

Course Module (Year-wise) NEW REGULATIONS B.Sc. BOTANY HONS

| Session 2016-2017 | | | |
|----------------------------|--|--------------------------|---------|
| Pattern | | | I+I+I |
| Examination | | | PART-I |
| Paper –I (Theory) | | | F.M.-75 |
| Major Topic | Sub Topics | Periods [Lec.H rs] | Marks |
| ALGAE | 1. Introduction; habitat and range of thallus structure in algae; origin and evolution of sex in algae. | 4 | 30 |
| | 2. Evolution of thallus structure in algae. | 1 | |
| | 3. Endosymbiosis and evolution of chloroplast in algae. | 1 | |
| | 4. Principles of classification and outline classification of Lee (2009) up to divisions. | 1 | |
| | 5. Cyanophyceae: Salient features, a general account with emphasis on cell structure and reproduction. | 2 | |
| | 6. Chlorophyceae: Salient features; life history of <i>Chlamydomonas</i> , <i>Zygnema</i> , <i>Oedogonium</i> & <i>Trentepohlia</i> . | 5 | |
| | 7. Charophyceae: Salient features; life history of <i>Chara</i> . | 2 | |
| | 8. Xanthophyceae: Salient features; life history of <i>Vaucheria</i> . | 1 | |
| | 9. Bacillariophyceae: Salient features; a general account with emphasis on cell structure and reproduction. | 3 | |
| | 10. Phaeophyceae: Salient features; life history of <i>Fucus</i> . | 2 | |
| | 11. Rhodophyceae: Salient features; life history of <i>Polysiphonia</i> | 2 | |
| | 12. Economic importance of algae. | 1 | |
| FUNGI | 1. Introduction, Salient features; Classification [Ainsworth Sparrow Sussman (1973)] and Gwynne-Vaughan & Barnes up to class). | 3 | 25 |
| | 2. Economic importance of fungi. | 1 | |
| | 3. Phycomycetes: Salient features, life histories of <i>Synchytrium</i> and <i>Rhizopus</i> . | 2 | |
| | 4. Ascomycetes: Salient features, development of <i>Ascus</i> and <i>Ascospores</i> , types of ascocarps; life histories of <i>Ascobolus</i> and <i>Claviceps</i> . | 3 | |
| | 5. Basidiomycetes: Salient features; development of Basidium and Basidiospore, life histories of <i>Agaricus</i> , <i>Polyporus</i> and <i>Lycoperdon</i> | 4 | |
| | 6. Deuteromycetes: Salient features; fruiting structures and parasexuality. | 1 | |
| | 7. Lichen: Habitat and thallus structures; economic importance. | 2 | |
| PLANT PATHOLOGY | 1. Plant Diseases: Definition; concepts of parasitism and saprophytism, Koch's postulate. | 1 | 20 |
| | 2. Classification of plant diseases based on symptoms. | 1 | |
| | 3. Pathotoxins (HV toxin and Wild-fire toxin) in disease development. | 1 | |
| | 4. Brief ideas on structural and biochemical defense mechanism of plants. | 1 | |
| | 5. Control of Plant diseases: Physical, cultural, chemical and biological. | 1 | |
| | 6. Symptoms, disease cycles and control measures of White rust of crucifer, Loose smut of wheat, Citrus canker, Late blight of potato, Rust of wheat & Brown spot of Rice. | 5 | |

| Session 2016-2017 | | | |
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| Pattern | | | I+I+I |
| Examination | | | PART-I |
| Paper –II (Theory) | | | F.M.-50 |
| Major Topic | Sub Topics | Periods [Lec.Hrs] | Marks |
| BRYOPHYTA | 1. Introduction, general characters, Classification (Smith, 1955), Economic importance. | 2 | 15 |
| | 2. Life histories of <i>Riccia</i> , <i>Marchantia</i> , <i>Pellia</i> , <i>Porella</i> , <i>Anthoceros</i> , <i>Sphagnum</i> & <i>Funaria</i> . | 9 | |
| | 3. Evolutionary trends among the above mentioned genera. | 1 | |
| MORPHOLOGY | 1. Leaves: Types, phyllotaxy, modifications of leaves. | 7 | 18 |
| | 2. Inflorescence: Types and evolution | 4 | |
| | 3. The flower as a modified shoot; aestivation; placentation and its evolution; floral formulae, floral diagram; adhesion and cohesion of floral parts. | 3 | |
| | 4. Fruits: Definition and types | 3 | |
| | 5. Dispersal of fruits and seeds | 2 | |
| PLANT ANATOMY | 1. Cell wall: Structure, growth and thickenings. | 2 | 17 |
| | 2. Tissue: Definition, organization of shoot and root apices, mechanical tissue and their distribution in plant bodies. | 3 | |
| | 3. Stele: Definition, evolution; types of vascular bundles. | 2 | |
| | 4. Root-stem transition. | 1 | |
| | 5. Secondary growth: normal and anomalous types; secondary growth in dicot root and shoot. | 4 | |
| | 6. Anomalous secondary growth in stems of <i>Bignonia</i> , <i>Boerhaavia</i> , <i>Dracaena</i> (<i>Cordyline</i>). | 2 | |

| Session 2016-2017 | | | |
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| Pattern | | | I+I+I |
| Examination | | | PART-II |
| Paper –IV (Theory) | | | F.M.-75 |
| Major Topic | Sub Topics | Periods [Lec.Hrs] | Marks |
| PTERIDOPHYTA | 1. Introduction to Pteridophyta. . | 1 | 30 |
| | 2. Outline of Pichi Sermolii's system (1977) of classification of pteridophytes up to orders mentioning class characters. | 1 | |
| | 3. Telome theory of Zimmerman and Enation theory of Bower. | 1 | |
| | 4. Vegetative and reproductive organography of the following genera: i) <i>Rhynia</i> , ii) <i>Zosterophyllum</i> , iii) <i>Psilophyton</i> , iv) <i>Lycopodium</i> , v) <i>Selaginella</i> , vi) <i>Isoetes</i> vii) <i>Lepidodendron</i> , viii) <i>Calamites</i> , ix) <i>Equisetum</i> , x) <i>Pteris</i> , xi) <i>Marsilea</i> . | 15 | |
| | 5. Apogamy and apospory in pteridophytes | 1 | |
| | 6. Economic importance of pteridophytes. | 1 | |
| GYMNOSPERM | 1. General features, concepts of ovule and seed; outline classification as adopted by Stewart & Rothwell (1993). | 3 | 30 |
| | 2. Progymnospermopsida: General features. | 2 | |
| | 3. Pteridospermales: General account of <i>Lyginopteris</i> plant (<i>Sphenopteris</i> leaf, <i>Lyginopteris</i> stem, <i>Crossotheca</i> male organ and <i>Lagenostoma</i> female organ). | 2 | |
| | 4. Glossopteridales: General account of <i>Glossopteris</i> plant (<i>Vertebraria</i> root, <i>Araucarioxylon</i> trunk, <i>Glossopteris</i> leaf, <i>Glossotheca</i> male organ, <i>Dictyopteridium</i> female organ). | 1 | |
| | 5. Cycadales: Structure and life history of <i>Cycas</i> and its distribution in India. | 3 | |
| | 6. Bennettitales: General account of <i>Williamsonia</i> plant (<i>Bucklandia</i> stem, <i>Ptilophyllum</i> leaf, <i>Weltrichia</i> male organ, <i>Williamsonia</i> female organ). | 1 | |
| | 7. Pentoxylales: General account of <i>Pentoxylon</i> plant (<i>Pentoxylon</i> stem, <i>Nipaniophyllum</i> leaf, <i>Sahania</i> male organ, <i>Carnoconites</i> female organ). | 1 | |
| | 8. Ginkgoales: Structure and life history of <i>Ginkgo</i> ; brief mention of the morphology of collar. | 2 | |
| | 9. Coniferales: Structure and life history of <i>Pinus</i> ; brief mention of the morphology of ovuliferous scale. | 4 | |
| | 10. Gnetales: Structure and life histories of <i>Ephedra</i> and <i>Gnetum</i> ; their distribution in India. | 4 | |
| | 11. Economic importance of gymnosperms | 1 | |
| PALEOBOTANY | 1. Introduction, importance of Paleobotany. | 1 | 15 |
| | 2. Definition of fossil, process of fossilization, types of fossils on the basis of their preservation; concept of Form Genus. | 2 | |
| | 3. Introductory idea of correlation and stratigraphy; stratigraphic deductions based on plant fossils. | 2 | |
| | 4. Age of the earth, Geologic Time Scale, major events of plant life through geologic time. | 1 | |

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| Pattern | | | I+I+I |
| Examination | | | PART-II |
| Paper –V (Theory) | | | F.M.-50 |
| Major Topic | Sub Topics | Periods [Lec.Hrs] | Marks |
| TAXONOMY | 1. Definition of Taxonomy (alpha & omega), Taxonomic principles, concept of hierarchy and categories. | 3 | 35 |
| | 2. Definition of Numerical taxonomy; Operational Taxonomic Units (OTU); Phenon,; Phenogram. | 6 | |
| | 3. Outline of the system of classification – Linnaeus (1753), Bentham and Hooker (1862-83), Takhtajan (1997). | 5 | |
| | 4. ICBN and its divisions, Valid publication. Principle of priority. Nomenclatural types. | 1 | |
| | 5. Importance of herbaria and botanical gardens in taxonomic studies. | 3 | |
| | 6. Salient features of the following families with examples from common Indian species and economic importance. [Evolutionary trends need to be briefly discussed in case of families marked with astericks]. Dicotyledons: Magnoliaceae*, Malvaceae, Brassicaceae, Fabaceae (Leguminosae), Euphorbiaceae, Apiaceae (Umbelliferae), Apocynaceae, Asclepiadaceae, Solanaceae, Scrophulariaceae, Lamiaceae (Labiatae), Verbinaceae, Acanthaceae, Rubiaceae, Cucurbitaceae, Asteraceae(Compositae)*. Monocotyledons: Alismataceae*,Liliaceae, Poaceae, Musaceae, Orchidaceae*. | 30 | |
| PLANT GEOGRAPHY | 1. Phytogeographical classification of India (D. Chatterjee- 1962). | 1 | 15 |
| | 2. Vegetation characteristic of Eastern Himalayas and Sunderbans | 2 | |
| | 3. Endemism : Definition and types. | 1 | |

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| Examination | | | PART-III |
| Paper –VII (Theory) | | | F.M.-100 |
| Major Topic | Sub Topics | Periods [Lec.Hrs] | Marks |
| MICROBIOLOGY | 1. Bacterial structure and function. Capsule, flagella, pili, cell wall (chemical composition and characteristics), plasma membrane, ribosomes, cytoplasmic inclusions (PHB, Volutin). Plasmids and bacterial chromosome, endospore. | 13 | 30 |
| | 2. Principles and modern approaches of bacterial Taxonomy, brief outline of Procaryotic classification (Bergey's Manual of systematic Bacteriology, 2 nd edition, 2001), Concept of Bacteria and Archaea. | 2 | |
| | 3. Economic importance of microorganisms i) Agricultural Microbiology (Biofertilizer, biopesticides), ii) Industrial Microbiology (in fermentation and Pharmaceuticals), iii) Medical Microbiology (air borne – Influenza; Water borne – Cholera; Food borne – Boutulism; Brief idea about epidemiology, causal organism and control). | 4 | |
| | 4. Brief idea about genetic recombination in bacteria: Transformation, Conjugation and Transduction. | 2 | |
| | 5. Viruses: General concept, nature of viruses, structure of TMV, T ₂ and HIV; Viral multiplication – Lytic and Lysogenic cycles. | 3 | |
| | 6. Brief idea about Prion and Viroid. | 1 | |
| ECONOMIC BOTANY & PHARMACOGNOSY | 1. Method of cultivation, processing and utilities of the products of the following: Rice, Tea and Jute. | 3 | 25 |
| | 2. Morphological nature and major uses of the economically important parts of the following products: Cotton (fibre), Sal (wood), Sugarcane (sugar), Mustard (oil) and Coconut (oil). | 2 | |
| | 3. A brief idea about pharmacognosy; definition of drugs, folk medicine, active principles; Pharmacy, Pharmacognosy, Pharmacopeia and adulteration. | 3 | |
| | 4. Study of the following drug plants (Diagnostic features, active principles and uses): <i>Rauwolfia serpentina</i> (root), <i>Adhatoda vasica</i> (leaf), <i>Strychnos nuxvomica</i> (seed), <i>Cinchona succirubra</i> (bark) | 5 | |
| PALYNOLOGY AND REPRODUCTIVE BIOLOGY | 1. Microsporogenesis ; Spore/pollen morphology with reference to polarity, size, shape, symmetry, aperture and sculpture. | 3 | 15 |
| | 2. Organization of orthotropous ovule, types of ovules; megasprogenesis. | 2 | |
| | 3. Pollination: Types and contrivances. | 1 | |
| | 4. Development of male and female gametophytes (<i>Polygonum</i> type) | 1 | |
| | 5. Fertilization. | 1 | |
| | 6. Endosperm: Types, development of free nuclear type. | 1 | |
| | 7. Development of typical dicot embryo (Crucifer - type). | 1 | |
| ECOLOGY | 1. Ecology: Autecology and Synecology (definition only). | 1 | 30 |
| | 2. Environment: Climatic, edaphic and biotic factors. | 3 | |
| | 3. Ecosystem: Definition, concept of ecological pyramids and energy flow. | 1 | |
| | 4. Ecological succession (Hydrosere, Xerosere). | 2 | |
| | 5. Morphological, anatomical and physiological adaptations of xerophytes, hydrophytes, halophytes and epiphytes. | 3 | |
| | 6. Biodiversity (a brief idea) and its conservation (<i>in-situ</i> -, <i>ex-situ</i> conservation and cryopreservation). | 1 | |
| | 7. Pollution: Definition and types with special reference to air and water pollution. | 3 | |

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| Pattern | | | I+I+I |
| Examination | | | PART-III |
| Paper –VIII (Theory) | | | F.M.-75 |
| Major Topic | Sub Topics | Periods [Lec.Hrs] | Marks |
| CELL BIOLOGY & GENETICS | 1. Cell structure: Ultrastructure and functions of Plasma membrane, Mitochondrion, Chloroplast, Nuclear envelope with nuclear pore complex, Golgi apparatus, Endoplasmic reticulum and Ribosome. | 4 | 40 |
| | 2. Nucleic acid: DNA and RNA – Types, Physical and Chemical structures of B-DNA and t-RNA. | 2 | |
| | 3. Replication of DNA - Mechanism and evidence of semi-conservative replication in prokaryotes. | 2 | |
| | 4. Transcription of DNA: Mechanism in Prokaryotes; Nuclear mRNA processing in Eukaryotes (Capping, Polyadenylation or tailing and Splicing). | 2 | |
| | 5. Translation: Mechanism in Prokaryotes. | 2 | |
| | 6. Genetic code: Definition, salient features and deciphering the genetic code. | 2 | |
| | 7. Gene regulation in Prokaryotes: Lac operon (negative and positive control). | 2 | |
| | 8. Eukaryotic chromosome structure: Ultrastructure of chromatin and its organization into chromosome, Concept of euchromatin and heterochromatin. | 2 | |
| | 9. Cell cycle and its regulation (MPF only), phases and events of Mitosis and Meiosis with their significance. | 2 | |
| | 10. Brief idea: Transposable elements, Gene amplification (PCR), Transgenic plant (Bt cotton). | 2 | |
| | 11. Recombinant DNA Technology: Basic concepts; Tools - Restriction enzymes (types with examples); Lygase; Vectors (Plasmid and Bacteriophage). | 2 | |
| | 12. Plant tissue culture: General techniques, concept of Basal medium, Micropropagation, Application of Plant tissue culture. | 3 | |
| GENETICS & PLANT BREEDING | 1. Mendelism and Chromosomal basis of inheritance. | 3 | 35 |
| | 2. Modified Mendelian Ratios: Lethal gene, Epistasis and Complementary gene interaction. | 2 | |
| | 3. Basic concept of Linkage: General idea of Crossing over including molecular mechanism (Holiday Model). | 3 | |
| | 4. Structural changes of chromosome (Deletion, Duplication, Translocation and Inversion) with their meiotic behavior and genetic consequences. | 4 | |
| | 5. Numerical changes of chromosome (Euploidy and Aneuploidy) and their applications. | 2 | |
| | 6. Gene mutation- types, physical & chemical mutagens and their effects. | 2 | |
| | 7. Aims and methods of Plant breeding: Introduction, Acclimatization, Domestication, Selection and Hybridization. | 3 | |
| | 8. Heterosis: Objectives, genetic basis and applications. | 1 | |
| | 9. Biometry: Frequency distribution - mean, median, mode, class range, standard deviation and standard error. Probability: product law, Sum law, conditional probability, Chi-square test of goodness of fit; | 2 | |

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| Examination | | | PART-III |
| Paper –IX (Theory) | | | F.M.-75 |
| Major Topic | Sub Topics | Periods [Lec.Hrs] | Marks |
| PLANT PHYSIOLOGY | 1. Water relation: Role of water in plant life. Water potential and its components in plant cell, soil water absorption, cavitation in xylem and embolism, Transpiration types and mechanism of stomatal transpiration (the roles of CO ₂ , blue light, potassium ion and abscisic acid), Antitranspirants. | 5 | 50 |
| | 2. Mineral nutrition: Essential elements and their physiological roles in plant life. Mechanism of active ion uptake. | 2 | |
| | 3. Organic translocation: Phloem loading and unloading mechanism, long distance transport (Pressure flow hypothesis). | 2 | |
| | 4. Photosynthesis: Definition, photosynthetic pigments, basic concept about mechanism of light and dark reaction. C ₃ -, C ₄ - and CAM pathways of CO ₂ fixation. Photorespiration - definition, sites and mechanism. | 10 | |
| | 5. Respiration: Glycolysis, Krebs cycle, electron transport system, oxidative phosphorylation and chemiosmotic system. | 5 | |
| | 6. Nitrogen metabolism, nitrate reduction, (nitrate reductase, nitrite reductase), nitrogen fixing organisms (free living, symbiotic and associative symbiotic organisms). Mechanism of nitrogen fixation – asymbiotic, symbiotic with special reference to nitrogenase and leghaemoglobin; nitrogen cycle. | 3 | |
| | 7. Growth physiology: Concept of growth and development, factors affecting growth. Phytohormones - types and chemical nature of Auxins, Gibberellins, Cytokinins, Abscisic acid and Ethylene; physiological roles; bioassay of IAA and GA ₃ ; an idea about immunoassay and radio immunoassay (RIA) of phytohormones. | 5 | |
| | 8. Concept of photoperiodism and vernalization. Phytochrome - chemical nature, photobiological properties and role in flowering. | 1 | |
| | 9. Seed physiology: Concept of dormancy, quiescence and germination. Dormancy - types, causes, significance, breaking of dormancy. Germination – a basic concept. | 2 | |
| BIOCHEMISTRY | 1. Carbohydrates: Outline classification, reducing and non-reducing sugars. Structures of mono-, di- and polysaccharides, properties of monosaccharides. | 2 | 25 |
| | 2. Amino acids: Basic structure and outline classification with examples. | 2 | |
| | 3. Protein: Primary, secondary (α -helix & β -pleated sheet), tertiary and quaternary structures. | 2 | |
| | 4. Lipid: Structure of fatty acids, types, outline classification; β -oxidation pathway. | 2 | |
| | 5. Enzymes: Definition, co-factors and prosthetic group with examples. Nomenclature and classification of enzymes (IUB system, 1961). Preliminary idea about the mechanism of enzyme action and kinetics, factors affecting enzyme action, Ribozyme, allosteric enzyme, abzyme. | 3 | |

N.B.: Bold and highlighted topics are taught by Dr. Moumita Basu.

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| Pattern | | | I+I+I |
| Examination | | | PART-I |
| Paper –I (Theory) | | | F.M.-75 |
| Major Topic | Sub Topics | Periods [Lec.H rs] | Marks |
| ALGAE | 1. Introduction; habitat and range of thallus structure in algae; origin and evolution of sex in algae. | 4 | 30 |
| | 2. Evolution of thallus structure in algae. | 1 | |
| | 3. Endosymbiosis and evolution of chloroplast in algae. | 1 | |
| | 4. Principles of classification and outline classification of Lee (2009) up to divisions. | 1 | |
| | 5. Cyanophyceae: Salient features, a general account with emphasis on cell structure and reproduction. | 2 | |
| | 6. Chlorophyceae: Salient features; life history of <i>Chlamydomonas</i>, <i>Zygnema</i>, <i>Oedogonium</i> & <i>Trentepohlia</i>. | 5 | |
| | 7. Charophyceae: Salient features; life history of <i>Chara</i>. | 2 | |
| | 8. Xanthophyceae: Salient features; life history of <i>Vaucheria</i>. | 1 | |
| | 9. Bacillariophyceae: Salient features; a general account with emphasis on cell structure and reproduction. | 3 | |
| | 10. Phaeophyceae: Salient features; life history of <i>Fucus</i>. | 2 | |
| | 11. Rhodophyceae: Salient features; life history of <i>Polysiphonia</i> | 2 | |
| | 12. Economic importance of algae. | 1 | |
| FUNGI | 1. Introduction, Salient features; Classification [Ainsworth Sparrow Sussman (1973)] and Gwynne-Vaughan & Barnes up to class). | 3 | 25 |
| | 2. Economic importance of fungi. | 1 | |
| | 3. Phycomycetes: Salient features, life histories of <i>Synchytrium</i> and <i>Rhizopus</i> . | 2 | |
| | 4. Ascomycetes: Salient features, development of <i>Ascus</i> and <i>Ascospores</i> , types of ascocarps; life histories of <i>Ascobolus</i> and <i>Claviceps</i> . | 3 | |
| | 5. Basidiomycetes: Salient features; development of Basidium and Basidiospore, life histories of <i>Agaricus</i> , <i>Polyporus</i> and <i>Lycoperdon</i> | 4 | |
| | 6. Deuteromycetes: Salient features; fruiting structures and parasexuality. | 1 | |
| | 7. Lichen: Habitat and thallus structures; economic importance. | 2 | |
| PLANT PATHOLOGY | 1. Plant Diseases: Definition; concepts of parasitism and saprophytism, Koch's postulate. | 1 | 20 |
| | 2. Classification of plant diseases based on symptoms. | 1 | |
| | 3. Pathotoxins (HV toxin and Wild-fire toxin) in disease development. | 1 | |
| | 4. Brief ideas on structural and biochemical defense mechanism of plants. | 1 | |
| | 5. Control of Plant diseases: Physical, cultural, chemical and biological. | 1 | |
| | 6. Symptoms, disease cycles and control measures of White rust of crucifer, Loose smut of wheat, Citrus canker, Late blight of potato, Rust of wheat & Brown spot of Rice. | 5 | |

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| Pattern | | | I+I+I |
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| Paper –II (Theory) | | | F.M.-50 |
| Major Topic | Sub Topics | Periods [Lec.Hrs] | Marks |
| BRYOPHYTA | 1. Introduction, general characters, Classification (Smith, 1955), Economic importance. | 2 | 15 |
| | 2. Life histories of <i>Riccia</i> , <i>Marchantia</i> , <i>Pellia</i> , <i>Porella</i> , <i>Anthoceros</i> , <i>Sphagnum</i> & <i>Funaria</i> . | 9 | |
| | 3. Evolutionary trends among the above mentioned genera. | 1 | |
| MORPHOLOGY | 1. Leaves: Types, phyllotaxy, modifications of leaves. | 7 | 18 |
| | 2. Inflorescence: Types and evolution | 4 | |
| | 3. The flower as a modified shoot; aestivation; placentation and its evolution; floral formulae, floral diagram; adhesion and cohesion of floral parts. | 3 | |
| | 4. Fruits: Definition and types | 3 | |
| | 5. Dispersal of fruits and seeds | 2 | |
| PLANT ANATOMY | 1. Cell wall: Structure, growth and thickenings. | 2 | 17 |
| | 2. Tissue: Definition, organization of shoot and root apices, mechanical tissue and their distribution in plant bodies. | 3 | |
| | 3. Stele: Definition, evolution; types of vascular bundles. | 2 | |
| | 4. Root-stem transition. | 1 | |
| | 5. Secondary growth: normal and anomalous types; secondary growth in dicot root and shoot. | 4 | |
| | 6. Anomalous secondary growth in stems of <i>Bignonia</i> , <i>Boerhaavia</i> , <i>Dracaena</i> (<i>Cordyline</i>). | 2 | |

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| Major Topic | Sub Topics | Periods [Lec.Hrs] | Marks |
| PTERIDOPHYTA | 1. Introduction to Pteridophyta. . | 1 | 30 |
| | 2. Outline of Pichi Sermolii's system (1977) of classification of pteridophytes up to orders mentioning class characters. | 1 | |
| | 3. Telome theory of Zimmerman and Enation theory of Bower. | 1 | |
| | 4. Vegetative and reproductive organography of the following genera: i) <i>Rhynia</i> , ii) <i>Zosterophyllum</i> , iii) <i>Psilophyton</i> , iv) <i>Lycopodium</i> , v) <i>Selaginella</i> , vi) <i>Isoetes</i> vii) <i>Lepidodendron</i> , viii) <i>Calamites</i> , ix) <i>Equisetum</i> , x) <i>Pteris</i> , xi) <i>Marsilea</i> . | 15 | |
| | 5. Apogamy and apospory in pteridophytes | 1 | |
| | 6. Economic importance of pteridophytes. | 1 | |
| GYMNOSPERM | 1. General features, concepts of ovule and seed; outline classification as adopted by Stewart & Rothwell (1993). | 3 | 30 |
| | 2. Progymnospermopsida: General features. | 2 | |
| | 3. Pteridospermales: General account of <i>Lyginopteris</i> plant (<i>Sphenopteris</i> leaf, <i>Lyginopteris</i> stem, <i>Crossotheca</i> male organ and <i>Lagenostoma</i> female organ). | 2 | |
| | 4. Glossopteridales: General account of <i>Glossopteris</i> plant (<i>Vertebraria</i> root, <i>Araucarioxylon</i> trunk, <i>Glossopteris</i> leaf, <i>Glossotheca</i> male organ, <i>Dictyopteridium</i> female organ). | 1 | |
| | 5. Cycadales: Structure and life history of <i>Cycas</i> and its distribution in India. | 3 | |
| | 6. Bennettitales: General account of <i>Williamsonia</i> plant (<i>Bucklandia</i> stem, <i>Ptilophyllum</i> leaf, <i>Weltrichia</i> male organ, <i>Williamsonia</i> female organ). | 1 | |
| | 7. Pentoxylales: General account of <i>Pentoxylon</i> plant (<i>Pentoxylon</i> stem, <i>Nipaniophyllum</i> leaf, <i>Sahania</i> male organ, <i>Carnoconites</i> female organ). | 1 | |
| | 8. Ginkgoales: Structure and life history of <i>Ginkgo</i> ; brief mention of the morphology of collar. | 2 | |
| | 9. Coniferales: Structure and life history of <i>Pinus</i> ; brief mention of the morphology of ovuliferous scale. | 4 | |
| | 10. Gnetales: Structure and life histories of <i>Ephedra</i> and <i>Gnetum</i> ; their distribution in India. | 4 | |
| | 11. Economic importance of gymnosperms | 1 | |
| PALEOBOTANY | 1. Introduction, importance of Paleobotany. | 1 | 15 |
| | 2. Definition of fossil, process of fossilization, types of fossils on the basis of their preservation; concept of Form Genus. | 2 | |
| | 3. Introductory idea of correlation and stratigraphy; stratigraphic deductions based on plant fossils. | 2 | |
| | 4. Age of the earth, Geologic Time Scale, major events of plant life through geologic time. | 1 | |

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| 2016-2017 | | | |
| Pattern | | | I+I+I |
| Examination | | | PART-II |
| Paper –V (Theory) | | | F.M.-50 |
| Major Topic | Sub Topics | Periods [Lec.Hrs] | Marks |
| TAXONOMY | 1. Definition of Taxonomy (alpha & omega), Taxonomic principles, concept of hierarchy and categories. | 3 | 35 |
| | 2. Definition of Numerical taxonomy; Operational Taxonomic Units (OTU); Phenon,; Phenogram. | 6 | |
| | 3. Outline of the system of classification – Linnaeus (1753), Bentham and Hooker (1862-83), Takhtajan (1997). | 5 | |
| | 4. ICBN and its divisions, Valid publication. Principle of priority. Nomenclatural types. | 1 | |
| | 5. Importance of herbaria and botanical gardens in taxonomic studies. | 3 | |
| | 6. Salient features of the following families with examples from common Indian species and economic importance. [Evolutionary trends need to be briefly discussed in case of families marked with astericks]. Dicotyledons: Magnoliaceae*, Malvaceae, Brassicaceae, Fabaceae (Leguminosae), Euphorbiaceae, Apiaceae (Umbelliferae), Apocynaceae, Asclepiadaceae, Solanaceae, Scrophulariaceae, Lamiaceae (Labiatae), Verbinaceae, Acanthaceae, Rubiaceae, Cucurbitaceae, Asteraceae(Compositae)*. Monocotyledons: Alismataceae*,Liliaceae, Poaceae, Musaceae, Orchidaceae*. | 30 | |
| PLANT GEOGRAPHY | 1. Phytogeographical classification of India (D. Chatterjee- 1962). | 1 | 15 |
| | 2. Vegetation characteristic of Eastern Himalayas and Sunderbans | 2 | |
| | 3. Endemism : Definition and types. | 1 | |

| Session 2016-2017 | | | |
|--|---|----------------------|----------|
| Pattern | | | I+I+I |
| Examination | | | PART-III |
| Paper –VII (Theory) | | | F.M.-100 |
| Major Topic | Sub Topics | Periods [Lec.Hrs] | Marks |
| MICROBIOLOGY | 1. Bacterial structure and function. Capsule, flagella, pili, cell wall (chemical composition and characteristics), plasma membrane, ribosomes, cytoplasmic inclusions (PHB, Volutin). Plasmids and bacterial chromosome, endospore. | 13 | 30 |
| | 2. Principles and modern approaches of bacterial Taxonomy, brief outline of Procaryotic classification (Bergey's Manual of systematic Bacteriology, 2 nd edition, 2001), Concept of Bacteria and Archaea. | 2 | |
| | 3. Economic importance of microorganisms i) Agricultural Microbiology (Biofertilizer, biopesticides), ii) Industrial Microbiology (in fermentation and Pharmaceuticals), iii) Medical Microbiology (air borne – Influenza; Water borne – Cholera; Food borne – Boutulism; Brief idea about epidemiology, causal organism and control). | 4 | |
| | 4. Brief idea about genetic recombination in bacteria: Transformation, Conjugation and Transduction. | 2 | |
| | 5. Viruses: General concept, nature of viruses, structure of TMV, T ₂ and HIV; Viral multiplication – Lytic and Lysogenic cycles. | 3 | |
| | 6. Brief idea about Prion and Viroid. | 1 | |
| ECONOMIC BOTANY & PHARMACOGNOSY | 1. Method of cultivation, processing and utilities of the products of the following: Rice, Tea and Jute. | 3 | 25 |
| | 2. Morphological nature and major uses of the economically important parts of the following products: Cotton (fibre), Sal (wood), Sugarcane (sugar), Mustard (oil) and Coconut (oil). | 2 | |
| | 3. A brief idea about pharmacognosy; definition of drugs, folk medicine, active principles; Pharmacy, Pharmacognosy, Pharmacopeia and adulteration. | 3 | |
| | 4. Study of the following drug plants (Diagnostic features, active principles and uses): <i>Rauwolfia serpentina</i> (root), <i>Adhatoda vasica</i> (leaf), <i>Strychnos nuxvomica</i> (seed), <i>Cinchona succirubra</i> (bark) | 5 | |
| PALYNOLOGY AND REPRODUCTIVE BIOLOGY | 1. Microsporogenesis ; Spore/pollen morphology with reference to polarity, size, shape, symmetry, aperture and sculpture. | 3 | 15 |
| | 2. Organization of orthotropous ovule, types of ovules; megasprogenesis. | 2 | |
| | 3. Pollination: Types and contrivances. | 1 | |
| | 4. Development of male and female gametophytes (<i>Polygonum</i> type) | 1 | |
| | 5. Fertilization. | 1 | |
| | 6. Endosperm: Types, development of free nuclear type. | 1 | |
| | 7. Development of typical dicot embryo (Crucifer - type). | 1 | |
| ECOLOGY | 1. Ecology: Autecology and Synecology (definition only). | 1 | 30 |
| | 2. Environment: Climatic, edaphic and biotic factors. | 3 | |
| | 3. Ecosystem: Definition, concept of ecological pyramids and energy flow. | 1 | |
| | 4. Ecological succession (Hydrosere, Xerosere). | 2 | |
| | 5. Morphological, anatomical and physiological adaptations of xerophytes, hydrophytes, halophytes and epiphytes. | 3 | |
| | 6. Biodiversity (a brief idea) and its conservation (<i>in-situ</i> -, <i>ex-situ</i> conservation and cryopreservation). | 1 | |
| | 7. Pollution: Definition and types with special reference to air and water pollution. | 3 | |

| Session 2016-2017 | | | |
|---------------------------|--|----------------------|----------|
| Pattern | | | I+I+I |
| Examination | | | PART-III |
| Paper –VIII (Theory) | | | F.M.-75 |
| Major Topic | Sub Topics | Periods [Lec.Hrs] | Marks |
| CELL BIOLOGY & GENETICS | 1. Cell structure: Ultrastructure and functions of Plasma membrane, Mitochondrion, Chloroplast, Nuclear envelope with nuclear pore complex, Golgi apparatus, Endoplasmic reticulum and Ribosome. | 4 | 40 |
| | 2. Nucleic acid: DNA and RNA – Types, Physical and Chemical structures of B-DNA and t-RNA. | 2 | |
| | 3. Replication of DNA - Mechanism and evidence of semi-conservative replication in prokaryotes. | 2 | |
| | 4. Transcription of DNA: Mechanism in Prokaryotes; Nuclear mRNA processing in Eukaryotes (Capping, Polyadenylation or tailing and Splicing). | 2 | |
| | 5. Translation: Mechanism in Prokaryotes. | 2 | |
| | 6. Genetic code: Definition, salient features and deciphering the genetic code. | 2 | |
| | 7. Gene regulation in Prokaryotes: Lac operon (negative and positive control). | 2 | |
| | 8. Eukaryotic chromosome structure: Ultrastructure of chromatin and its organization into chromosome, Concept of euchromatin and heterochromatin. | 2 | |
| | 9. Cell cycle and its regulation (MPF only), phases and events of Mitosis and Meiosis with their significance. | 2 | |
| | 10. Brief idea: Transposable elements, Gene amplification (PCR), Transgenic plant (Bt cotton). | 2 | |
| | 11. Recombinant DNA Technology: Basic concepts; Tools - Restriction enzymes (types with examples); Lygase; Vectors (Plasmid and Bacteriophage). | 2 | |
| | 12. Plant tissue culture: General techniques, concept of Basal medium, Micropropagation, Application of Plant tissue culture. | 3 | |
| GENETICS & PLANT BREEDING | 1. Mendelism and Chromosomal basis of inheritance. | 3 | 35 |
| | 2. Modified Mendelian Ratios: Lethal gene, Epistasis and Complementary gene interaction. | 2 | |
| | 3. Basic concept of Linkage: General idea of Crossing over including molecular mechanism (Holiday Model). | 3 | |
| | 4. Structural changes of chromosome (Deletion, Duplication, Translocation and Inversion) with their meiotic behavior and genetic consequences. | 4 | |
| | 5. Numerical changes of chromosome (Euploidy and Aneuploidy) and their applications. | 2 | |
| | 6. Gene mutation- types, physical & chemical mutagens and their effects. | 2 | |
| | 7. Aims and methods of Plant breeding: Introduction, Acclimatization, Domestication, Selection and Hybridization. | 3 | |
| | 8. Heterosis: Objectives, genetic basis and applications. | 1 | |
| | 9. Biometry: Frequency distribution - mean, median, mode, class range, standard deviation and standard error. Probability: product law, Sum law, conditional probability, Chi-square test of goodness of fit; | 2 | |

| Session 2016-2017 | | | |
|----------------------|--|----------------------|----------|
| Pattern | | | I+I+I |
| Examination | | | PART-III |
| Paper –IX (Theory) | | | F.M.-75 |
| Major Topic | Sub Topics | Periods [Lec.Hrs] | Marks |
| PLANT PHYSIOLOGY | 1. Water relation: Role of water in plant life. Water potential and its components in plant cell, soil water absorption, cavitation in xylem and embolism, Transpiration types and mechanism of stomatal transpiration (the roles of CO ₂ , blue light, potassium ion and abscisic acid), Antitranspirants. | 5 | 50 |
| | 2. Mineral nutrition: Essential elements and their physiological roles in plant life. Mechanism of active ion uptake. | 2 | |
| | 3. Organic translocation: Phloem loading and unloading mechanism, long distance transport (Pressure flow hypothesis). | 2 | |
| | 4. Photosynthesis: Definition, photosynthetic pigments, basic concept about mechanism of light and dark reaction. C ₃ -, C ₄ - and CAM pathways of CO ₂ fixation. Photorespiration - definition, sites and mechanism. | 10 | |
| | 5. Respiration: Glycolysis, Krebs cycle, electron transport system, oxidative phosphorylation and chemiosmotic system. | 5 | |
| | 6. Nitrogen metabolism, nitrate reduction, (nitrate reductase, nitrite reductase), nitrogen fixing organisms (free living, symbiotic and associative symbiotic organisms). Mechanism of nitrogen fixation – asymbiotic, symbiotic with special reference to nitrogenase and leghaemoglobin; nitrogen cycle. | 3 | |
| | 7. Growth physiology: Concept of growth and development, factors affecting growth. Phytohormones - types and chemical nature of Auxins, Gibberellins, Cytokinins, Abscisic acid and Ethylene; physiological roles; bioassay of IAA and GA ₃ ; an idea about immunoassay and radio immunoassay (RIA) of phytohormones. | 5 | |
| | 8. Concept of photoperiodism and vernalization. Phytochrome - chemical nature, photobiological properties and role in flowering. | 1 | |
| | 9. Seed physiology: Concept of dormancy, quiescence and germination. Dormancy - types, causes, significance, breaking of dormancy. Germination – a basic concept. | 2 | |
| BIOCHEMISTRY | 1. Carbohydrates: Outline classification, reducing and non-reducing sugars. Structures of mono-, di- and polysaccharides, properties of monosaccharides. | 2 | 25 |
| | 2. Amino acids: Basic structure and outline classification with examples. | 2 | |
| | 3. Protein: Primary, secondary (α - helix & β -pleated sheet), tertiary and quaternary structures. | 2 | |
| | 4. Lipid: Structure of fatty acids, types, outline classification; β -oxidation pathway. | 2 | |
| | 5. Enzymes: Definition, co-factors and prosthetic group with examples. Nomenclature and classification of enzymes (IUB system, 1961). Preliminary idea about the mechanism of enzyme action and kinetics, factors affecting enzyme action, Ribozyme, allosteric enzyme, | 3 | |

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N.B.: Bold and highlighted topics were taught by Dr Sanjukta Maiti.

Course Module (Year-wise) NEW REGULATION B.SC BOTANY HONS

| Session 2016-2017 | | | |
|----------------------------|--|--------------------------|---------|
| Pattern | | | I+I+I |
| Examination | | | PART-I |
| Paper –I (Theory) | | | F.M.-75 |
| Major Topic | Sub Topics | Periods [Lec.H rs] | Marks |
| ALGAE | 1. Introduction; habitat and range of thallus structure in algae; origin and evolution of sex in algae. | 4 | 30 |
| | 2. Evolution of thallus structure in algae. | 1 | |
| | 3. Endosymbiosis and evolution of chloroplast in algae. | 1 | |
| | 4. Principles of classification and outline classification of Lee (2009) up to divisions. | 1 | |
| | 5. Cyanophyceae: Salient features, a general account with emphasis on cell structure and reproduction. | 2 | |
| | 6. Chlorophyceae: Salient features; life history of <i>Chlamydomonas</i> , <i>Zygnema</i> , <i>Oedogonium</i> & <i>Trentepohlia</i> . | 5 | |
| | 7. Charophyceae: Salient features; life history of <i>Chara</i> . | 2 | |
| | 8. Xanthophyceae: Salient features; life history of <i>Vaucheria</i> . | 1 | |
| | 9. Bacillariophyceae: Salient features; a general account with emphasis on cell structure and reproduction. | 3 | |
| | 10. Phaeophyceae: Salient features; life history of <i>Fucus</i> . | 2 | |
| | 11. Rhodophyceae: Salient features; life history of <i>Polysiphonia</i> | 2 | |
| | 12. Economic importance of algae. | 1 | |
| FUNGI | 1. Introduction, Salient features; Classification [Ainsworth Sparrow Sussman (1973)] and Gwynne-Vaughan & Barnes up to class). | 3 | 25 |
| | 2. Economic importance of fungi. | 1 | |
| | 3. Phycomycetes: Salient features, life histories of <i>Synchytrium</i> and <i>Rhizopus</i>. | 2 | |
| | 4. Ascomycetes: Salient features, development of <i>Ascus</i> and <i>Ascospores</i>, types of ascocarps; life histories of <i>Ascobolus</i> and <i>Claviceps</i>. | 3 | |
| | 5. Basidiomycetes: Salient features; development of Basidium and Basidiospore, life histories of <i>Agaricus</i>, <i>Polyporus</i> and <i>Lycoperdon</i> | 4 | |
| | 6. Deuteromycetes: Salient features; fruiting structures and parasexuality. | 1 | |
| | 7. Lichen: Habitat and thallus structures; economic importance. | 2 | |
| PLANT PATHOLOGY | 1. Plant Diseases: Definition; concepts of parasitism and saprophytism, Koch's postulate. | 1 | 20 |
| | 2. Classification of plant diseases based on symptoms. | 1 | |
| | 3. Pathotoxins (HV toxin and Wild-fire toxin) in disease development. | 1 | |
| | 4. Brief ideas on structural and biochemical defense mechanism of plants. | 1 | |
| | 5. Control of Plant diseases: Physical, cultural, chemical and biological. | 1 | |
| | 6. Symptoms, disease cycles and control measures of White rust of crucifer, Loose smut of wheat, Citrus canker, Late blight of potato, Rust of wheat & Brown spot of Rice. | 5 | |

| Session 2016-2017 | | | |
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| Pattern | | | I+I+I |
| Examination | | | PART-I |
| Paper –II (Theory) | | | F.M.-50 |
| Major Topic | Sub Topics | Periods [Lec.Hrs] | Marks |
| BRYOPHYTA | 1. Introduction, general characters, Classification (Smith, 1955), Economic importance. | 2 | 15 |
| | 2. Life histories of <i>Riccia</i> , <i>Marchantia</i> , <i>Pellia</i> , <i>Porella</i> , <i>Anthoceros</i> , <i>Sphagnum</i> & <i>Funaria</i> . | 9 | |
| | 3. Evolutionary trends among the above mentioned genera. | 1 | |
| MORPHOLOGY | 1. Leaves: Types, phyllotaxy, modifications of leaves. | 7 | 18 |
| | 2. Inflorescence: Types and evolution | 4 | |
| | 3. The flower as a modified shoot; aestivation; placentation and its evolution; floral formulae, floral diagram; adhesion and cohesion of floral parts. | 3 | |
| | 4. Fruits: Definition and types | 3 | |
| | 5. Dispersal of fruits and seeds | 2 | |

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| PLANT ANATOMY | 1. Cell wall: Structure, growth and thickenings. | 2 | 17 |
| | 2. Tissue: Definition, organization of shoot and root apices, mechanical tissue and their distribution in plant bodies. | 3 | |
| | 3. Stele: Definition, evolution; types of vascular bundles. | 2 | |
| | 4. Root-stem transition. | 1 | |
| | 5. Secondary growth: normal and anomalous types; secondary growth in dicot root and shoot. | 4 | |
| | 6. Anomalous secondary growth in stems of <i>Bignonia</i> , <i>Boerhaavia</i> , <i>Dracaena</i> (<i>Cordyline</i>). | 2 | |

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| Session | | | |
| 2016-2017 | | | |
| Pattern | | | I+I+I |
| Examination | | | PART-II |
| Paper –IV (Theory) | | | F.M.-75 |
| Major Topic | Sub Topics | Periods [Lec.H rs] | Marks |
| PTERIDOPHYTA | 1. Introduction to Pteridophyta. . | 1 | 30 |
| | 2. Outline of Pichi Sermolii's system (1977) of classification of pteridophytes up to orders mentioning class characters. | 1 | |
| | 3. Telome theory of Zimmerman and Enation theory of Bower. | 1 | |
| | 4. Vegetative and reproductive organography of the following genera: i) Rhynia, ii) Zosterophyllum, iii) Psilophyton, iv) Lycopodium, v) Selaginella, vi) Isoetes vii) Lepidodendron, viii) Calamites, ix) Equisetum, x) Pteris, xi) Marsilea. | 15 | |
| | 5. Apogamy and apospory in pteridophytes | 1 | |
| | 6. Economic importance of pteridophytes. | 1 | |

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| GYMNOSPERM | 1. General features, concepts of ovule and seed; outline classification as adopted by Stewart & Rothwell (1993). | 3 | 30 |
| | 2. Progymnosperms: General features. | 2 | |
| | 3. Pteridospermales: General account of <i>Lyginopteris</i> plant (<i>Sphenopteris</i> leaf, <i>Lyginopteris</i> stem, <i>Crossotheca</i> male organ and <i>Lagenostoma</i> female organ). | 2 | |
| | 4. Glossopteridales: General account of <i>Glossopteris</i> plant (<i>Vertebraria</i> root, <i>Araucarioxylon</i> trunk, <i>Glossopteris</i> leaf, <i>Glossotheca</i> male organ, <i>Dictyopteridium</i> female organ). | 1 | |
| | 5. Cycadales: Structure and life history of <i>Cycas</i> and its distribution in India. | 3 | |
| | 6. Bennettitales: General account of <i>Williamsonia</i> plant (<i>Bucklandia</i> stem, <i>Ptilophyllum</i> leaf, <i>Weltrichia</i> male organ, <i>Williamsonia</i> female organ). | 1 | |
| | 7. Pentoxylales: General account of <i>Pentoxylon</i> plant (<i>Pentoxylon</i> stem, <i>Nipaniophyllum</i> leaf, <i>Sahania</i> male organ, <i>Carnoconites</i> female organ). | 1 | |
| | 8. Ginkgoales: Structure and life history of <i>Ginkgo</i> ; brief mention of the morphology of collar. | 2 | |
| | 9. Coniferales: Structure and life history of <i>Pinus</i> ; brief mention of the morphology of ovuliferous scale. | 4 | |
| | 10. Gnetales: Structure and life histories of <i>Ephedra</i> and <i>Gnetum</i> ; their distribution in India. | 4 | |
| | 11. Economic importance of gymnosperms | 1 | |
| PALEOBOTANY | 1. Introduction, importance of Paleobotany. | 1 | 15 |
| | 2. Definition of fossil, process of fossilization, types of fossils on the basis of their preservation; concept of Form Genus. | 2 | |
| | 3. Introductory idea of correlation and stratigraphy; stratigraphic deductions based on plant fossils. | 2 | |
| | 4. Age of the earth, Geologic Time Scale, major events of plant life through geologic time. | 1 | |

Session

2016-2017

| Pattern | | I+I+I | |
|----------------------------|---|------------------------------|--------------|
| Examination | | PART-II | |
| Paper –V (Theory) | | F.M.-50 | |
| Major Topic | Sub Topics | Periods [Lec.Hrs] | Marks |
| TAXONOMY | 1. Definition of Taxonomy (alpha & omega), Taxonomic principles, concept of hierarchy and categories. | 3 | 35 |
| | 2. Definition of Numerical taxonomy; Operational Taxonomic Units (OTU); Phenon,; Phenogram. | 6 | |
| | 3. Outline of the system of classification – Linnaeus (1753), Bentham and Hooker (1862-83), Takhtajan (1997). | 5 | |
| | 4. ICBN and its divisions, Valid publication. Principle of priority. Nomenclatural types. | 1 | |
| | 5. Importance of herbaria and botanical gardens in taxonomic studies. | 3 | |
| | 6. Salient features of the following families with examples from common Indian species and economic importance. [Evolutionary trends need to be briefly discussed in case of families marked with astericks]. Dicotyledons: Magnoliaceae*, Malvaceae, Brassicaceae, Fabaceae (Leguminosae), Euphorbiaceae, Apiaceae (Umbelliferae), Apocynaceae, Asclepiadaceae, Solanaceae, Scrophulariaceae, Lamiaceae (Labiatae), Verbinaceae, Acanthaceae, Rubiaceae, Cucurbitaceae, Asteraceae(Compositae)*. Monocotyledons: Alismataceae*,Liliaceae, Poaceae, Musaceae, Orchidaceae*. | 30 | |
| PLANT GEOGRAPHY | 1. Phytogeographical classification of India (D. Chatterjee- 1962). | 1 | 15 |
| | 2. Vegetation characteristic of Eastern Himalayas and Sunderbans | 2 | |
| | 3. Endemism : Definition and types. | 1 | |

| Session 2016-2017 | | | |
|--|--|----------------------|----------|
| Pattern | | | I+I+I |
| Examination | | | PART-III |
| Paper –VII (Theory) | | | F.M.-100 |
| Major Topic | Sub Topics | Periods [Lec.Hrs] | Marks |
| MICROBIOLOGY | 1. Bacterial structure and function. Capsule, flagella, pili, cell wall (chemical composition and characteristics), plasma membrane, ribosomes, cytoplasmic inclusions (PHB, Volutin). Plasmids and bacterial chromosome, endospore. | 13 | 30 |
| | 2. Principles and modern approaches of bacterial Taxonomy, brief outline of Prokaryotic classification (Bergey's Manual of systematic Bacteriology, 2 nd edition, 2001), Concept of Bacteria and Archaea. | 2 | |
| | 3. Economic importance of microorganisms i) Agricultural Microbiology (Biofertilizer, biopesticides), ii) Industrial Microbiology (in fermentation and Pharmaceuticals), iii) Medical Microbiology (air borne – Influenza; Water borne – Cholera; Food borne – Botulism; Brief idea about epidemiology, causal organism and control). | 4 | |
| | 4. Brief idea about genetic recombination in bacteria: Transformation, Conjugation and Transduction. | 2 | |
| | 5. Viruses: General concept, nature of viruses, structure of TMV, T₂ and HIV; Viral multiplication – Lytic and Lysogenic cycles. | 3 | |
| | 6. Brief idea about Prion and Viroid. | 1 | |
| ECONOMIC BOTANY & PHARMACOGNOSY | 1. Method of cultivation, processing and utilities of the products of the following: Rice, Tea and Jute. | 3 | 25 |
| | 2. Morphological nature and major uses of the economically important parts of the following products: Cotton (fibre), Sal (wood), Sugarcane (sugar), Mustard (oil) and Coconut (oil). | 2 | |
| | 3. A brief idea about pharmacognosy; definition of drugs, folk medicine, active principles; Pharmacy, Pharmacognosy, Pharmacopeia and adulteration. | 3 | |
| | 4. Study of the following drug plants (Diagnostic features, active principles and uses): <i>Rauwolfia serpentina</i> (root), <i>Adhatoda vasica</i> (leaf), <i>Strychnos nuxvomica</i> (seed), <i>Cinchona succirubra</i> (bark) | 5 | |
| PALYNOLOGY AND REPRODUCTIVE BIOLOGY | 1. Microsporogenesis ; Spore/pollen morphology with reference to polarity, size, shape, symmetry, aperture and sculpture. | 3 | 15 |
| | 2. Organization of orthotropous ovule, types of ovules; megasporogenesis. | 2 | |
| | 3. Pollination: Types and contrivances. | 1 | |
| | 4. Development of male and female gametophytes (<i>Polygonum</i> type) | 1 | |
| | 5. Fertilization. | 1 | |
| | 6. Endosperm: Types, development of free nuclear type. | 1 | |
| | 7. Development of typical dicot embryo (Crucifer - type). | 1 | |
| ECOLOGY | 1. Ecology: Autecology and Synecology (definition only). | 1 | 30 |
| | 2. Environment: Climatic, edaphic and biotic factors. | 3 | |
| | 3. Ecosystem: Definition, concept of ecological pyramids and energy flow. | 1 | |
| | 4. Ecological succession (Hydrosere, Xerosere). | 2 | |
| | 5. Morphological, anatomical and physiological adaptations of xerophytes, hydrophytes, halophytes and epiphytes. | 3 | |
| | 6. Biodiversity (a brief idea) and its conservation (<i>in-situ</i> -, <i>ex-situ</i> conservation and cryopreservation). | 1 | |
| | 7. Pollution: Definition and types with special reference to air and water pollution. | 3 | |

| Session 2016-2017 | | | | |
|----------------------------------|---|--|----------------------|-------|
| Pattern | | | I+I+I | |
| Examination | | | PART-III | |
| Paper –VIII (Theory) | | | F.M.-75 | |
| Major Topic | Sub Topics | | Periods [Lec.Hrs] | Marks |
| CELL BIOLOGY & Molecular Biology | 1. Cell structure: Ultrastructure and functions of Plasma membrane, Mitochondrion, Chloroplast, Nuclear envelope with nuclear pore complex, Golgi apparatus, Endoplasmic reticulum and Ribosome. | | 4 | 40 |
| | 2. Nucleic acid: DNA and RNA – Types, Physical and Chemical structures of B-DNA and t-RNA. | | 2 | |
| | 3. Replication of DNA - Mechanism and evidence of semi-conservative replication in prokaryotes. | | 2 | |
| | 4. Transcription of DNA: Mechanism in Prokaryotes; Nuclear mRNA processing in Eukaryotes (Capping, Polyadenylation or tailing and Splicing). | | 2 | |
| | 5. Translation: Mechanism in Prokaryotes. | | 2 | |
| | 6. Genetic code: Definition, salient features and deciphering the genetic code. | | 2 | |
| | 7. Gene regulation in Prokaryotes: Lac operon (negative and positive control). | | 2 | |
| | 8. Eukaryotic chromosome structure: Ultrastructure of chromatin and its organization into chromosome, Concept of euchromatin and heterochromatin. | | 2 | |
| | 9. Cell cycle and its regulation (MPF only), phases and events of Mitosis and Meiosis with their significance. | | 2 | |
| | 10. Brief idea: Transposable elements, Gene amplification (PCR), Transgenic plant (Bt cotton). | | 2 | |
| | 11. Recombinant DNA Technology: Basic concepts; Tools - Restriction enzymes (types with examples); Lygase; Vectors (Plasmid and Bacteriophage). | | 2 | |
| | 12. Plant tissue culture: General techniques, concept of Basal medium, Micropropagation, Application of Plant tissue culture. | | 3 | |
| GENETICS & PLANT BREEDING | 1. Mendelism and Chromosomal basis of inheritance. | | 3 | 35 |
| | 2. Modified Mendelian Ratios: Lethal gene, Epistasis and Complementary gene interaction. | | 2 | |
| | 3. Basic concept of Linkage: General idea of Crossing over including molecular mechanism (Holiday Model). | | 3 | |
| | 4. Structural changes of chromosome (Deletion, Duplication, Translocation and Inversion) with their meiotic behavior and genetic consequences. | | 4 | |
| | 5. Numerical changes of chromosome (Euploidy and Aneuploidy) and their applications. | | 2 | |
| | 6. Gene mutation- types, physical & chemical mutagens and their effects. | | 2 | |
| | 7. Aims and methods of Plant breeding: Introduction, Acclimatization, Domestication, Selection and Hybridization. | | 3 | |
| | 8. Heterosis: Objectives, genetic basis and applications. | | 1 | |
| | 9. Biometry: Frequency distribution - mean, median, mode, class range, standard deviation and standard error. Probability: product law, Sum law, conditional probability, Chi-square test of goodness of fit; | | 2 | |

| Session 2011-2012 | |
|----------------------|-------|
| Pattern | I+I+I |

| Examination | | PART-III | |
|--------------------|--|-------------------|-------|
| Paper –IX (Theory) | | F.M.-75 | |
| Major Topic | Sub Topics | Periods [Lec.Hrs] | Marks |
| PLANT PHYSIOLOGY | 1. Water relation: Role of water in plant life. Water potential and its components in plant cell, soil water absorption, cavitation in xylem and embolism, Transpiration types and mechanism of stomatal transpiration (the roles of CO ₂ , blue light, potassium ion and abscisic acid), Antitranspirants. | 5 | 50 |
| | 2. Mineral nutrition: Essential elements and their physiological roles in plant life. Mechanism of active ion uptake. | 2 | |
| | 3. Organic translocation: Phloem loading and unloading mechanism, long distance transport (Pressure flow hypothesis). | 2 | |
| | 4. Photosynthesis: Definition, photosynthetic pigments, basic concept about mechanism of light and dark reaction. C ₃ -, C ₄ - and CAM pathways of CO ₂ fixation. Photorespiration - definition, sites and mechanism. | 10 | |
| | 5. Respiration: Glycolysis, Krebs cycle, electron transport system, oxidative phosphorylation and chemiosmotic system. | 5 | |
| | 6. Nitrogen metabolism, nitrate reduction, (nitrate reductase, nitrite reductase), nitrogen fixing organisms (free living, symbiotic and associative symbiotic organisms). Mechanism of nitrogen fixation – asymbiotic, symbiotic with special reference to nitrogenase and leghaemoglobin; nitrogen cycle. | 3 | |
| | 7. Growth physiology: Concept of growth and development, factors affecting growth. Phytohormones - types and chemical nature of Auxins, Gibberellins, Cytokinins, Abscisic acid and Ethylene; physiological roles; bioassay of IAA and GA ₃ ; an idea about immunoassay and radio immunoassay (RIA) of phytohormones. | 5 | |
| | 8. Concept of photoperiodism and vernalization. Phytochrome - chemical nature, photobiological properties and role in flowering. | 1 | |
| | 9. Seed physiology: Concept of dormancy, quiescence and germination. Dormancy - types, causes, significance, breaking of dormancy. Germination – a basic concept. | 2 | |
| BIOCHEMISTRY | 1. Carbohydrates: Outline classification, reducing and non-reducing sugars. Structures of mono-, di- and polysaccharides, properties of monosaccharides. | 2 | 25 |
| | 2. Amino acids: Basic structure and outline classification with examples. | 2 | |
| | 3. Protein: Primary, secondary (α - helix & β -pleated sheet), tertiary and quaternary structures. | 2 | |
| | 4. Lipid: Structure of fatty acids, types, outline classification; β -oxidation pathway. | 2 | |
| | 5. Enzymes: Definition, co-factors and prosthetic group with examples. Nomenclature and classification of enzymes (IUB system, 1961). Preliminary idea about the mechanism of enzyme action and kinetics, factors affecting enzyme action, Ribozyme, allosteric enzyme, abzyme. | 3 | |

N.B.: Bold and highlighted topics were taught by Chandan Das

Course Module (Year-wise) NEW REGULATION B.SC BOTANY HONS

| Session 2016-2017 | | | |
|----------------------|---|--------------------------|---------|
| Pattern | | | I+I+I |
| Examination | | | PART-I |
| Paper –I (Theory) | | | F.M.-75 |
| Major Topic | Sub Topics | Periods [Lec.H rs] | Marks |
| ALGAE | 1. Introduction; habitat and range of thallus structure in algae; origin and evolution of sex in algae. | 4 | 30 |
| | 2. Evolution of thallus structure in algae. | 1 | |
| | 3. Endosymbiosis and evolution of chloroplast in algae. | 1 | |
| | 4. Principles of classification and outline classification of Lee (2009) up to divisions. | 1 | |
| | 5. Cyanophyceae: Salient features, a general account with emphasis on cell structure and reproduction. | 2 | |
| | 6. Chlorophyceae: Salient features; life history of <i>Chlamydomonas</i> , <i>Zygnema</i> , <i>Oedogonium</i> & <i>Trentepohlia</i> . | 5 | |
| | 7. Charophyceae: Salient features; life history of <i>Chara</i> . | 2 | |
| | 8. Xanthophyceae: Salient features; life history of <i>Vaucheria</i> . | 1 | |
| | 9. Bacillariophyceae: Salient features; a general account with emphasis on cell structure and reproduction. | 3 | |
| | 10. Phaeophyceae: Salient features; life history of <i>Fucus</i> . | 2 | |
| | 11. Rhodophyceae: Salient features; life history of <i>Polysiphonia</i> | 2 | |
| | 12. Economic importance of algae. | 1 | |
| FUNGI | 1. Introduction, Salient features; Classification [Ainsworth Sparrow Sussman (1973)] and Gwynne-Vaughan & Barnes up to class. | 3 | 25 |
| | 2. Economic importance of fungi. | 1 | |
| | 3. Phycomycetes: Salient features, life histories of <i>Synchytrium</i> and <i>Rhizopus</i> . | 2 | |
| | 4. Ascomycetes: Salient features, development of <i>Ascus</i> and <i>Ascospores</i> , types of ascocarps; life histories of <i>Ascobolus</i> and <i>Claviceps</i> . | 3 | |
| | 5. Basidiomycetes: Salient features; development of Basidium and Basidiospore, life histories of <i>Agaricus</i> , <i>Polyporus</i> and <i>Lycoperdon</i> | 4 | |
| | 6. Deuteromycetes: Salient features; fruiting structures and parasexuality. | 1 | |
| | 7. Lichen: Habitat and thallus structures; economic importance. | 2 | |
| PLANT PATHOLOGY | 1. Plant Diseases: Definition; concepts of parasitism and saprophytism, Koch's postulate. | 1 | 20 |
| | 2. Classification of plant diseases based on symptoms. | 1 | |
| | 3. Pathotoxins (HV toxin and Wild-fire toxin) in disease development. | 1 | |
| | 4. Brief ideas on structural and biochemical defense mechanism of plants. | 1 | |
| | 5. Control of Plant diseases: Physical, cultural, chemical and biological. | 1 | |
| | 6. Symptoms, disease cycles and control measures of White rust of crucifer, Loose smut of wheat, Citrus canker, Late blight of potato, Rust of wheat & Brown spot of Rice. | 5 | |

| Session 2016-2017 | | | |
|----------------------|---|-------------------|---------|
| Pattern | | | I+I+I |
| Examination | | | PART-I |
| Paper –II (Theory) | | | F.M.-50 |
| Major Topic | Sub Topics | Periods [Lec.Hrs] | Marks |
| BRYOPHYTA | 1. Introduction, general characters, Classification (Smith, 1955), Economic importance. | 2 | 15 |
| | 2. Life histories of <i>Riccia</i> , <i>Marchantia</i> , <i>Pellia</i> , <i>Porella</i> , <i>Anthoceros</i> , <i>Sphagnum</i> & <i>Funaria</i> . | 9 | |
| | 3. Evolutionary trends among the above mentioned genera. | 1 | |
| MORPHOLOGY | 1. Leaves: Types, phyllotaxy, modifications of leaves. | 7 | 18 |
| | 2. Inflorescence: Types and evolution | 4 | |
| | 3. The flower as a modified shoot; aestivation; placentation and its evolution; floral formulae, floral diagram; adhesion and cohesion of floral parts. | 3 | |
| | 4. Fruits: Definition and types | 3 | |
| | 5. Dispersal of fruits and seeds | 2 | |
| PLANT ANATOMY | 1. Cell wall: Structure, growth and thickenings. | 2 | 17 |
| | 2. Tissue: Definition, organization of shoot and root apices, mechanical tissue and their distribution in plant bodies. | 3 | |
| | 3. Stele: Definition, evolution; types of vascular bundles. | 2 | |
| | 4. Root-stem transition. | 1 | |
| | 5. Secondary growth: normal and anomalous types; secondary growth in dicot root and shoot. | 4 | |
| | 6. Anomalous secondary growth in stems of <i>Bignonia</i> , <i>Boerhaavia</i> , <i>Dracaena</i> (<i>Cordyline</i>). | 2 | |

| Session 2016-2017 | | | |
|----------------------|---|--------------------------|---------|
| Pattern | | | I+I+I |
| Examination | | | PART-II |
| Paper –IV (Theory) | | | F.M.-75 |
| Major Topic | Sub Topics | Periods [Lec.H rs] | Marks |
| PTERIDOPHYTA | 1. Introduction to Pteridophyta. . | 1 | 30 |
| | 2. Outline of Pichi Sermolii's system (1977) of classification of pteridophytes up to orders mentioning class characters. | 1 | |
| | 3. Telome theory of Zimmerman and Enation theory of Bower. | 1 | |
| | 4. Vegetative and reproductive organography of the following genera: i) <i>Rhynia</i> , ii) <i>Zosterophyllum</i> , iii) <i>Psilophyton</i> , iv) <i>Lycopodium</i> , v) <i>Selaginella</i> , vi) <i>Isoetes</i> vii) <i>Lepidodendron</i> , viii) <i>Calamites</i> , ix) <i>Equisetum</i> , x) <i>Pteris</i> , xi) <i>Marsilea</i> . | 15 | |
| | 5. Apogamy and apospory in pteridophytes | 1 | |
| | 6. Economic importance of pteridophytes. | 1 | |
| GYMNOSPERM | 1. General features, concepts of ovule and seed; outline classification as adopted by Stewart & Rothwell (1993). | 3 | 30 |
| | 2. Progymnospermopsida: General features. | 2 | |
| | 3. Pteridospermales: General account of <i>Lyginopteris</i> plant (<i>Sphenopteris</i> leaf, <i>Lyginopteris</i> stem, <i>Crossotheca</i> male organ and <i>Lagenostoma</i> female organ). | 2 | |
| | 4. Glossopteridales: General account of <i>Glossopteris</i> plant (<i>Vertebraria</i> root, <i>Araucarioxylon</i> trunk, <i>Glossopteris</i> leaf, <i>Glossotheca</i> male organ, <i>Dictyopteridium</i> female organ). | 1 | |
| | 5. Cycadales: Structure and life history of <i>Cycas</i> and its distribution in India. | 3 | |
| | 6. Bennettitales: General account of <i>Williamsonia</i> plant (<i>Bucklandia</i> stem, <i>Ptilophyllum</i> leaf, <i>Weltrichia</i> male organ, <i>Williamsonia</i> female organ). | 1 | |
| | 7. Pentoxylales: General account of <i>Pentoxylon</i> plant (<i>Pentoxylon</i> stem, <i>Nipaniophyllum</i> leaf, <i>Sahania</i> male organ, <i>Carnoconites</i> female organ). | 1 | |
| | 8. Ginkgoales: Structure and life history of <i>Ginkgo</i> ; brief mention of the morphology of collar. | 2 | |
| | 9. Coniferales: Structure and life history of <i>Pinus</i> ; brief mention of the morphology of ovuliferous scale. | 4 | |
| | 10. Gnetales: Structure and life histories of <i>Ephedra</i> and <i>Gnetum</i> ; their distribution in India. | 4 | |
| | 11. Economic importance of gymnosperms | 1 | |
| PALEOBOTANY | 1. Introduction, importance of Paleobotany. | 1 | 15 |
| | 2. Definition of fossil, process of fossilization, types of fossils on the basis of their preservation; concept of Form Genus. | 2 | |
| | 3. Introductory idea of correlation and stratigraphy; stratigraphic deductions based on plant fossils. | 2 | |
| | 4. Age of the earth, Geologic Time Scale, major events of plant life through geologic time. | 1 | |

| Session 2016-2017 | | | |
|----------------------|---|----------------------|---------|
| Pattern | | | I+I+I |
| Examination | | | PART-II |
| Paper –V (Theory) | | | F.M.-50 |
| Major Topic | Sub Topics | Periods [Lec.Hrs] | Marks |
| TAXONOMY | 1. Definition of Taxonomy (alpha & omega), Taxonomic principles, concept of hierarchy and categories. | 3 | 35 |
| | 2. Definition of Numerical taxonomy; Operational Taxonomic Units (OTU); Phenon.; Phenogram. | 6 | |
| | 3. Outline of the system of classification – Linnaeus (1753), Bentham and Hooker (1862-83), Takhtajan (1997). | 5 | |
| | 4. ICBN and its divisions, Valid publication. Principle of priority. Nomenclatural types. | 1 | |
| | 5. Importance of herbaria and botanical gardens in taxonomic studies. | 3 | |
| | 6. Salient features of the following families with examples from common Indian species and economic importance. [Evolutionary trends need to be briefly discussed in case of families marked with astericks]. Dicotyledons: Magnoliaceae*, Malvaceae, Brassicaceae, Fabaceae (Leguminosae), Euphorbiaceae, Apiaceae (Umbelliferae), Apocynaceae, Asclepiadaceae, Solanaceae, Scrophulariaceae, Lamiaceae (Labiatae), Verbinaceae, Acanthaceae, Rubiaceae, Cucurbitaceae, Asteraceae(Compositae)*. Monocotyledons: Alismataceae*,Liliaceae, Poaceae, Musaceae, Orchidaceae*. | 30 | |
| PLANT GEOGRAPHY | 1. Phytogeographical classification of India (D. Chatterjee- 1962). | 1 | 15 |
| | 2. Vegetation characteristic of Eastern Himalayas and Sunderbans | 2 | |
| | 3. Endemism : Definition and types. | 1 | |

| Session 2016-2017 | | | |
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| Pattern | | | I+I+I |
| Examination | | | PART-III |
| Paper –VII (Theory) | | | F.M.-100 |
| Major Topic | Sub Topics | Periods [Lec.Hrs] | Marks |
| MICROBIOLOGY | 1. Bacterial structure and function. Capsule, flagella, pili, cell wall (chemical composition and characteristics), plasma membrane, ribosomes, cytoplasmic inclusions (PHB, Volutin). Plasmids and bacterial chromosome, endospore. | 13 | 30 |
| | 2. Principles and modern approaches of bacterial Taxonomy, brief outline of Procaryotic classification (Bergey's Manual of systematic Bacteriology, 2 nd edition, 2001), Concept of Bacteria and Archaea. | 2 | |
| | 3. Economic importance of microorganisms i) Agricultural Microbiology (Biofertilizer, biopesticides), ii) Industrial Microbiology (in fermentation and Pharmaceuticals), iii) Medical Microbiology (air borne – Influenza; Water borne – Cholera; Food borne – Boutulism; Brief idea about epidemiology, causal organism and control). | 4 | |
| | 4. Brief idea about genetic recombination in bacteria: Transformation, Conjugation and Transduction. | 2 | |
| | 5. Viruses: General concept, nature of viruses, structure of TMV, T ₂ and HIV; Viral multiplication – Lytic and Lysogenic cycles. | 3 | |
| | 6. Brief idea about Prion and Viroid. | 1 | |
| ECONOMIC BOTANY & PHARMACOGNOSY | 1. Method of cultivation, processing and utilities of the products of the following: Rice, Tea and Jute. | 3 | 25 |
| | 2. Morphological nature and major uses of the economically important parts of the following products: Cotton (fibre), Sal (wood), Sugarcane (sugar), Mustard (oil) and Coconut (oil). | 2 | |
| | 3. A brief idea about pharmacognosy; definition of drugs, folk medicine, active principles; Pharmacy, Pharmacognosy, Pharmacopeia and adulteration. | 3 | |
| | 4. Study of the following drug plants (Diagnostic features, active principles and uses): <i>Rauwolfia serpentina</i> (root), <i>Adhatoda vasica</i> (leaf), <i>Strychnos nuxvomica</i> (seed), <i>Cinchona succirubra</i> (bark) | 5 | |
| PALYNOLOGY AND REPRODUCTIVE BIOLOGY | 1. Microsporogenesis ; Spore/pollen morphology with reference to polarity, size, shape, symmetry, aperture and sculpture. | 3 | 15 |
| | 2. Organization of orthotropous ovule, types of ovules; megasprogenesis. | 2 | |
| | 3. Pollination: Types and contrivances. | 1 | |
| | 4. Development of male and female gametophytes (<i>Polygonum</i> type) | 1 | |
| | 5. Fertilization. | 1 | |
| | 6. Endosperm: Types, development of free nuclear type. | 1 | |
| | 7. Development of typical dicot embryo (Crucifer - type). | 1 | |
| ECOLOGY | 1. Ecology: Autecology and Synecology (definition only). | 1 | 30 |
| | 2. Environment: Climatic, edaphic and biotic factors. | 3 | |
| | 3. Ecosystem: Definition, concept of ecological pyramids and energy flow. | 1 | |
| | 4. Ecological succession (Hydrosere, Xerosere). | 2 | |
| | 5. Morphological, anatomical and physiological adaptations of xerophytes, hydrophytes, halophytes and epiphytes. | 3 | |
| | 6. Biodiversity (a brief idea) and its conservation (<i>in-situ</i> -, <i>ex-situ</i> conservation and cryopreservation). | 1 | |
| | 7. Pollution: Definition and types with special reference to air and water pollution. | 3 | |

| Session 2016-2017 | | | |
|---------------------------|---|----------------------|----------|
| Pattern | | | I+I+I |
| Examination | | | PART-III |
| Paper –VIII (Theory) | | | F.M.-75 |
| Major Topic | Sub Topics | Periods [Lec.Hrs] | Marks |
| CELL BIOLOGY & GENETICS | 1. Cell structure: Ultrastructure and functions of Plasma membrane, Mitochondrion, Chloroplast, Nuclear envelope with nuclear pore complex, Golgi apparatus, Endoplasmic reticulum and Ribosome. | 4 | 40 |
| | 2. Nucleic acid: DNA and RNA – Types, Physical and Chemical structures of B-DNA and t-RNA. | 2 | |
| | 3. Replication of DNA - Mechanism and evidence of semi-conservative replication in prokaryotes. | 2 | |
| | 4. Transcription of DNA: Mechanism in Prokaryotes; Nuclear mRNA processing in Eukaryotes (Capping, Polyadenylation or tailing and Splicing). | 2 | |
| | 5. Translation: Mechanism in Prokaryotes. | 2 | |
| | 6. Genetic code: Definition, salient features and deciphering the genetic code. | 2 | |
| | 7. Gene regulation in Prokaryotes: Lac operon (negative and positive control). | 2 | |
| | 8. Eukaryotic chromosome structure: Ultrastructure of chromatin and its organization into chromosome, Concept of euchromatin and heterochromatin. | 2 | |
| | 9. Cell cycle and its regulation (MPF only), phases and events of Mitosis and Meiosis with their significance. | 2 | |
| | 10. Brief idea: Transposable elements, Gene amplification (PCR), Transgenic plant (Bt cotton). | 2 | |
| | 11. Recombinant DNA Technology: Basic concepts; Tools - Restriction enzymes (types with examples); Lygase; Vectors (Plasmid and Bacteriophage). | 2 | |
| | 12. Plant tissue culture: General techniques, concept of Basal medium, Micropropagation, Application of Plant tissue culture. | 3 | |
| GENETICS & PLANT BREEDING | 1. Mendelism and Chromosomal basis of inheritance. | 3 | 35 |
| | 2. Modified Mendelian Ratios: Lethal gene, Epistasis and Complementary gene interaction. | 2 | |
| | 3. Basic concept of Linkage: General idea of Crossing over including molecular mechanism (Holiday Model). | 3 | |
| | 4. Structural changes of chromosome (Deletion, Duplication, Translocation and Inversion) with their meiotic behavior and genetic consequences. | 4 | |
| | 5. Numerical changes of chromosome (Euploidy and Aneuploidy) and their applications. | 2 | |
| | 6. Gene mutation- types, physical & chemical mutagens and their effects. | 2 | |
| | 7. Aims and methods of Plant breeding: Introduction, Acclimatization, Domestication, Selection and Hybridization. | 3 | |
| | 8. Heterosis: Objectives, genetic basis and applications. | 1 | |
| | 9. Biometry: Frequency distribution - mean, median, mode, class range, standard deviation and standard error. Probability: product law, Sum law, conditional probability, Chi-square test of goodness of fit; | 2 | |

| Session 2016-2017 | | | |
|-------------------------|--|----------------------|----------|
| Pattern | | | I+I+I |
| Examination | | | PART-III |
| Paper –IX (Theory) | | | F.M.-75 |
| Major Topic | Sub Topics | Periods [Lec.Hrs] | Marks |
| PLANT PHYSIOLOGY | 1. Water relation: Role of water in plant life. Water potential and its components in plant cell, soil water absorption, cavitation in xylem and embolism, Transpiration types and mechanism of stomatal transpiration (the roles of CO ₂ , blue light, potassium ion and abscisic acid), Antitranspirants. | 5 | 50 |
| | 2. Mineral nutrition: Essential elements and their physiological roles in plant life. Mechanism of active ion uptake. | 2 | |
| | 3. Organic translocation: Phloem loading and unloading mechanism, long distance transport (Pressure flow hypothesis). | 2 | |
| | 4. Photosynthesis: Definition, photosynthetic pigments, basic concept about mechanism of light and dark reaction. C ₃ -, C ₄ - and CAM pathways of CO ₂ fixation. Photorespiration - definition, sites and mechanism. | 10 | |
| | 5. Respiration: Glycolysis, Krebs cycle, electron transport system, oxidative phosphorylation and chemiosmotic system. | 5 | |
| | 6. Nitrogen metabolism, nitrate reduction, (nitrate reductase, nitrite reductase), nitrogen fixing organisms (free living, symbiotic and associative symbiotic organisms). Mechanism of nitrogen fixation – asymbiotic, symbiotic with special reference to nitrogenase and leghaemoglobin; nitrogen cycle. | 3 | |
| | 7. Growth physiology: Concept of growth and development, factors affecting growth. Phytohormones - types and chemical nature of Auxins, Gibberellins, Cytokinins, Abscisic acid and Ethylene; physiological roles; bioassay of IAA and GA ₃ ; an idea about immunoassay and radio immunoassay (RIA) of phytohormones. | 5 | |
| | 8. Concept of photoperiodism and vernalization. Phytochrome - chemical nature, photobiological properties and role in flowering. | 1 | |
| | 9. Seed physiology: Concept of dormancy, quiescence and germination. Dormancy - types, causes, significance, breaking of dormancy. Germination – a basic concept. | 2 | |
| BIOCHEMISTRY | 1. Carbohydrates: Outline classification, reducing and non-reducing sugars. Structures of mono-, di- and polysaccharides, properties of monosaccharides. | 2 | 25 |
| | 2. Amino acids: Basic structure and outline classification with examples. | 2 | |
| | 3. Protein: Primary, secondary (α -helix & β -pleated sheet), tertiary and quaternary structures. | 2 | |
| | 4. Lipid: Structure of fatty acids, types, outline classification; β -oxidation pathway. | 2 | |
| | 5. Enzymes: Definition, co-factors and prosthetic group with examples. Nomenclature and classification of enzymes (IUB system, 1961). Preliminary idea about the mechanism of | 3 | |

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| | enzyme action and kinetics, factors affecting enzyme action, Ribozyme, allosteric enzyme, abzyme. | | |
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N.B.: Bold and highlighted topics were taught by Swarnendu Mondal