**VIVEKANAND COLLEGE (AUTONOMOUS), KOLHAPUR**

**Department of Botany**

**Syllabus of B.Sc.- III**

**List of Papers**

| Semester | Paper No. | Code | Section | Title of Paper |
|---|---|---|---|---|
| V | V | DSC 7 E | I | " Cytology and Research Techniques in LifeSciences" |
| | | | II | "Microbiology, Plant Pathology and Biofertilizers" |
| | VI | DSC 7 F | I | "Plant Biochemistry and Stress Physiology" |
| | | | II | " Plants Systematics and Paleobotany" |
| VI | VII | DSC 7 G | I | "Genetics and Plant Breeding" |
| | | | II | "Biostatistics, Economic Botany and Ethnobotany" |
| | VIII | DSC 7 H | I | "Molecular Biology and Biotechnology" |
| | | | II | "Horticulture, Forestry and Herbal Technology" |

# Paper V

## " Cytology and Research Techniques in Life Sciences"

## Section – I

| Unit | Contents | 40 Hours |
|---|---|---|
| **1.** | **Cell as a unit of Life**<br>1a: The cell theory, Prokaryotic and Eukaryotic cells, Cell size and shape, Eukaryotic cell components.<br>1b: Cell Membrane and cell wall<br>1c: The functions of membranes, Models of membrane structure.<br>1d: The fluidity of membranes, Membrane proteins and their functions, faces of the Membranes, selective permeability of the membrane cell wall. | **12** |
| **2.** | **Cell Organelles**<br>2a: Glyoxisomes, Peroxisomes and Lysosomes – Structure, composition and functions.<br>2b: Cell cycle<br>2c: Apoptosis. | **08** |
| **3.** | **Analytical Techniques in Plant Sciences.**<br>3a:Principles of Microscopy – Light Microscopy, Fluorescence Microscopy, Electron Microscopy (TEM and SEM)<br>3b:Chromatography : Principles – Paper chromatography, TLC.<br>3c: Micrometry, Microphotography, Electrophoresis. | **10** |
| **4** | **Radiation Biology**<br>4a: Radioactive Isotopes<br>4b: Effect of Radiations on Biological Systems.<br>4c: Beneficial Effect of Radiations.<br>4d: Autoradiography Technique<br>4e: Geiger – Muller Experiment / Liquid Scintillation Counter<br>4f: Precautionary measures | **10** |

## Paper V

## "Microbiology, Plant Pathology and Biofertilizers"

## Section – II

| Unit | Contents | 40 Hours |
|---|---|---|
| **1** | **Microbiology**<br>1a: Methods in Microbiology<br>1b: Micro-organisms in Biological world<br>1c: Scope of Microbes in Industry and Environment | **10** |
| **2** | **Plant Pathology**<br>2a: Classification of plant diseases based on Pathogens, Crops and Symptoms.<br>2b:Study of Mechanism of Infection in Disease development (Biochemical changes),prevention and control of Plant Diseases. Role of Quarantine, Significance of Plant Pathology. | **10** |
| **3** | **Study of Plant Diseases**<br>3a: Cereals – Rust of Wheat<br>3b: Cashcrop – Red Rot of Sugarcane<br>3c: Legume – Rust of Soybean, Mosaic of Bean<br>3d: Spices – Leaf spot of Turmeric<br>3e: Vegetable – White Rust of *Amaranthus*<br>3f: Fruit - Leaf curl of Papaya | **09** |
| **4** | **Biofertilizer**<br>4a: Microbes in Agriculture –Biological Nitrogen Fixation, Mycorhhizae.<br>4b: Organic Farming – Introduction, Concept and scope of Organic farming<br>Green Manuring<br>Biocompost Making Methods | **11** |

# Paper VI

## "Plant Biochemistry and Stress Physiology"

## Section – I

| Unit | Contents | 40 Hours |
|---|---|---|
| **1.** | **Plant Biochemistry.**<br>**Carbohydrate metabolism.**<br>1a: Introduction and classification of Carbohydrates<br>1b: Properties of Monosaccharide's, Oligosaccharide's, Polysaccharide's<br>1c: Significance<br>**Protein metabolism.**<br>1d: Introduction, properties and characters of amino acids<br>1e: Protein- structure and classification<br>1f: Protein synthesis | **14** |
| **2.** | **Lipid metabolism and Fatty acid metabolism.**<br>2a: Introduction and classification of lipids.<br>2b:Properties of fatty acids(Stearic and Palmatic acid), and unsaturated fatty acids(Linoleic and Linolenic acid)<br>2c: Beta oxidation.<br>2d:Gluconeogenesis and role in mobilization of fatty acids during germination.<br>2e:Significance of lipids. | **12** |
| **3.** | **Stress physiology.**<br>3a: Defining Plant stress.<br>3b:Types of stress:- Water stress-Salinity stress, High light stress, Temperature stress.<br>3c: Stress sensing mechanisms in plants, Calcium modulation, Phospholipid signaling. | **10** |
| **4** | **Senescence and Aging.**<br>4a: Patterns of senescence.<br>4b: Physical changes during senescence.<br>4c: Control of senescence. | **04** |

## Paper VI

## " Plants Systematics and Paleobotany"

## Section –II

| Unit | Contents | 40 Hours |
|---|---|---|
| **1.** | **Importance of Plant Systematics.**<br>1a: Introduction to Systematics, Evidences From Palenology, Cytology, Phytochemistry, and Molecular data.<br>1b:Field inventory, Functions of Herbarium, Important Herbaria and Botanical gardens of the World and India. | **15** |
| **2.** | **System Of Classification.**<br>2a:Phylogeny of Angiosperms, The general account of origin of Aniosperms(with reference to Gnetalean theory)<br>2b:Classification system of Takhtajan, Brief reference of Angiosperm Phylogeny Group (APG-III) classification (2009)<br>2c: Ranks of IUCN and methods of Conservation. | **09** |
| **3.** | **Plant Families.**<br>3a:Morphological and floral characters, distinguishing characters and economic importance of following families.<br>3b:Anacardiaceae,Fabaceae,Apiaceae,Rubiaceae,Acanthaceae, Euphorbiaceae, Poaceae. | **08** |
| **4.** | **Paleobotany.**<br>4a: General account types of fossils, Geological time scale.<br>4b: Study of following form genera with reference to systematic position, external morphology and affinities.<br>4c:Applications of Paleobotany- Role of microfossils in oil and coal exploration. | **09** |

# Paper- VII

## "Genetics and Plant Breeding"

## Section I

| Unit | Contents | 40 Hours |
|---|---|---|
| 1 | **Heredity**<br>1a: Introduction, Terminologies,Laws of Inheritance (Monohybrid and Dihybrid)<br>1b: Multiple Allelism. | **10** |
| 2 | **Linkage and Crossing over**<br>2a: Linkage- Concept and History, Types of Linkage<br>2b: Crossing over- Concept and Significance,<br>Cytological proof of crossing over.<br>2c: Linkage Maps | **08** |
| 3 | **Extra – Chromosomal Genome**<br>3a: Introduction and Organization of genome<br>3b: Plastid Inheritance<br>3c: Mitochondrial Inheritance | **07** |
| 4 | **Plant Breeding**<br>4a:Introduction and objectives, Plant genetic resources, Centers of origin and Domestication of crop plants.<br>4b: Methods of crop improvements:<br>Methods of Breeding,<br>Selection methods for self-pollinated, cross pollinated and vegetatively propagated plants.<br>Mutation breeding. | **15** |

## Paper- VII

## "Biostatistics, Economic Botany and Ethnobotany"

## Section II

| Unit | Contents | 40 Hours |
|---|---|---|
| **1** | **Biostatistics**<br>1a: Introduction, Statistical Terms.<br>1b: Sampling- Sampling Methods.<br>1c:Collection and Representation of data(Diagrammatic and Graphic representation)<br>1d: Measures of Central tendency- Mean, Mode and Median<br>1e: Variances and standard deviation, Coefficient of variation.<br>1f: Test of Significance (T- test), Chi-square test ($X_2$ test) | **12** |
| **2** | **Economic Botany**<br>2a: Study of following economical important plant with reference to origin, morphology, parts used and uses.<br>2b: Cereals- Jowar and Rice<br>2c: Legumes – Soybean and ----------<br>2d: Vegetables – *Amaranthus* and Chilly<br>2e: Spices- Clove and black pepper | **10** |
| **3** | **Economic Botany II**<br>3a: Beverages- Tea and Coffee<br>3b: Fiber Yielding Plants - Cotton and *Hibiscus canabinis*<br>3c: Oil yielding – *Pongamia pinnata* and Sunflower<br>3d: Dye : *Bixa* and *Lawsonia* | **08** |
| **4** | **Ethnobotany**<br>4a: introduction, Concept and Scope<br>4b: Ethnobotanical studies with reference to data collection- Field work, Herbarium, Ancient literature, Archaeological findings, Sacred groves.<br>4c: Role of ethnobotany in Modern Medicine- *Adathoda vasica, Tinospora cordifolia, Curcuma longa* and *Tribulus terrestris* | **10** |

## Paper- VIII

## "Molecular Biology and Biotechnology"

## Section I

| Unit | Contents | 40 Hours |
|---|---|---|
| **1** | **Genetic Material**<br>1a: Nucleic Acids (DNA, RNA)<br>1b: Griffith's and Avery's transformation experiment, Harshey-Chase bacteriophage experiment<br>1c: DNA structure and Types of DNA<br>1d: DNA replication<br>1e: Types of RNA | **10** |
| **2** | **Recombinant DNA Technology**<br>2a: Introduction and Principle<br>2b: Enzymes involved in recombinant DNA technology<br>2c: Cloning Vectors (Plasmid, Bacteriophage and Cosmids)<br>2d: Gene Amplification: PCR techniques | **10** |
| **3** | **Genetic Engineering**<br>3a: Introduction<br>3b:Method of gene transfer- *Agrobacterium* mediated, Direct gene transfer by Electroporation, Microinjection, Microprojectil bambardment<br>3c: Transgenic Plants (*Bt* Cotton and Golden Rice)<br>3d: Applications of Genetic transformation<br>3e: Blotting Techniques- Northern, Southern and DNA Fingerprinting | **10** |
| **4** | **Plant Tissue Culture**<br>4a: Principle and Totipotency<br>4b: Components of culture media, Sterilization techniques<br>4c: Techniques in Tissue culture (Callus culture and Cell suspension)<br>4d:Organogenesis , Embryogenesis<br>4e: Anther culture<br>4f: Applications of Plant Tissue Culture | **10** |

## Paper- VIII

## "Horticulture, Forestry and Herbal Technology"

## Section II

| Unit | Contents | 40 Hours |
|---|---|---|
| **1** | **Horticulture**<br>1a: Introduction and importance<br>1b: Methods of Propagation a) Asexual b) Sexual<br>1c: Plant Nursery – Introduction<br>Types of Nursery<br>Infrastructure and requirement<br>Use of Fertilizers and Pesticides<br>Commercial importance | **10** |
| **2** | **Gardening and Ornamental Plants**<br>2a: Gardening- Definition, Objective, Types of Gardening, Importance and Landscape garden<br>2b:Ornamental Plants: Herbs, Shrubs, Trees, Indoor plants, Lawn and Climber | **10** |
| **3** | **Forestry**<br>3a: Introduction, Forest types of India<br>3b: Wild life and Biosphere reserves<br>3c: Social and Agricultural Forestry<br>3d: Forest research education and Training institutions<br>3e: Forest Acts<br>3f: Different Plant as a forest products | **12** |
| **4** | **Herbal Technology**<br>4a: Pharmacognosy- Definition and Techniques<br>4b: Phytochemicals – Alkaloids and Phenols<br>4c: Drug- types and adultration<br>4d: Scope of Pharmacognosy | **08** |