BOTANY (ACADEMIC CALENDAR)

B. Sc. (Hons.) Part - I

<u>Term -1</u>

Paper -1 (Theory)

- Algae:
- 1. General characters, thallus organisation, flagella &plastid ultra structure. Origin and evolution of sex, life-cycle pattern. (Dr.Shampriya Chowdhury)
- 2. Classification by Lee (1999) upto phylum with examples. Salient features of Cyanophyceae, Chlorophyceae, Phaeophyceae, Rhodophyceae etc. (**Dr.Shampriya Chowdhury**)
- 3. Life history of Oedogonium, Chara, Ectocarpus. Polysiphonia. (Dr.Tapati Das)
- 4. Algae as food and algal toxin.(Dr.Shampriya Chowdhury)
- Fungi: (Dr.Malyasri Bhattacharya)
- 1. General account, hyphal forms, various spore formation and mode of liberation.
- 2. Sexual reproduction and degeneration of sex, homothallism& Heterothallism.
- 3. Life cycle patterns.
- 4. Anamorphic fungi, parasexuality, Mycotoxins with emphasis on aflatoxin.
- Classification of fungi (Ainsworth el:al 1973) upto class with characters and examples.
- 6. Life history: Synchytrium. Rhizopus. Ascobolus & Agaricus.
- 7. Mycorrhiza-Types with salient features. Role in Agriculture and Forestry.
- 8. Lichen : Types, Reproduction, Economic and Ecological importance.
- 9. Fungal Biotechnology:
 - i) Mushroom Food value and cutilvation of Pleurotus. ii) Citric acid and Ethanol production brief outline.
 - iii) Fungal sources (name only) and uses of Mycoprotein, Enzyme (Cellulase), Amino acid (Tryptophan), Vitamin (Riboflavin), Antibiotic (Griseofulvin), Recombinant protein (Hepatitis B vaccine), Pharmaceuticals (Cyclosporin - A)
- Plant Pathology:(Sutapa Gupta)
- A. Terms & Definitions :
 - i) Disease concept, Symptom, Ecology and causal complex.
 - ii) Primary and secondary Inocula, Infection, Pathogenicity and Pathogenesis.
 - iii) Necrotroph and Biotroph, Koch's Postulates.
 - iv) Disease types : Endemic, Epidemic, Pandemic and Sporadic disease,
 - v) Disease cycle (Disease triangle, monocyclic, poly cyclic and polyetic)
- B. Host-Parasite Interacon :
 - i) Mechanism of infection (Brief idea about Pre-penetration, Penetration and Post-Penetration)
 - ii) Pathotoxin (Defintion, criteria and example)
 - iii) Defence mechanisms with special reference to Phytoalexin and Phytoanticipin.
 - iv) Resistance Systemic acquired and Induced systemic
- C. Plant disease Management:

i) Quarantine, Chemical, Biological, Integrated, Disease forecasting & Disease diagnosis.

<u> Paper - II (A)</u>

• Bryophyta:(Sutapa Gupta)

- 1. Origin, amphibian nature; classification (Proskaeur, 1957) upto class with characters and examples.
- 2. Life history, gametophytic and sporophytic structure and spore dispersal mechanisms of the following genera :<u>Marchantia. Anthoceros&Funaria</u>.
- Palaeobotany: (Dr.Shampriya Chowdhury)
- 1. Plant fossil types (Micro and Mega-fossils, Index fossil)
- 2. Mode of preservation (Schopf, 1975)
- 3. Conditions favouring fossilization, Importance of fossil.
- 4. Indian Gondwana System Three fold division with major Mega fossil assemblages.

<u> Paper - II (B)</u>

Practical. (Dr.Shampriya Chowdhury)

<u>Term - II</u>

- Algae:
- 1. Blue green algae Ultra structure of cell. (Dr.Tapati Das)
- 2. Heterocyst Structure and function, Renaming of cyano bacteria.(Dr. Tapati Das)
- 3. Diatom Cell structure, cell division, Auxospore formation in Centrales&Pennales. (Dr.Tapati Das)
- 4. Economic importance of algae as food, Phycocolloid (Agar-Agar, Algin, Carrageenan), Diatomite, Algal biotechnology. (Dr.Shampriya Chowdhury)
- Plant Pathology: (Sutapa Gupta)
- 1. Symptoms, causal organism, disease cycle and control measures of Tungro Virus disease of rice, Bacterial Blight of rice, Black stem rust of wheat, Stem rot of Jute.
- Microbiology: (Dr.Malyasri Bhattacharya)
- 1. Plant virus type, transmission of plant virus (inside and between host)
- 2. TMV Physicochemical characteriscs and multiplication.
- 3. One step growth curve, ^ phage molecular mechanism of lysogeny&induction. Significance of lysogeny, viroids and prions.
- 4. Bacteria classification with dislinguishing features of some major groups : Gram + ve, Proteobacteria, Actino bacteria, Spirochaetes, Chlamydae, Mollicutes. Glycocalyx -nature&function. Flagella, Pili and Fimbriae-ultra structure &function. Cell wall - chemical nature and differences between gram + ve& - ve bacteria, bacterial genome & plasmid. Endospore formation. Genetic recombination of bacteria.
 - a) Transformation with special emphasis on Natural and induced competence & DNA uptake.
 - b) Conjugation : F-factor, $F^+ x F^-$, Hfr x F^- , concept of F1, chromosome mobilization.
 - c) Transduction : General and Specialized.
- Embryology: (Dr.Sangita Das Chowdhury)
- 1. Pre-fertilization changes: Microsporogenesis and Micro-gametogenesis, Megasporogenesis and Mega gameto-genesis (Monosporic, bisporic and Tetrasporic)
- 2. Pollen ovule ratio and its significance. Pollen germination and pollen tube growth. Entry of pollen tube into ovule, pollen tube discharge. Double fertilisation.
- 3. Post fertilization changes Embryogenesis in Capsella.
- Palaeobotany: (Dr.Shampriya Chowdhury)

Palynology: Spore & pollen, pollen aperture types. Pollen wall-Sporopollenin, Strafication and ornamentati on (sculpturing)

<u> Paper - II (B)</u>

Practical. (Dr.Shampriya Chowdhury)

<u>Term - III</u>

Paper - I (Theory)

- Algae: Revision (Dr.Shampriya Chowdhury)
- Fungi: Revision (Dr.Malyasri Bhattacharya)
- Pathology: Revision (Sutapa Gupta)
- Microbiology: (Dr.Malyasri Bhattacharya)
 - i) Applied Microbiology: Industrial production of vinegar and streptomycin. Microbial sources and uses of enzyme, amino acid and Polysaccharides (Dextran).
 - ii) Uses of microbes as biofertilizer and biopesticides.

Paper - II (A)

- Bryophyta: (Sutapa Gupta)
 - i) Phylogeny: Origin of alternation of generations (Homologous and Antithetic theory)
 - ii) Importance : Role of BryOophytes in plant succession and pollution monitoring.
- Palynology:(Dr. Shampriya Chowdhury)
 - i) NPC classificati (Erdtman)
 - ii) Applied Palynology : Basic concept of-

a) Palaeopalynology, b) Aero palynology, c) Forensic Palynology and d) Melissopalynology.

- Embryology : (Dr. Sangita Das Chowdhury)
 - i) Post-fertilisation changes: Development of Endosperm. (Three types)
 - ii) Apomixis Aposporyand, Apogamy.
 - iii) Polyembryony Different types.

Paper-II(B)

Practical. (Dr. Shampriya Chowdhury)

B. Sc. (Hons.) Part - II

<u> Term - I</u>

Paper - III (Theory)

A) Pteridophytes:(Sutapa Gupta)

- i) General Account: Colonisation of early land plants.
- ii) Classification of vascular plants by Gifford and Foster (1989) upto division (Rhynophyta to Filicophyta) with diagnostic characters & examples.
- iii) Life history : Sporophyte structure, reproduction and gametophytic structure of <u>Psilotum</u>, <u>Selaqinella,Equisetum</u>&<u>Dryopteris</u>.

B) Anatomy: (Dr. Atrayee Banerjee)

- i) Cell Wall: Ultra structure & chemical constituents, Plasmodesmata ultra structure, concept of Apoplast and Symplast, Growth and thickening of cell wall.
- ii) Stomata Types (Metcalfe and Chalk, Stebbins & Khush), Ontogeny.
- iii) Ontogeny of Trachea & sieve-tube.

- iv) Stele, leaf trace and leaf-gap, stelar types & evolution.
- v) Secondary Growth : normal (intra & extra stelar), Anomalous (Stem of <u>Bignonia, Boerhaavia. Tecoma</u>, <u>Dracaena & root of Tinospora</u>)
- vi) Mechanical ti ssues and the principles governing their distribution in plants.

Paper-IV (A)

- A) Morphology of Angiosperms : (Dr.Sangita Das Chowdhury)
 - i) Inflorescence types with examples.
 - ii) Flowers : Corolla forms, aestivation, stamen types, Placentation types, ovule structure and forms.
 - iii) Fruits types with examples.
- B) Taxonomy of Angiosperms :
 - i) Systems of classification : Broad outline of Bentham and Hooker (1862-1883), Cronquist's (1988) system of classification with merits and demerits.
 - ii) Herbaria and Botanical Gardens their role, important Indian Herbaria and Botanical Gardens.
 - iii) Dichotomous keys : Indented and bracketed.
 - iv) Diagnostic features, systematic position (Bentham & Hooker & Cronquist), Economically important plants (parts used and uses) of the following families :

Dicot :Magnoliaceae, Malvaceae, Leguminosae (Sub-families), Euphorbiaceae, Umbelliferae (Apiaceae), Solanaceae, Scrophulariaceae, Acanthaceae, Lamiaceae, Cucurbitaceae, Rubiaceae, Compositae (Asterceae)

Monocot: Alismataceae, Palmae (Arecaceae), Gramineae (Poaceae), Liliaceae, Zingiberaceae, Orchidaceae.

<u> Paper-IV (B)</u>

Practical. (Dr. Sangita Das Chowdhury and Dr. Shampriya Chowdhury)

<u> Term - II</u>

Paper - III (Theory)

A. Pteridophyta: (Sutapa Gupta)

- i) Fossil Pteridophytes : Structural features, Geological distribution and Evolutionary significance of <u>Rhynia, Lepidodendron</u> (Reconstructed) <u>Calamites</u> (Reconstructed)
- ii) Telome concept and its significance in the origin of different groups of pteridophytes.
- iii) Heterospory and origin of seed habit.
- iv) Economic importance with reference to Wood, Resins, Essential oils & Drugs.

B. Gymnosperms :(Sutapa Gupta)

- i) Classification by Gifford and Foster (1989) upto division (Progymnospermophyta&Gnetophyta)
- ii) Progymnosperms characters, vegetative and reproductive features of <u>Archaeopteris</u>, Phylogenetic importance.

C. Anatomy:(Dr.Atrayee Banerjee)

- i) Development of shoot apex (Tunica-corpus) and Root apex (Korper-kappe), Plastochrone.
- ii) Ecological anatomy adaptive anatomical features of Hydrophytes and xerophytes.

<u> Paper-IV (A)</u>

- A. Taxonomy of Angiosperms : (Dr.Sangita Das Chowdhury)
 - i) Components of systematics, Nomenclature, Identi fication & Classification.
 - ii) Taxonomy & its phases : Pioneer, consolidation, Bio-systematic and Encyclopaedic, alpha and omega-

taxonomy.

- iii) Nomenclature, Elementary knowledge of ICBN, Principles : Rank of taxa, Retention and rejection of names, Type method, Principle of priority, Effective and valid publication, author citation.
- iv) Diagnostic features of Monocot & Dicot, families continued.

<u> Paper - IV (B)</u>

Practical: (Dr.Shampriya Chowdhury and Dr.Sangita Das Chowdhury)

Field Work : Long excursion to a different phytogeographical zone of India. (**Dr.Shampriya Chowdhury and Dr.** Sangita Das Chowdhury)

<u>Term - III</u>

Paper - III (Theory)

A. Gymnosperm: (Sutapa Gupta)

- i) Life history, distribution in India, vegetative and gametophytic & embryogeny in <u>Cycas, Pinus &</u> <u>Gnetum</u>.
- ii) Fossil Gymnosperm : Structural features and Geological distribution of reconstructed genera of Lyginopteris, Williamsonia. Cordaites.
- iii) Economic importance with reference to Wood, Resins, essential oils and drugs.

B. Ecology:(Dr.Shampriya Chowdhury)

- i) Preliminary idea on Habitat and Niche, Ecotone & edge-effect, Microclimate, Ecads, Ecotype &Ecoclines, Carrying capacity.
- ii) Community ecology: Community characteriscs and diversity.
- iii) Ecological succession Primary & Secondary. Seral stages (Hydrosere), autogenic & allogenic succession.
- iv) Plant indicators (metallophytes) Phytoremediation.
- v) Conservation of Biodiversity, In-situ & Ex-situ conservation, seed bank, Geographical information system and Remote sensing.

C. Plant Geography: (Dr. Malyasri Bhattacharya)

- i) Phytogeographical regions of India (Chatterjee 1960). Dominant flora of Eastern Himalayas, Western Himalayas & Sunderbans.
- ii) Endemism : Endemic types & factors. Endemism in Indian flora.
- iii) Age and area hypothesis & epibiotic theory.
- D. Revision of 1st & 2nd Terms topics.

Paper - IV (A)

- 1. Taxonomy & Systematics : (Dr.Sangita Das Chowdhury)
 - i) Brief idea on Phenetics, Numerical taxonomy, Cladistics, Monophyletic, Polyphyletic and paraphyletic groups. Pleisomorphy&apomorphy.
- 2. Data sources in Taxonomy Supportive evidences from

a) phytochemistry, b) Cytology, c) Anatomy.

3. Revision

Paper-IV (B)

Practical(Dr.Shampriya Chowdhury and Dr. Sangita Das Chowdhury)

- Field Work : (Dr.Sangita Das Chowdhury)
- 1. At least four local excursions and one to Acharya Jagadish Chandra Bose Indian Botanic Garden (Shibpur, Howrah) and Central National Herbarium (CNH).
- 2. 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).

3. Field record : a) Field note book (authenticated) with ecological notes on the plants of the area of excursion and voucher specimen book, b) Herbarium specimen : Preparation of 25 angiospermic specimens (identified with author citation, voucher number & arranged following Bentham & Hooker's system of classification) to be submitted in the University Examination. (**Dr.Sangita Das Chowdhury)**

B. Sc. (Hons.) Part - III

<u>Term -1</u>

Paper - V (Theory)

A. Biochemistry : (Dr.Shampriya Chowdhury and Dr.Tapati Das)

- i) Biochemical Foundations : Covalent non-covalent bond, structure & properties of water etc.
- ii) Molecules of life: a) Nucleic acids, nucleotide derivatives (ATP, NADP), b) Proteins : Structure and classification of amino acids, c) Carbohydrates : Structures, stereoisomers, enantiomers and epimers, d) Lipids: structures of different lipids, fatty acids saturated and unsaturated.

B. Plant Physiology: (Dr. Shampriya Chowdhury)

- i) Plant water relations water potential, soil-plant -atmosphere continuum concept, Stomatal physiology, Anti transpirants.
- ii) Organic translocation Phloem sap, phloem loading & unloading, Mass flow hypothesis and its critical evaluation.
- iii) Photosynthesis: Chlorophyll a & b, biological significance of carotenoids ; components of photosynthesis, photochemical reaction centre. Calvin cycle, HSK-pathway, Photosynthetic efficiency of C3 and C4 plants & crop productivity; Photo respiration; Crassulacean acid metabolism.
- C. Pharmacognosy: (Dr.Malyasri Bhattacharya)
 - i) Importance of Pharmacognosy in modern medicine; Crude drugs, classification chemical & pharmacological, evaluation of crude drugs.
 - ii) Secondary metabolites & Primary metabolites. Inter relationship of basic metabolic pathways with secondary metabolite biosynthesis.
 - iii) Major types terpenoids, phenolics, flavonoids, alkaloids & their protective action against microbes and herbivores.
 - iv) Pharmacologically active constituents: Source plants, parts used & use of steroids, Tannins, Resins & Alkaloids.

<u> Paper-VI</u>

- A. Cell Biology: (Dr.Atrayee Banerjee)
 - i) Origin and evolution of cells, concept of RNA-world, Ribozyme, First cell, origin of eukaryotic cell, Organellar DNA (cp&mt DNA).
 - ii) Nucleus & Chromosome Nucleolus ultra structure & ribosome biogenesis, Chromatin ultra structure& DNA packaging in eukaryotic chromosome.
 - iii) Cell cycle and its regulation dynamics of chromosome movement in anaphase, mechanism of cell cycle control in Yeast (Check points and role of MPF) Apoptosis (brief idea).
- B. Genetics and Molecular Biology: (Dr.Debarati Nag Roy)
 - i) Linkage, crossing over & gene mapping, Molecular mapping ISH, FISH (brief idea)
 - ii) Epistasis and Polygenic inheritance in plants, iii) Aneupoidy and Polyploidy.
 - iv) Chromosomal aberration: Types of meiotic behaviour,
 - v) Mutation Molecular mechanism, DNA repair.

<u> Paper-VII</u>

Paper-VIII

Practical. (Dr.Debarati Nag Roy)

<u>Term - II</u>

<u> Paper - V (Theory)</u>

- A. Biochemistry : Energy flow and enzymology Bioenergetics Thermodynamic principles. Enzymes Classification, mechanism of enzyme action, Enzyme kinetics (Michaelis-Menten equation) and simple problems. (**Dr.Shampriya Chowdhury**)
- B. Plant Physiology :Respiration (Dr.Shampriya Chowdhury)
 - i) EMP pathway, TCA- cycle & its role, Oxidative pentose phosphate pathway & its significance, Mitochondrial electron transport system, Uncouplers; Oxidation of cytosolic NADH + H⁺, Stoichiometry of glucose oxidation (aerobic)
 - ii) N₂ metabolism. (Dr.Tapati Das)
 - iii) Plant growth regulators. (Dr.Tapati Das)

<u> Paper - VI</u>

- A. Genetics and Molecular Biology: (Dr.Debarati Nag Roy)
 - Structural organisation of gene, one gene one enzyme concept, complementation test (r¹¹ locus), split gene, overlapping gene, Repetitive DNA-tandem and interspersed, Transposon (Ac Ds system). Homoeotic gene in plants (ABC model in <u>Arabidopsis</u>).
 - ii) DNA -Replication, Transcription & Translation (prokaryotes & eukaryotes).
 - iii) Gene regulation, Genetic code.
 - iv) Bio- informatics: Brief concept
- . B. Plant Biotechnology: (Dr.Atrayee

Banerjee)

- i) Plant ti ssue culture, cellular topotency, Tissue culture media etc.
- ii) Callus culture Growth and maintenance, applications.
- iii) Micropropagation- Organogenesis, somatic embryogenesis, artificial seed, significance.
- iv) Haploid culture anther & pollen culture, significance.
- v) Protoplast culture.
- vi) Plant genetic engineering.

<u>Paper-VII</u>

Practical.(Dr.Debarati Nag Roy)

Paper-VIII

Practical.(Dr.Shampriya Chowdhury)

<u>Term - III</u>

<u> Paper - V</u>

- A. Plant physiology: (Dr.Tapati Das)
 - i) Photomorphogenesis.
 - ii) Seed dormancy, Biochemistry of seed germination.
 - iii) Physiology of Senescence and Ageing.
 - iv) Stress Physiology.
- B. Revision of other topics.

Paper-VI

- A. Plant Breeding & Biometry : (Dr.Debarati Nag Roy)
 - i) Maintenance of germplasm, selection, back- cross, Heterosis & Hybrid seed production.
 - ii) Biometry : Frequency distribution, Central Tendency, Arithmetic Mean & Median.
 - iii) Good-fit. Probability, Measurement of gene frequency.
- B. Revision of other topics.

<u> Paper - VII</u>

Practical.(Dr.Shampriya Chowdhury)

Paper-VIII

Practical. (Dr.Debarati Nag Roy)

<u>BOTANY</u>
<u>GENERAL</u>
IST YEAR
<u>TERM-I</u>
PAPER-I

Module I:

- Microbiology:(Dr.Malyasri Bhattacharya)
- 1. Archaea, Bacteria, Eukarya.
- 2. Plant virus characteristics, Transmission and Translocation.
- 3. Lytic cycle (T₄ phage) & Lysogenic Cycle (Lambda phage).
- 4. Chemical nature of cell wall of Gram + ve and Gram ve bacteria.
- 5. Genetic recombination of bacteria (Conjugation, transformation and Transduction).
- Algae:(Dr.Tapati Das)
- 1. Salient features of Cyanophyceae, Rhodophyceae, Chlorophyceae, Charophyceae and Phaeophyceae. (Lee, 1999).
- 2. Life history of Chara, Ectocarpus.
- 3. Economic importance of Algae.
- Fungi: (Dr.Malyasri Bhattacharya)
- 1. Diagnostic characters with examples of Oomycotina, Mastigomycona, Zygomycotina, Ascomycotina & Basidiomycotina. (Ainsworth, 1973)
- 2. Life cycles of <u>Rhizopus & Ascobolus</u>.
- 3. Economic importance of Fungi.
- 4. Fungal symbioses: Mycorrhiza & Lichens & their importance.

Module II:

- Angiosperms : (Dr.Malyasri Bhattacharya))
- 1. Inflorescence types Definition with examples.
- 2. Corolla forms, Aesvation.
- 3. Placentation types.
- 4. Sporogenesis& Gametogenesis.
- 5. Embryo development in Capsella.
- 6. Endosperm development.

<u> Paper - III</u>

Practical. (Dr.Malyasri Bhattacharya)

<u>Term - II</u>

<u> Paper - I</u>

Module I: (Sutapa Gupta)

- Plant pathology:
- 1. Symptoms necroitc, hypoplastic, hyperplastic
- 2. Koch's postulates, Biotrophs & Necrotrophs.
- 3. Disease triangle; Palliotoxin and Phytoalexins (Brief concept)
- 4. Symptoms, causal complex, causal organism, disease cycle and control measures of plant disease :
 - a) Late blight of potato.
 - b) Black stem rust of wheat.

Module II:

- Pteridophytes: (Sutapa Gupta)
- 1. Diagnostic characters and examples of Psilophyta, Lycophyta, Sphenophyta and Filicophyta. (Gifford& Foster, 1989)
- 2. Life histories of <u>Selaqinella&Dryopteris</u>.
- 3. Economic importance of Pteridophyta.
- Paleobotany: (Dr.Tapati Das)
- 1. Importance of fossil studies.
- 2. Modes of preservation, Geological time scale.
- Taxonomy: (Dr.Malyasri Bhattacharya)
- 1. Artificial, Natural and Phylogenetic systems of classification.
- 2. Principles of ICBN.
- 3. Bentham and Hooker's system of Classification.
- 4. Phenetics Brief concept.

<u>Paper-III</u>

Practical. (Dr.Malyasri Bhattacharya)

<u>Term - III</u> <u>Paper - I</u>

Module I:

- 4.1 Bryophyta :(Sutapa Gupta)
- 1. Amphibian nature, Diagnostic characters with examples :Hepatocopsida, Anthoceroropsida, Bryopsida (Proskauer 1957)
- 2. Life histories of Marchantia & Funaria.
- 3. Ecological importance of Bryophyta.

Module II: (Sutapa Gupta)

- Gymnosperms :
- 1. Progymnosperms (brief idea).
- 2. Classification, Class characters with examples of Cycadophyta, Coniferophyta & Gnetophyta (Gifford &

Foster 1989)

- 3. Life histories of Cycas & Pinus.
- 4. Economic importance of Gymnosperms.
- Palaeobotany & Palynology : (Dr.Tapati Das)
- 1. Williamsonia (Reconstructed)
- 2. Palynology Definition, spore & Pollen (brief idea) application
- Taxonomy :Diagnostic features of following families (Dr.Malyasri Bhattacharya)
 - a) Malvaceae.
 - b) Leguminosae (Fabaceae)
 - c) Cucurbitaceae.
 - d) Solanaceae.
 - e) Labiatae (Lamiaceae)
 - f) Acanthaceae
 - g) Rubiaceae.
 - h) Compositae (Asteraceae)
 - i) Graminae (Poaceae)
 - j) Orchidaceae.

<u> Paper - III</u>

Practical. (Dr.Malyasri Bhattacharya)

BOTANY 2nd Year General <u>Term -1</u> Paper - II (Theory)

Module III:

- 1. Anatomy: Stomata -Types (Metacalfe & Chalk); Mechanical Tissues Principle and distribution ;Stelar types and evolution ; Shoot apex (Tunica corpus) and Root apex (Korper-Kappe); Secondary growth normal in dicot stem and anomaly in stem of <u>Tecoma</u> and <u>Dracaena</u>. (Sutapa Gupta)
- Cell Biology and Genetics : Ultra structure of nuclear envelope, nucleolus and their function, Molecular organisation of metaphase chromosome (Nucleosome concept). Chromosomal aberrations deletion, duplication, inversion and translocation, Aneupioidy and Polyploidy -types, importance and role in evolutiion. (Dr.Atrayee Banerjee)

Module IV:

 Biochemistry and Plant Physiology : Protein - Primary, Secondary and tertiary structure; Nucleic acid-DNA structure, RNA types ; Enzyme - Classification with examples (IUBMB), Mechanism of action ; Transport in plants - ascent of sap and xylem cavitation , Phloem transport and source - sink relation ; Transpiration -Mechanism. (Dr.Shampriya Chowdhury/Dr.Debarati Nag Roy)

<u> Term - II</u>

Module III: (Con nued)

4. Cell Biology and Genetics: Central Dogma; DNA replication - Mechanism in prokaryote; Transcription processing of mRNA and Translation; Genetic code - properties; Epistasis. (**Dr.Debarati Nag Roy)**

Module IV:

- 5. Biochemistry and Plant Physiology : Photosynthesis -Pigments, Action spectra and Enhancement effect, Electron transport system and photophosphorylation, C₃ and C₄ photosynthesis, CAM Relation and significance; Respiration Glycolysis and Krebs cycle Reaction and significance, ETS and Oxidative phosphorylation. (**Dr.Shampriya Chowdhury**)
- Economic Botany : Study of the following economically important plants (scientific names, families, parts used and importance); Cereals - rice, wheat, pulses - mung, gram, spices - ginger, cumin, Beverages- tea, coffee; Medicinal Plants-cinchona, neem, ipecac,vasaka; Oil yielding plants-mustard, groundnut, coconut; Vegetables potato, radish, bottlegourd, cabbage; Fibre yielding plants - cotton, jute; Timber yielding plants - teak, sal; Fruits -mango, apple; Sugar yielding plant-sugarcane. (Sutapa Gupta)

<u>Term - III</u>

<u> Paper - II</u>

Module III: Continued.

7. Cell Biology and Genetics : Linkage group and genetic map (3 point test cross); Mutation - Point mutation (tautomerisation, transition, transversion and frame-shi ft), Mutagen - physical and chemical; Brief concept of split gene, Transposons. (**Dr.Debarati Nag Roy**)

Module IV: Continued.

- Biochemistry and Plant Physiology : Nitrogen metabolism Biological dinitrogen fixation, Amino acid synthesis (reductive amination on and transamination); Plant growth regulators - Physiological roles of Auxin, Gibberellin, Cytokinin, Ethylene, ABA; Photoperiodism (Plant types, Role of phytochrome and GA in flowering) and Vernalization; Senescence (brief idea). (Dr.Shampriya Chowdhury/Dr.Debarati Nag Roy/Dr.Atrayee Banerjee)
- 9. Ecology : Ecotypes and microclimate; Plant succession stages of succession (hydrosere) Ecological adaptation of hydrophytes, halophytes and xerophytes; Bio diversity -Definition, levels of biodiversity (genetic, species and ecosystem) methods of in-situ and ex-situ conservation; Phytoremediation (brief idea). (Sutapa Gupta)

<u> Paper - III</u>

Practical: PAPER III.(Dr.Shampriya Chowdhury/Dr.Sangita Das Chowdhury)

3rd Year General

(Theory - 70 & Practical - 30)

<u> Term - I</u>

Paper-IV A (Theory)

Module VII:

- 1. Biofertilizer: Sources, production, Application. (Dr.Malyasri Bhattacharya)
- 2. Mushroom : Food value, Cultivation technique of <u>Pleurotus</u>. (Dr.Malyasri Bhattacharya)
- 3. Plant Breeding : Mass and Pure-line selection; Heterosis and Hybrid seed production.(Dr.Debarati Nag Roy)

Paper - IV B (Practical)

Module VIII:

- 1. Acquaintance with laboratory instrument: Autoclave, Incubator, Clinical centrifuge, Analytical Balance. (Dr.Shampriya Chowdhury)
- 2. Acquaintance with common medicinal plants and their useful parts :<u>Terminalia arjuna, Centella asiatica</u>, <u>Saraca asoca, Adhatoda vasica, Andrographis paniculata, Asteracantha longifolia, Eclipta alba</u>.(**Dr.Malyasri Bhattacharya)**

<u> Term - II</u>

Paper-IV A (Theory)

Module VII: Continued

- 4. Plant disease control: Quarantine, Biological control, Chemical control.(Dr.Tapati Das)
- 5. Biometry : Measures of central tendency (Mean, Mode and Median), Goodness of fit (Chisquare test).(**Dr.Debarati Nag Roy)**
- 6. Plant tissue culture : Callus culture and plant regeneration; Micropropagation; Somatic embryogenesis and Artificial seed; Protoplast culture and application. (**Dr.Atrayee Banerjee**)

Paper - IV B (Practical)

Module VIII: Continued

- 3. Sterilization technique by autoclaving.(Dr. Malyasri Bhattacharya)
- 4. Acquaintance of common medicinal plants :<u>Aloe barbadensis, Rauvolfia serpentina, Vitex</u> <u>negundo,Herpestis monieria, Holarrhena anti dysenterica, Boerhaavia repens</u>.(**Dr.Malyasri Bhattacharya**)
- 5. Acquaintance with laboratory instruments-pH meter, colorimeter, Water-bath, Distillation plant.(**Dr.Shampriya Chowdhury)**

<u>Term - III</u>

Paper-IV A (Theory)

Module VII: Continued

- 7. Recombinant DNA technology : Recombinant DNA, restriction enzymes, plasmids as vector; gene cloning (basic stages); Transgenic plants.(Dr.Atrayee Banerjee)
- 8. Pharmacognosy : Scope and importance, secondary metabolites alkaloids, terpenoids, phenolics and their function, organoleptic evaluation of crude drugs.(**Dr.Tapati Das**)

Paper - IV B (Practical)

Module VIII: Continued

- 6. Preparation of PDA medium (Slants, pouring of plates). Bacterial Staining. (Dr. Malyasri Bhattacharya)
- 7. Determination of Goodness of fit of normal monohybrid ratios (3:1 and 1:1) by chi square analysis.(**Dr.Shampriya Chowdhury**)

8. Visit to a Medicinal Plant Garden. (Dr.Sangita Das Chowdhury)

[Updated Laboratory Notebooks and Field Note Books to be submitted at the time of examination]