombinant DNA Technology:

4.1. Restriction endonuclease, - types and roles, 4.2. Vector (plasmid pBR 322), 4.3. Marker gene, 4.4. Steps of cloning technique, 4.5. PCR and its application, 4.6. Genomic DNA and cDNA library.

5. Development and causes of Cancer (in general and brief), tumor suppressor gene and oncogene.

PRACTICAL **DR. SUJITA DATTA GHOSH and PROF. SAYELA GUHA**

CELL BIOLOGY **No of Practical Classes Allotted – Two (2)/Week**

1. Study of plant cell structure with the help of epidermal peal mount of Onion/*Rhoeo*/*Crinum*
2. Measurement of cell size by the technique of micrometry.
3. Counting cells per unit volume with the help of haemocytometer (Yeast/pollengrains)
4. Cytochemical staining of DNA- Pyronine-methyl green staining.
5. Estimation of DNA content through DPA staining.
6. Estimation of RNA through orcinol method.
7. Study of nucleolus through hematoxylin/ orcin staining and determination of nucleolar frequency.
8. Preparation of models/ charts: rolling circle, theta replication, semi-discontinuous replication, prokaryotic RNA polymerase and eukaryotic RNA polymerase II, assembly of spliceosome mechinary, splicing mechanism in group I and group II introns, ribozyme and alternative splicing.

CC12 BIOCHEMISTRY (BOT-A-CC-5-12-TH, BOT-A-CC-5-12-P)

Lead Teacher : DR. ARKAJO MAJUMDAR

DR. ARKAJO MAJUMDAR

THEORETICAL **No of Classes Allotted – Two (2)/Week**

1. Biochemical Foundations:
1.1. Covalent and non-covalent bonds; hydrogen bond; Van der Waal's forces; 1.2. Structure and properties of water; 1.3. pH and buffer (inorganic and organic); 1.4. Handerson-Hasselbalch equation; 1.5. Isoelectric point.

3. Energy flow and enzymology:
3.1. Bioenergetics-Thermodynamic principles; free energy; energy rich bonds- phosphoryl group transfer and ATP; redox potentials and Biological redox reactions,

4. Cell membrane:
4.1. Membrane chemistry, 4.2. Membrane transport (uniport, symport, antiport), mechanism of ion uptake.

5. Phosphorylation: ATP Synthesis- Chemiosmotic model, Oxidative and Photophosphorylation-Mechanism and differences.

DR. NANDINI CHAKRABARTY

THEORETICAL **No of Classes Allotted – Two (2)/Week**

2. Molecules of life:
2.1. Nucleic Acids – structure of nucleosides & nucleotides ; oligo- and poly nucleotides , B & Z form of DNA, RNA- different forms; nucleotide derivatives (ATP, NADP), 2.2. Proteins – structure and classification of amino acids; primary, secondary, tertiary and quaternary

structure of proteins; 2.3. Carbohydrates - structure of mono-, di- and polysaccharide; stereoisomers, enantiomers and epimers; 2.4. Lipids - structure of simple lipid and compound lipid (phospholipids and glycolipids), fatty acids- saturated and unsaturated.
Enzymes – classification and nomenclature (IUBMB); Co-factors and co-enzymes; isozymes, 3.3. Mechanism of enzyme action; enzyme inhibition; 3.4. Enzyme kinetics (Michaelis- Menten equation) and simple problems.

PRACTICAL **DR. ARKAJO MAJUMDAR and DR. NANDINI CHAKRABARTY**

No of Classes Allotted – Two (2)/Week

PLANT BIOCHEMISTRY

Qualitative:

1. Detection of organic acids: citric, tartaric, oxalic and malic from laboratory samples.
2. Detection of carbohydrate and protein from plant samples.
3. Detection of the nature of carbohydrate – glucose, fructose , sucrose and starch from laboratory samples.
4. Detection of Ca, Mg, Fe, S from plant ash sample.

Quantitative:

1. Preparation of solutions and buffers.
2. Estimation of amino-nitrogen by formol titration method (glycine) .
3. Estimation of glucose by Benedicts quantitative reagent.
4. Estimation of titratable acidity from lemon.
5. Estimation of catalase activity in plant samples and effect of substrate, enzyme concentration and pH on enzyme activity.
6. Estimation of urease activity in plant samples.
7. Colorimetric estimation of protein by Folin phenol reagent.

DSE A BIOSTATISTICS (BOT-A-DSE-A-5-1-TH, BOT-A-DSE-A-5-1-P)

Lead Teacher : PROF. SAYELA GUHA

DR. SUJITA GHOSH

THEORETICAL **No of Classes Allotted – One (1)/Week**

3. Central tendency– Arithmetic Mean, Mode and Median; Measurement of dispersion– Coefficient of variation, Standard Deviation, Standard error of Mean.
4. Test of significance: chi- square test for goodness of fit.
6. Measurement of gene frequency: Hardy-Weinberg equilibrium- conditions applied for its implications (simple problems to calculate genotypic and allelic frequencies).

PROF. SAYELA GUHA	
THEORETICAL	**No of Classes Allotted – One (1)/Week**
1. Biostatistics: Definition, statistical methods, basic principles, variables- measurements, functions, limitations and uses of statistics. **2. Biometry:** Data, Sample, Population, Random sampling, Frequency distribution- definition only. **5. Probability-** multiplicative and additive rules of probability: application and importance	
PRACTICAL	**DR. SUJITA GHOSH and PROF. SAYELA GUHA** **No of Classes Allotted – Two (2)/Week**
BIOSTATISTICS **1.** Univariate analysis of statistical data: Statistical tables, mean, mode, median, standard deviation and standard error (using seedling population / leaflet size). **2.** Calculation of correlation coefficient values and finding out the probability. **3.** Determination of goodness of fit in Mendellian and modified mono-and dihybrid ratios (3:1, 1:1, 9:3:3:1, 1:1:1:1, 9:7, 13:3, 15:1) by Chi-square analysis and comment on the nature of inheritance. **4.** Calculation of 'F' value and finding out the probability value for the F value **5.** Basic idea of computer programme for statistical analysis of correlation coefficient,'t' test, standard error, standard deviation.	

DSE B PLANT BIOTECHNOLOGY (BOT-A-DSE-B-5-5-TH, BOT-A-DSE-B-5-5-P)

Lead Teacher : DR. RUPAK KUMAR SENGUPTA

DR. RUPAK KUMAR SENGUPTA	
THEORETICAL	**No of Classes Allotted – Two (2)/Week**
1. Plant tissue culture –Introduction: 1.1. Basic concept and milestones, 1.2. Cellular totipotency, 1.3. Tissue culture media, 1.4. Aseptic manipulation, 1.5. Cyto-differentiation and dedifferentiation. **2. Callus culture:** 2.1. Callus induction, maintenance and application, 2.2. Suspension culture-introductory idea. **3. Plant regeneration:** 3.1. Organogenesis (direct and indirect), 3.2. Somatic embryogenesis, 3.3. Significance of organogenesis and somatic embryogenesis, 3.4. Artificial seed. **4. Haploid Culture:** 4.1. Anther and Pollen culture methods, 4.2. Applications. **5. Protoplast Culture:** 5.1. Protoplast isolation and culture, 5.2. Protoplast fusion (somatic hybridization), 5.3. Significance.	

PROF. SUTAPA GUPTA

THEORETICAL **No of Classes Allotted – One (1)/Week**

6. Plant Genetic Engineering:

6.1. Brief concept of different gene transfer methods, special emphasis on *Agrobacterium* mediated gene transfer, Role of Reporter gene, 6.2. Achievements in crop biotechnology, environment and industry (suitable example)- pest resistant plants (BT cotton), herbicide resistance, disease and stress tolerance, transgenic crop with improved quality (flavr tomato, golden rice), role of transgenic in population degradation (super-bug), leaching of minerals, production of industrial enzymes, oil, edible vaccine.

PRACTICAL **DR. RUPAK KUMAR SENGUPTA and PROF. SUTAPA GUPTA**

No of Practical Classes Allotted – One (1)/Week

1. Familiarization of basic equipments in plant tissue culture
2. Study through photographs/ charts/ models of anther culture, somatic embyogenesis, endosperm and embryo culture, micropropagation.
3. Preparation of basal media. Sterilization techniques.
4. Demonstration of any tissue culture technique during visit in a plant tissue culture lab.
5. Preparation of Field Report on a visit to a tissue culture lab.

TRACKING ACADEMIC PROGRESSION THROUGH INTERNAL ASSESSMENT/EVALUATION

1. **METHOD : CLASS TEST – First during MID TERM and the second before the END TERM by each teacher concerned.**
2. **MENTOR – MENTEE APPROACH**
3. **Presentation by the students in the Departmental STUDENTS SEMINAR.**

CC 13 PLANT PHYSIOLOGY (BOT-A-CC-6-13-TH, BOT-A-CC-6-13-P)

Lead Teacher : DR. NANDINI CHAKRABARTY

DR. NANDINI CHAKRABARTY

THEORETICAL **No of Classes Allotted – Two (2)**

4. Plant Growth Regulators:

4.1. Physiological roles of Auxin, Gibberellin, Cytokinin, Abscisic acid, Ethylene, 4.2. Chemical nature –IAA, GA3, Kinetin, 4.3. Biosynthesis and bioassay of IAA, 4.4. Mode of action of IAA, 4.5. Brassinosteroids and Polyamines as PGRs (brief idea).

5.6. Role of GA in flowering, 5.7. Vernalisation – role of low temperature in flowering, 5.8. Concept of biological clock and biorhythm.

6. Seed dormancy: 6.1. Types, Causes and Methods of breaking seed dormancy, 6.2. Biochemistry of seed germination.

7. Physiology of Senescence and Ageing.

DR. ARKAJO MAJUMDAR

THEORETICAL **No of Classes Allotted – Two (2)**

1. Plant-water relations: 1.1 Concept of water potential, components of water potential in plant system, 1.2. Soil-plant-

Atmosphere continuum concept, Cavitation in xylem and embolism, 1.3. Stomatal physiologymechanism of opening and closing, Role of carbon di-oxide, potassium ion, abscisic acid and blue light in stomatal movement, Antitranspirants.

2. Mineral nutrition: essential and beneficial elements, macro- and micronutrients, methods of study and use of nutrient solutions, criteria for essentiality, mineral deficiency symptoms, roles of essential elements, chelating agents.

3. Organic Translocation: 3.1. Phloem sap, P-protein, 3.2. Phloem loading and unloading, 3.3. Mass-flow (pressure flow) hypothesis and its critical evaluation.

5. Photomorphogenesis: 5.1. Concept of photomorphogenesis, 5.2. Photoperiodism and plant types, 5.3. Perception of photoperiodic stimulus, 5.4. Critical day length, concept of light monitoring, 5.5. Phytochrome, cryptochrome and phototropins- chemical nature and role in photomorphogenesis,

PRACTICAL **DR. NANDINI CHAKRABARTY and DR. ARKAJO MAJUMDAR**

No of Practical Classes Allotted – Two (2)

PLANT PHYSIOLOGY

1. Determination of loss of water per stoma per hour.

2. Relationship between transpiration and evaporation.

3. Measurement of osmotic pressure of storage tissue by weighing method.

4. Measurement of osmotic pressure of *Rhoeo* leaf by plasmolytic method.

5. Effect of temperature on absorption of water by storage tissue and determination of Q_{10}.

6. Rate of imbibition of water by starchy, proteinaceous and fatty seeds and effect of seed coat.
7. To study the phenomenon of seed germination (effect of light).
8. To study the induction of amylase activity in germinating grains.
9. To study the effect of different concentrations of IAA on *Avena* coleopotile elongation (IAA bioassay)

CC 14 PLANT METABOLISM (BOT-A-CC-6-14-TH, BOT-A-CC-6-14-P)

Lead Teacher : DR. NANDINI CHAKRABARTY

DR. NANDINI CHAKRABARTY

THEORETICAL **No of Classes Allotted – Two (2)**

4. Nitrogen Metabolism: 4.1. Assimilation of nitrate by plants, 4.2. Biochemistry of dinitrogen fixation in Rhizobium, 4.3.
General principle of amino acid biosynthesis (including GS and GOGAT enzyme system).
5. Lipid metabolism: 5.1. synthesis and breakdown of triglycerides, ß-oxidation, glyoxalate cycle, gluconeogenesis and its role in mobilization of the lipids during seed germinbations, α-oxidation.
6. Mechanism of signal transduction: receptor-ligand interactions, second messenger concept,calcium-calmodilin, G protein, MAP-kinase cascade.

DR. ARKAJO MAJUMDAR

THEORETICAL **No of Classes Allotted – Two (2)**

1. Concept of metabolism: Introduction, Anabolic and catabolic metabolic pathways, regulation of metabolism, role of regulatory enzymes (allosteric, covalent modulation and isozymes)
2. Photosynthesis:
2.1.Chemical structure of chlorophyll a and b, absorption and action spectra, biological significance of carotenoid pigments, 2.2. Red drop and Emerson effect, Components of photosystems (light harvesting complex), photochemical reaction centres, Cyclic and noncyclic electron transport, Water splitting mechanism, 2.3. Calvin cycle – Biochemical reactions & stoichiometry, 2.4. HSK Pathway–three variants of the pathway, 2.5. Photosynthetic efficiency of C_3 and C_4 plants and crop productivity, 2.6. Photorespiration – mechanism and significance, 2.7. Crassulacean Acid Metabolism– mechanism and ecological significance.
3. Respiration: 3.1. EMP pathway, regulation and its anabolic role, 3.2. Conversion of Pyruvic acid to Acetyl CoA,3.3. TCA-cycle and its amphibolic role, 3.4. Oxidative pentose phosphate pathway and its significance,3.5. Mitochondrial electron transport system, uncouplers, 3.6. Oxidation of cytosolic $NADH+H^+$, 3.7. Stoichiometry of glucose oxidation (aerobic).

PRACTICAL **DR. NANDINI CHAKRABARTY and DR. ARKAJO MAJUMDAR**

No of Practical Classes Allotted – Two (2)

1. A basic idea of chromatography: Principle, paper chromatography and column chromatography; demonstration of column chromatography.
2. Separation of plastidial pigments by solvent and paper chromatography.
3. Estimation of total chlorophyll content from different chronologically aged leaves (young, mature and senescence) by Arnon method.
4. Effect of HCO_3 concentration on oxygen evolution during photosynthesis in an aquatic plant and to find out the optimum and toxic concentration (either by volume measurement or bubble counting).
5. Measurement of oxygen uptake by respiring tissue (per g/hr.)
6.. Determination of the RQ of germinating seeds.
7. Test of seed viability by TTC method.

DSE A MEDICINAL AND ETHNOBOTANY (BOT-A-DSE-A-6-3-TH, BOT-A-DSE-A-6-3-P)

Lead Teacher : PROF. SANDGYAY DUTTA

PROF. SANDGYAY DUTTA

THEORETICAL

1. Medicinal botany: History, scope and importance of medicinal plant, a brief idea about indigenous medicinal sciences- ayurveda, siddha and unani. Polyherbal formulations.

4. Pharmacologically active constituents:

Source plants (one example) parts used and uses of: 3.1 Steroids (Solasodin, Diosgenin, Digitoxin), 3.2 Tannin (Catechin), 3.3 Resins (Gingerol, Curcuminoids), 3.4 Alkaloids (Quinine, Atropine. Pilocarpine, Strychnine, Reserpine, Vinblastine), 3.5. Phenols (Sennocide and Capsaicin).

5. Ethnobotany and folk medicine: Definition, methods of study, application, Indian scenario, national interacts, Palaeo-ethnobotany, folk medicines in ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India, application of natural products to certain diseases- Jaudice, cardiac, infertility, diabetics, blood pressure and skin diseases.

DR. SITAL CHATTERJEE

THEORETICAL

2. Pharmacognosy- General account : 2.1 Pharmacognosy and its importance in modern medicine, 2.2 Crude drugs, 2.3 Classification of drugs- chemical and pharmacological, 2.4 Drug evaluation– organoleptic, microscopic, chemical, physical and biological, 2.5. Major pharmacological groups of plant drugs and their uses.

PRACTICAL **PROF. SANDGYAY DUTTA and DR. SITAL CHATTERJEE**

No of Practical Classes Allotted – Two (2)

MEDICINAL AND ETHNOBOTANY

1. Chemical tests for (a) Tannin (*Camellia sinensis* / *Terminalia chebula*), (b) Alkaloid (*Catharanthus roseus*) .
2. Powder microscopy – *Zingiber* and *Holarrhena* .
3. Histochemical tests of (a) Curcumin (*Curcuma longa*), (b) Starch in non-lignified vessel (*Zingiber*), (c) Alkaloid (stem of *Catharanthus* and bark of *Holarrhena*).

DSE B NATURAL RESOURCE MANAGEMENT (BOT-A-DSE-B-6-8-TH, BOT-A-DSE-B-6-8-P)

Lead Teacher : DR. PARTHA KARAK

DR. PARTHA KARAK

THEORETICAL **No of Class Allotted – Two (2)**

Unit 6: Forests

Definition, Cover and its significance (with special reference to India); Major and minor Forest products; Depletion; Management.

Unit 7: Energy

Renewable and non-renewable sources of energy.

Unit 8: Contemporary practices in resource management

EIA, GIS, Participatory Resource Appraisal, Ecological Footprint with emphasis on carbon footprint, Resource Accounting; Waste management.

Unit 9: National and international efforts in resource management and conservation

DR. RUPAK SENGUPTA

THEORETICAL **No of Class Allotted – One (1)**

Unit 1: Natural resources:, Definition and types.

Unit 2: Sustainable utilization: Concept, approaches (economic, ecological and socio-cultural).

Unit 3: Land : Utilization (agricultural, pastoral, horticultural, silvicultural); Soil degradation and management.

DR. ARGHYA KUMAR HAIT

THEORETICAL **No of Class Allotted – One (1)**

Unit 4: Water

Fresh water (rivers, lakes, groundwater, aquifers, watershed); Marine; Estuarine; Wetlands;Threats and management strategies.

Unit 5: Biological Resources

Biodiversity-definition and types; Significance; Threats; Management strategies; Bioprospecting; IPR; CBD; National Biodiversity Action Plan).

PRACTICAL **DR PARTHA KARAK**

No of Practical Classes Allotted – Two (2)

1. Estimation of solid waste generated by a domestic system (biodegradable and nonbiodegradable) and its impact on land degradation.
2. Estimation of foliar dust deposition.
3. Determination of total solid in water (TDS)
4. Determination of chemical properties of soil by rapid spot test (carbonate, iron, nitrate).
5. Estimation of organic carbon percentage present in soil sample.
6. Collection of data on forest covers of specific area.

TRACKING ACADEMIC PROGRESSION THROUGH INTERNAL ASSESSMENT/EVALUATION

1. **METHOD : CLASS TEST – First during MID TERM and the second before the END TERM by each teacher concerned.**
2. **MENTOR – MENTEE APPROACH**
3. **CAREER COUNSELLING INCLUDING EXPLORATION OF AVENUES FOR HIGHER STUDIES.**