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Syllabus for MSc Botany

B. Sc. I Year (Theory) Semester - I

Paper I (Diversity of Cryptogams - I)

Lectures - 45

Unit - 1 Credit - 1

1.1 Viruses: General characters, classification based on host, economic importance, TMV – structure and multiplication (04)

1.2 Mycoplasma: General characters (01)

1.3 Bacteria: General characters, ultra structure, classification based on shape, reproduction, economic importance (05)

1.4 Cryptogams: General characters, classification according to G.M. Smith up to class level (01) 1.5 Lichens: General characters, nature of association, forms of thalli, economic importance, structure and reproduction in Usnea (04)

Unit – 2 Credit - 1

2. Algae:

2.1 General characters, classification according to F.E. Fritsch (1935) up to the class level, economic importance. (02)

2.2 Systematic position, occurrence, thallus structure, reproduction vegetative, asexual and sexual, (excluding development of sex organs) and graphic life cycle with respect to following types: i. Cyanophyceae – Nostoc (02) ii. Chlorophyceae – Chara (03) iii. Xanthophyceae – Botrydium (02) iv. Phaeophyceae – Sargassum (03) v. Rhodophyceae – Batrachospermum (03)

Unit – 3 Credit -1

3. Fungi:

3.1 General characters, classification according to Alexopoulous and Mims (1979) up to the class level, economic importance (03)

3.2 Systematic position, occurrence, structure of mycelium, reproduction - asexual, sexual and graphic life cycle with respect to the following types: i) Oomycetes – Albugo (03) ii) Zygomycetes – Mucor (02) iii) Ascomycetes – Eurotium (02) iv) Basidiomycetes – Agaricus (03) v) Deuteromycetes – Cercospora (02)

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B. Sc. I Year (Theory)

Semester - I

Paper - II (Morphology of Angiosperms)

45Lectures

Unit – 1 Credit 1

1.1- Basic body plan of flowering plant, modular type of growth, diversity of plant forms – Herbs, Shrubs, Trees, Climbers; annuals, biennials and perennials. (02)

1.2 Morphology of vegetative organs:

a) Root: Characteristics, functions, regions of root, types – tap and adventitious, modification of root for storage, mechanical support (stilt root) and vital functions (Pneumatophore). (04)

b) Stem: Characteristics, functions, modification – underground, sub aerial and aerial (03)

c) Leaf: Parts of typical leaf, phyllotaxy, types (simple and compound), diversity in shape and size, venation and modifications of leaf. (06)

Unit – 2 Credits 2

2. Morphology of reproductive organs:

2.1 Inflorescence: Racemose, cymose and special types (05)

2.2 Flower: Definition, parts of typical flower, forms of thalamus, androphore, gynophore, gynandrophore, insertion of floral whorls on thalamus (hypogyny, perigyny and epigyny), structure, function and modification of calyx, corolla, androecium, gynoecium, aestivation and placentation (15)

2.3 Fruit: Types of fruits (06)

2.4 Fruit and Seed dispersal strategies. (04)

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B. Sc. I Year (Theory)

Semester – II

Paper - III

(Diversity of Cryptogams - II)

45 Lectures.

Unit- 1 Credit 1

1. Bryophytes:

1.1 General characters of bryophytes, classification as per G. M. Smith (02)

1.2 Systematic position, occurrence, thallus structure (external and internal), reproduction - vegetative, asexual, and sexual (excluding developmental stages), graphic life cycle and alternation of generations of the following types:

a) Hepaticopsida – Marchantia (07)

b) Bryopsida – Funaria (06)

Unit - 2 Credits 2

2. Pteridophytes:

2.2 General characters of Pteridophytes, classification as per G. M. Smith (02) Systematic position, occurrence, external and internal structure of sporophyte and gametophyte, reproduction (excluding developmental stages), graphic life cycle and alternation of generations of the following types:

a) Psilopsida – Psilotum (03)

b) Lycopsida – Lycopodium, Selaginella (12)

c) Sphenopsida – Equisetum (06)

d) Pteropsida – Marsilea (07)

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B. Sc. I Year (Theory)

Semester - II

Paper - IV

(Histology, Anatomy and Embryology)

45 Lectures

Unit – 1 Credit - 1

Histology:

a) Types of tissue:

i. Meristematic tissue – Meristem, structure and types based on origin and position. (03)

ii. Permanent tissues: Simple, Complex and Secretary (06)

iii. Epidermal tissues: Trichomes and Stomata (02)

b) Histological organization of root and shoot apices (02)

c) Various theories of cellular organization (02)

Unit – 2 Credit 1

Anatomy:

a) Primary structure of root, stem and leaf of Monocot (Maize) and Dicot (Sunflower) (07)

b) Secondary growth in root and stem of Dicot (Sunflower) (04)

c) Wood anatomy: Growth rings, heart wood and sap wood (02)

d) Periderm: Origin, structure and functions. (02)

Unit – 3 Credit 1

Embryology:

a) Structure of anther, microsporogenesis and development of male gametophyte (03)

b) Structure and types of ovule, megasporogenesis and development of female gametophyte (Polygonum type). (04)

c) Pollination -Mechanism, types and agencies. (02)

d) Double fertilization and its significance (01)

e) Development of Dicot embryo (Crucifer type). (01)

f) Structure, development and types of endosperm. (02)

g) Structure of Dicot and Monocot seed (02)

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B. Sc. II Year (Theory)

Semester III

Paper -V (Taxonomy of Angiosperms)

(45Lectures)

Unit:1 Credit - 1

1. Salient features, origin and evolution of Angiosperms (03)
2. Bentham and Hooker's system of classification upto series level, its merits and demerits (03)
3. Taxonomy in relation to anatomy, embryology, palynology, ecology and cytology (03)
4. Concept of Binomial Nomenclature and its advantages (02)
5. Concept of genus, species and epithet. (02)
6. Herbaria and Botanical Gardens. (02)

Unit:2 Credits - 2

Study of the following families: systematic position , (30) salient features, floral formula, floral diagram, common examples and their economic importance i. Annonaceae ii. Malvaceae iii. Leguminosae Fabaceae (Papilionaceae) Caesalpiniaceae Mimosaceae iv. Apocynaceae v. Solanaceae vi. Acanthaceae vii. Lamiaceae (Labiatae) viii. Nyctaginaceae ix. Liliaceae x. Poaceae (Gramineae)

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B.Sc.II Year (Theory)

Semester - III

Paper - VI (Plant Ecology)

45 Lectures

Unit: 1 Credit: 1

Plant and environment:

A) Climatic factors –

a) Light as an ecological factor, global radiation and photosynthetically active radiation (02)

b) Temperature as an ecological factor (02)

c) Water as an ecological factor, physicochemical properties of water (03)

B) Edaphic factor – Soil formation -soil profile, physicochemical properties of soil, major soil types of India, soil erosion and soil conservation (08)

Unit:2 Credit:1

1. Response of plants to water Morphological, physiological and anatomical response of plants to water – hydrophytes, xerophytes, halophytes and epiphytes (12)

2. Phytogeography: Biogeographical regions of India, vegetation types of India (03)

Unit: 3 Credit:1

1. Community ecology: Community characteristics -frequency, density, life forms, biological spectrum (06)

2. Ecosystem: structure -biotic and abiotic components, food chain, food web, ecological pyramids, energy flow, biogeochemical cycles- nitrogen and phosphorus. (09)

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B. Sc. II Year (Theory)

Semester - IV

Paper - VII (Gymnosperms and Utilization of Plants)

45 Lectures

Unit:1 Credits 1.5

Gymnosperms:

1. Salient features, classification as per Sporne 1965, economic importance (02)
2. Geological time scale, fossilization, types of fossils, Lyginopteris, fossil fuels (04)
3. Contributions of Prof. Birbal Sahani (01)
4. Study of morphology, anatomy, reproduction (excluding developmental stages) and graphical representation of life cycle of the following types:

a) Cycadales – Cycas (08)

b) Coniferales – Pinus (08)

Unit:2 Credits:1.5

Utilization of Plants:

1. Domestication of plants and their centers of origin (02)
2. History, origin, cultivation, harvesting, improved varieties and economic importance of the following plants: (15)

i. Food plants – Wheat, Jowar

ii. Sugar – Sugarcane

iii. Fibers -Cotton, Jute

iv. Vegetable oils – Groundnut, Sunflower v. Beverages – Tea, Coffee

3. Botanical name, family name and economic importance of the following plants: (05)

i. Medicinal plants – Aloe vera, Withania somnifera, Curcuma longa, Vitex negundo

ii. Timber and Gum – Teak, Neem, Babul, Sisham

iii. Cosmetics and Perfumes – Rose, Mogara, Tuberose

iv. Spices – Clove, Black pepper, Cumin, Coriander, Cinnamon

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B. Sc. II Year (Theory)

Semester IV Paper VIII (Plant Physiology)

45 Lectures

Unit:1 Credit 1

1. Plant water relations:

a) Diffusion, osmosis, plasmolysis and imbibition (02)

b) Water absorption and ascent of sap (Transpiration pull theory) (03)

c) Transpiration – Definition, types -cuticular, lenticular and stomatal, structure of stomata, mechanism of opening and closing of stomata (starch – sugar hypothesis) (02)

2. Mineral nutrition:

a) Macro and microelements: roles and deficiency symptoms of N, P, K, Mg, Ca, Fe, Zn, Bo, Mo.

b) Mineral uptake – passive (ion exchange theory) and active (carrier concept) (05)

3. Translocation of solutes: Mass flow hypothesis, protoplasmic streaming theory, Source and sink relationship (03)

Unit:2 Credits 1

1. Enzymes : Chemical nature – holoenzym, apoenzyme, prosthetic group, cofactor and coenzyme, properties , nomenclature, classification based on type of reactions, mechanism of enzyme action (06)

2. Growth: Definition, Phases of Growth, Sigmoid growth curve. (02)

3. Growth regulators: Discovery, stucture, roles and practical applications of Auxins, Gibberellins, Cytokinins, Abscisic acid and Ethylene (07)

Unit:3 Credit 1

1. Photosynthesis: Definition, ultra structure of chloroplast, photosynthetic pigments, Light reactions -Hill reaction, red drop and Emerson enhancement effect, two pigment systems (PS I, PS II), photophosphorylation – cyclic and noncyclic, Z-scheme; Dark reactions -C3, C4 and CAM pathways (08)

2. Respiration: Definition, Ultra structure of mitochondria, types of respiration, Glycolysis, TCA Cycle, Electron transport system, alcoholic and lactic acid fermentation. (07)

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B.Sc. III Botany (Theory)
Semester -V Paper IX
Cell Biology & Molecular Biology
(45Lectures)

Unit-1 Credit-1

1. Cell: Structure of Prokaryotic cell (Bacterial cell) and Eukaryotic cell (plant cell) (02).
2. Cell wall and cell organelles: Structure and functions of cell wall and Cell organelles – Golgi complex, Endoplasmic reticulum, Lysosomes (08)
3. Nucleus: Ultra structure, (nuclear membrane, nucleolus, chromatin material, nucleoplasm), Functions of nucleus. (05)

Unit-2 Credit-1

1. Cell division: (06)

a) Cell cycle -G1 phase, S phase, G2 phase and M phase

b) Mitosis – definition,process and significance.

c) Meiosis-definition, process and significance.

2. Nucleic acids: (09)

a. DNA: Definition, structure, chemical composition (nitrogenous bases, purines, pyrimidines, nucleosides, nucleotides, phosphate and sugars) Watson and Crick's model, Z - DNA, B - DNA, functions of DNA

b. Replications of DNA – conservative, semi conservative and dispersive.

c. RNA: Structure, types and functions

Unit-3 Credit-1

1) Chromosome: (07)

Definition, morphology-size, shape, number, Ultra structure – chromatid, chromonema, chromomere, centromere, kinetochore, secondary constriction, satellite, telomere, heterochromatin, euchromatin, Nucleosome model (Woodlock 1973), chemical composition, Functions of chromosome, Giant chromosomes-polytene and lampbrush chromosome.

2) Chromosomal aberrations : (08)

a) Structural-deletion, duplication, inversion and translocation

b) Numerical: – euploidy and aneuploidy

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B. Sc. III (Theory) Semester - VI

Paper X (Genetics and Biotechnology) 45 L

Unit : 1 Credit : 1

1. Mendelism: (04)

i. Introduction -G.J. Mendel

ii. Mendelian principles –Law of Dominance , law of segregation, law of independent assortment, back cross and test cross

2. Interaction of genes: (07)

i. Allelic interaction: incomplete dominance, co dominance, lethal genes and blood group inheritance

ii. Non allelic and non epistatic -comb shapes in fowls

iii. Non allelic and epistatic:

a) Complementary genes or duplicate recessive epistasis (9:7)

b) Supplementary genes or recessive epistasis (9:3:4)

c) Dominant epistatic genes or dominant epistasis (12:3:1)

d) Duplicate genes or duplicate dominant epistasis (15:1)

3. Sex determination: (04)

i. Chromosomal theory of sex determination

ii. Mechanism of sex determination in man (xx -xy), Drosophila (xx and xy), birds (zz-zw), grasshopper (xx-xo) and genic balance theory in Drosophila

iii. Sex determination in plants – Melandrium

Unit : 2 Credit : 1

1. Sex linked inheritance: (07)

X, XY and Y linked inheritance: i) Colourblindness and hemophilia in man ii) Holandric genes iii) White eye colour in Drosophila, iv) Gynandromorphs,

2. Structure and function of gene: (08) i. Fine structure of gene (Seymour Benzer) ii. One gene one enzyme hypothesis iii. Genes and related diseases – phenylketonuria, and alkaptonuria iv. Detection of genetic diseases –amniocentesis Genetic counseling

Unit: 3 Credit : 1

Biotechnology: (15)

1. Concept of genetic engineering and recombinant DNA technology

2. Restriction endonucleases, their properties and uses

3. Cloning vectors -plasmids and phage vectors 4. Techniques of genetic engineering -isolation of desired gene, gene cloning, transfer of gene into plants 5. Applications of genetic engineering

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