SHIVAJI UNIVERSITY KOLHAPUR

Syllabus for M. Sc. Part – II Botany (Regular)

(To be implemented from June 2010)

Course Titles

Semester III.

BO – 301 Plant Ecology, Forestry and Phytogeography

BO – 302 Plant Biochemistry

BO – 303 Special Paper I : Plant Protection / Plant Biodiversity

BO – 304 Special Paper II : Plant Protection / Plant Biodiversity

BO – 311 Practical based on BO – 301 and BO – 302

BO – 312 Practical based on BO – 303 and BO – 304

Semester IV

BO – 401 Plant Physiology.

BO – 402 Plant Propagation and Utilization of resources

BO – 403 Special Paper III : Plant Protection / Plant Biodiversity

BO – 404 Special Paper IV : Plant Protection / Plant Biodiversity

BO – 411 Practical course based on BO – 401 and BO – 402

BO – 412 Practical course based on BO – 403 and BO – 404

SEMESTER III

BO 301- Plant Ecology, Forestry and Phytogeography

1. Plant Ecology

1.1 **Ecosystem** :Structure, functions, energy dynamics (tropic organization) energy flow pathways, food chain, bio-geo chemical cycles of C, N, P and S, mineral cycles in terrestrial and aquatic ecosystems, concept of ecosystem stability and ecological management. (5)

1.2 **Population ecology:** - Definition, Characters, Demography, Life tables, Pyramids and Gene ecology. (3)

1.3 **Plant Community –** Concept, Qualitative & Qualitative features. of the plant community. (3)

1.4 **Biomes: -** Concept, major biomes of the world, wetlands- fresh water, coastal and marine biomes. (3)

1.5 **Environmental Monitoring:** - Principles, Methods used in monitoring pollution and indicator plants. (3)

1.6 **Threats to Ecosystem :-** Acid rains, Pesticidal effects ,CFC's ozone layer depletion global warming and sea level rise. (2)

1.7 **Ecological organizations** - WWF, UNESCO, MAB, UNEP, NIE, NWDB. (3)

2 Forestry

2.1 **Forest :-** Classification, extent of forests in India, Role of forests, National forest Policy, use of remote sensing techniques. (4)

2.2 **Agro forestry -** Definition, scope and advantages. (2)

2.3 **Social forestry** - A tool of integrated rural development. (3)

3:- **Phytogeography.**

3.1 Relationship of geography to plant distribution, phytogeographical regions of India (4)

3.2 Major Phytochoria of the world's flora, Western Ghat vegetation, mangrove vegetation of India. (4)

3.3 **Age and area Hypothesis** - endemism, hot spots, and endangered plants from red data book. (3)

Total Lectures : 40

BO 302 – Plant Biochemistry

1**. pH and Buffers:** Ionization of water, pH Scale, Bronsted- Lowry concept of acids and bases- strong and weak acids, ionization of weak acids, titration of weak acid by strong base. Buffers; Henderson- Hasselbalch Equation. (3)

2**. Carbohydrates** : Classification, asymmetry, isomerism, Kiliani cyanohydrin synthesis, mutarotation :

a) **Monosaccharides-** Tautomerization, reducing properties, dehydration, osazon formation, Reactions of Glycosides.

b) **Disaccharides –** Reducing and non- reducing sugars.

c) **Polysaccharides** – Homopolysaccharides (Properties and Examples). (4)

3. **Proteins :** Sources and properties of SCP, seed proteins and leaf Proteins. (2)

4. **Lipids :** Properties of fats and oils, chemical constants for lipids (e.g. acid number, iodine number etc.) Chemical composition and proprieties of groundnut oil, linseed oil and Garcinia butter. (3)

5. **Metabolism of Nucleotides** – Biosynthesis and degradation of purines and pyrimidines. (2)

6. **Analytical Biochemistry** : Isotopic tracer technique - Radioactive isotopes and their applications in agriculture, Geiger- Muller counter and Scintillation counting

. Electrophoresis- Principle, Electrophoresis mobility and factors, PAGE Electrophoresis, Types, Modifications and Applications. (5)

7. **Organic Acids:** A Brief account of Organic acids, Oxalic acids. Glycolic acid and Tartaric acid. (2)

8. **Essential Oils :** Sources of essential oils, general properties and extraction methods. chemical nature and properties and use of clove oil, *Santalum, Eucalyptus, Citrus* Lavender and Rose. (3)

9. **Resins :** Sources , Properties, Chemical nature, Classification and uses of Asafetida Canada Balsam. (2)

10. **Gums and Mucilages** - Sources, Properties, Chemical nature and uses of some common Gums and Mucilages. (2)

11. **Alkaloids :** Sources, Properties, Classification, Chemical nature Extraction and uses of Ergot alkaloids, Morphine and Nicotine. (2)

12. **Glycosides and Flavonoides –** Classification, sources, chemical nature, properties and uses of Digitalis and Senna glycocides and anthocyanins. (2)

13. **Pigments :** Sources, Properties, Classification, Chemical nature, Extraction and uses of carotenoids. (2)

14. **Tannins :** Sources, properties, classification, Chemical nature, Extraction and uses of myrobolans and bark, wood, galls and leaf tannins. (2)

15. **Antibiotics:** Sources, production, properties of Penicillin, Streptomycin, Chloramphenicol, Tetracyclin, Tyrothrecin, Griseofulvin. (2)

16. **Vitamins :** Concept, classification, sources, chemical nature, properties and deficiency diseases of vitamin A, D, E, and B complex. (2)

Total Lectures. - 40.

BO 303 – Special Paper I : Plant Protection : Crop Diseases and their management

1. Introduction of crop diseases and losses caused by them. (2)

2. Study of major crop diseases :

2.1. Study of fungal diseases of following crop plants with respect to distribution, causal organism, symptoms, disease cycle (wherever applicable) and their management

i) Cereals : Udbatta disease of Paddy, Loose smut of Wheat and Rust of Jowar. (4)

ii) Oil seeds : Rust of Ground nut and Soybean. (3)

iii) Pulses :Anthracnose of Bean. (1)

iv) Cash crops : Leaf blotch of Sugar cane, Leaf spot (*Taphrina*) of Turmeric, Rust of Coffee. (4)

v) Fruit crops : Anthracnose of Mango, Downy mildew of Grapes. (2)

vi) Vegetable crops : Powdery mildew of Pea, Ripe fruit rot of Chilli. (2)

2.2 Bacterial Diseases of following crop plants : (2)

Paddy : Leaf streak

Mango : Leaf spot

2.3 Mycoplasma Diseases of crop plants : (1)

Citrus : Citrus greening

2.4 Viral diseases of crop plants : Sugarcane mosaic, Papaya leaf curl. (2)

2.5 Angiospermic parasitic diseases of crop plants (3)

3. Plant disease epidemiology (6)

a. Pathometry

b. Epidemic avoidance by means other than chemicals

4. Post harvest market diseases of important fruit and vegetable crops. (5)

5. Seed Treatment – Introduction, methods of seed treatment, mode of action of various chemicals and *Trichoderma.* Equipments used and their significance. (3)

Total Lectures : 40

BO 304 – Special Paper II : Plant Protection : Animate Pests of crops and their Management

1. Introduction.

1.1 Definition of animate pest, general characters of insects, outline of class - Insecta, orders of economic importance of class- Insecta. (3)

1.2 General account of non-insect pests with respect to snails, mites, rats, nematodes, birds, damage caused by them and their management. (2)

2. Study of major insect pests with reference to their marks of identification, nature of damage, host range, life cycle and their management. (20)

2:1 Cereals : a) Paddy - grass hopper
b) Jowar - stem borer

2.2 Pulses : a) Tur - pod borer
b) Soybean - leaf roller

2.3 Cash crops : a) Sugar cane - mealy bug
b) Sugar cane - internode/stem borer

2.4 Oil seed crops: a) Ground nut - leaf miner
b) Castor – semi looper

2.5 Vegetables : a) Tomato - fruit worms
b) Okra - fruit borer

2.6 Fruits: a) Rhinoceros beetle
b) Mango stem borer
c) Citrus caterpillar

2.7 Fiber plants : Cotton boll worm

2.8 Polyphagus pests: a) Aphids
b) White grub
c) Termites
d) White fly

3. Stored grain and fruit pests and their management. (5)

a) Rust red flour beetle
b) Lesser grain borer
c) Saw toothed beetle
d) Rice moth
e) Khapra beetle

4. a) General methods of insect pest management. (5)

i) Mechanical

ii) Physical

iii) Cultural

iv) Chemical

b) Definition and examples of following methods of insect pest control. (5)

i) Pesticides of plant origin (excluding pyrethrum, nicotine and Azadirechtine)

ii) Biological control

iii) Autocidal methods

Total Lectures : 40

BO 303 – Special Paper I : Plant Biodiversity

1 **Introduction to Biodiversity** : Concept, importance of biodiversity with reference to natural resources, genetic resources, maintaining ecosystem and abiotic resources. (3)

2 Levels of Biodiversity: Species, Genetic, Ecosystem, Habitat, Plant and Animal Biodiversity in India, Kinds of Biodiversity – Alpha, Beta and Gamma. (3)

3 **Characterization of Biodiversity**: Definition, components of biodiversity, Taxonomic (evolutionary) biodiversity, Diversity of Plant Groups (Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms) based on important characters and their role in formulating systems of classification concept of species - taxonomical, ecological, phylogenetic and evolutionary. (10)

4 **Genetic diversity** : Concept, definition and terminology used in genetic diversity eco-clines, ecotypes, chemotypes, cytotypes, varieties, subspecies, polytypic, monotypic and hybrids. Molecular methods for assessing levels of genetic diversity and their importance. (4)

5 **Ecological diversity** - Concept, definition, ecological theories of species diversity, diversity within areas, species richness and diversity, Raunkiaer's life forms, Taxic functional diversity - Synecology and Autecology. (6)

6 Biodiversity crisis - Concept, causes - destruction of ecosystems, adverse changes in biotic and abiotic environment due to pollution, over exploitation of species, habitat fragmentation, exotic species, natural calamities , chain extinctions, biodiversity and future changes in climate. (10)

7 Plant diversity of Western Ghats Geographical position, climate, area, districts, forest types and products, Endemism, RET plants of the area, Western Ghats as megadiversity center of the world. (4)

Total Lectures : 40

BO 304 – Special Paper II : Plant Biodiversity

1 **Conservation of Biodiversity -** Concept and need for conservation, criteria for species to be conserved, ex - situ methods of conservation, polyhouse, botanical gardens, seed banks, gene banks, advantages and disadvantages, justification of ex situ conservation. (6)

2 **In situ conservation** - Concept, advantages and disadvantages, role of national parks, sanctuaries, biosphere reserves. conservation of habitats - intensification of agriculture and forest policies, scrutinizing developmental projects affecting natural habitats, restoration of degraded habitats.

ii. Conventions on Biological Diversity (CBD), CITES and Ramsar.

iii. Value of Biological Diversity. (8)

3 **The Biological Diversity Act 2002,** National Biodiversity Authority, Concept powers, function and approvals, State Biodiversity Board -concept, powers, functions and duties of Central and State Government Biodiversity Management Committees, Settlement of disputes between State Biodiversity boards, Appeal, Execution of orders, penalties. (8)

4 Forest Conservation Act and The Wildlife Protection Act. (2)

5 **Role of NGO in conservation of biodiversity -** WWF, IUCN ,UNCED BNHS, BSI, ZSI, concept, working and evaluation of NGO, local NGOs involved in biodiversity, role of taxonomy and taxonomists in conservation of biodiversity. (8)

6 **Plant Biodiversity and Ecosystem functioning** - concept, types- forest, grassland, desert and aquatic, functional attributes of an ecosystem, Biological diversity and maintenance of stability, primary and secondary productivity, food chain relationships, energy flow, material cycling, Homeostasis and feedback. Ecosystem services, Drivers and dynamics of Biodiversity. (8)

Total Lectures : 40.

BO 311. Practicals based on BO 301 and BO 302

I. Practicals based on BO 301 : Plant Ecology

1 .Study of Phytoplankton and macrophytes from water bodies.

2. Study of species diversity index of vegetation.

3. Study of vegetation analysis by Satellite imagery

4. Estimation of Primary Productivity of an ecosystem

5. To determine hardness of water and residual chlorine from water sample.

6. To study field vegetation with respect to stratification, canopy cover and composition.

7. Study of plants included in agro forestry and social forestry.

8. To locate the hotspots, phytogeographical regions and distribution of endemic plants in the map of India.

9. Plants in the map of India.

10. Monitoring pollution by analyzing media data of metropolis.

II. Practicals based on BO 302 : Plant Biochemistry

1. Determination of pKa value of dicarboxylic acid (Malic acid)
2. Qualitative test for carbohydrates
3. Determination of proteins by Lowry or Bradford or biuret method from plant material.
4. Saponification value of fat.
5. Qualitative tests for alkaloids.
6. SDS – PAGE for soluble proteins extracted for the given plant materials. And comparison of their profile by staining with Coomassie Brilliant blue or silver nitrate. Or other suitable electrophoresis method.
7. Qualitative tests for proteins.
8. Extraction and detection of anthocyanin and betacyanin from suitable plant material.
9. Qualitative tests for tannins.
10. Identification of plant source, properties and uses of gums, tannins, essential oils and antibiotics.
11. Estimation of Ascorbic acid (Vitamin C) from plant material

BO – 312. Practicals based on BO 303 and BO 304 : Plant Protection

I. Practicals based on BO 303 : Plant Protection

Following diseases should be studied with respect to causal organism, symptoms, disease cycle (wherever applicable) and their management

Practicals 1 – 16

1. Udbatta disease of paddy
2. Brown rust of Wheat
3. Loose smut of Wheat
4. Rust of Jowar
5. Rust of Ground nut
6. Powdery mildew of Pea.
7. Anthracnose of Bean
8. Rust of Soybean.
9. Leaf blotch of Sugarcane
10. *Taphrina* leaf spot of Turmeric
11. Rhizome rots of Turmeric
12. Anthracnose of Mango
13. Downy mildew of Grape
14. Leaf spot of Brinjal
15. Ripe fruit rot of Chili
16. Bacterial, Mycoplasma, viral and Angiospermic parasitic diseases.
17. Market diseases of vegetables (available in local market)
18. Market diseases of fruits (available in local market)
19. Recording the percentage of infection by Cobb's (1892) method in given infected crop for disease epidemiological study.
20. Study of the various methods of seed treatment and chemicals, bioagents used in seed treatment.

II. Practicals based on BO 304 : Plant Protection

1) General characters of insects ,their appendages and mouth parts (slides)
2) Mites, snails and nematodes, general characters and damage caused by them.

3-11) Study of insect pests with respect to marks of identifications ,nature of damage, life cycle and management.

i) Paddy grass hopper	ii) Jowar stem borer
iii) Tur pod borer	iv) Soybean leaf roller
v) Groundnut leaf miner	vi) Ground nut semilooper
vii) Sugarcane mealy bug	viii) Tomato fruit worm
ix) Rhinoceros beetle	x) Mango stem borer
xi) Citrus caterpillar	xii) Cotton boll worms
xiii) White grub	xiv) Termites
xv) Aphids	xvi) Heliothis sp.
xvii) White fly	xviii) Okra fruit borer

12-13 Stored grain and dry fruit pests: marks of identification, nature of damage, life cycle and management)

14-15 Study of any three chemicals of each group: Insecticides, Acaricides, Rhodenticides, Molluscicides with respect to properties, mode of action and formulations

BO – 312. Practicals based on BO 303 and BO 304 : Plant Biodiversity

I. Practicals based on BO 303 : Plant Biodiversity

1. Study of comparative diversity in Algae
2. Study of comparative diversity in fungi
3. Study of comparative diversity in Bacteria & Viruses
4. Study of comparative diversity in Bryophytes.
5. Study of comparative diversity in Pteridophytes.
6. Study of comparative diversity in Gymnosperms.
7. &8 -Study of comparative diversity in Angiosperms (Leaves, Infloresence, Flower, Fruit, and Seed)

9. Use of database in studying biodiversity.

10. Sampling methods for biodiversity studies.

II. Practicals based on BO 304 : Plant Biodiversity

The following practical should be conducted in the Field/lab with the help of photo graphs, herbarium, Floras . Red data book, at lest 5 (five) plants from each practical should be studied

1) Study of wild ornamental plants.
2) Study of wild edible fruits.
3) Study of critically endangered plants species
4) Study of endangered plants species.
5) Study of vulnerable plant species.
6) Study of Monotypic endemic genera of India.
7) Visit to NGO, working in the field of biodiversity and report writing.
8) Writing a proposal for need based NGO.

9.To study Honey Bees and plants yielding honey.

10. To study wild plants from above category by suitable sampling method (Quadrat) from nearby locality .

SEMESTER -IV

BO - 401. Plant Physiology

1. **Energy flow :-** Principles of thermodynamics, free energy and chemical potential redox reactions, structure and functions of *ATP* (2)

2) **Fundamentals of Enzymology** :- General aspects, allosteric mechanism, regulatory and active sites, isozymes, kinetics of enzymatic catalysis, Michalis- Menton equation and its significance. (4)

3) **Membrane transport and translocation of water and solutes** : plant water relations, mechanism of water transport ,membranes transport proteins . (4)

4) **Signal Transduction** : Overview, Receptors and G- proteins, Phospholipids, signaling, role of cyclic nucleotides, calcium- calcium –calmodulin cascade ,diversity in protein kinases and phosphatases, specifc signaling mechanisms,e.g. two- component sensor-regulator system in bacteria and plants, sucrose-sensing mechanism . (4)

5**) Photochemistry and photosynthesis** : General concept and historical background, photosynthetic apparatus and light harvesting complexes photo- oxidation of water, mechanisms of electron and proton transport, carbon assimilation- the Calvin cycle, RuBisCo, Photorespiration and its significance, C 4 Subgroups, CAM modifications (4)

6) **Respiration and metabolism** :- Modern concept of electron transport system and ATP synthesis in respiration, inhibitors of respiration, pentose phosphate pathway ,glyoxylate cycle, alternative oxidase, system, structure and function of lipids, fatty acid biosynthesis ,synthesis of membrane lipids, structural lipids and storage lipids and their catabolism. (4)

7. **Nitrogen fixation, Nitrogen and Sulphur metabolism** : overview, Biological nitrogen fixation,nodule formation and nod factors, mechanism of nitrate uptake and reduction, ammonium assimilation, sulphate uptake, transport and assimilation. (4)

8**. Sensory Photobiology :** History and discovery, phytochromes and cryptochromes and their photochemical and biochemical properties, photo physiology of light induced responses, cellular localization, and molecular mechanism of action of photomorphogenic receptors signaling ,and gene expression. (4)

9. **Plant growth regulators and elicitors** : Physiological effects and mechanism of action of auxins, gibberllins, cytokinins and ethylene. Abscisic acid brassinosteroids, polyamines,jasmonic acid and hormone receptors, signal transduction and gene expression. (2)

10) **The flowering process :** Photoperiodisim and its significance endogenous clock and its regulation , floral induction and development genetic and molecular analysis, role of vernalisation. (4)

11) **Stress Physiology :-** plant response to biotic and stress, mechanism of biotic and abiotic stress tolerance, HR and SAR, water deficit and draught resistance salinity stress, metal toxicity, freezing and heat stress, oxidative stress. (4)

Total Lectures : 40

BO – 402. Plant Propogation and Utilization of Resources

1. Plant Propagation :

1.1 **Plant Propagation :** Introduction**,** methods, propagation structures, media, fertilizers, sanitation and containers. (4)

1. 2. **Principles and techniques of propagation by seeds** : Germination, types of seed dormancy and breaking, growing seeds in field by nurseries. (4)

1. 3. **General aspects of asexual propagation** : General aspects and genetic variation in asexually propagated plants, production and maintenance of pathogen free clones. Anatomical and Physiological basis of asexual propagation. (4)

1.4Techniques of grafting and budding and layering : Type sand process, in budding and grafting, compatibility between stock and scion. Process of layering and factors affecting regeneration of plants. (4)

1.**5 Tissue culture and Micro propagation :** Micropropagation technique and its significance, factors affecting success in producing plant by micropropagation, control of pathogen through micropropagation. (4)

II. Plant biodiversity and utilization of plant resources :

2.1. Economic importance and utilization of Algae, Fungi, Bacteria, Lichens and Bryophytes with reference to food, fodder manure, medicine, industry, energy and pollution control. (4)

2.2**. Domestication of plants :** World centers of primary diversity, domestication, origin, evolution botany, cultivation and uses of important cereals, forage and fodder crops. (4)

2.3. **Ethanobotany :** Principles and scope, drug obtained from roots, stem, bark, leaves, flowers, buds, fruits and seeds. (4)

2.**4 Industrially important plants** : Plants yielding rubber, sugar and starch, tannins and dyes gums and resins, beverages and narcotics (4)

2.5 Petrocrops, aromatic plants, plants used in sericulture aesthetics, firewood timber yielding and papermaking plants.

Total Lecture 40

BO 403. Special Paper III : Plant Protection : Recent Advances in Plant Protection

1.**Introduction :**

1.1 Recent advances in plant protection a need of recent era. (2)

1.2 Pest: Origin, factor responsible, measurements of pest population. (3)

2. **International plant Protection conventions.** (4)

2.1 Domestic and international quarantine.

2.2 International support to the plant protection viz . Commonwealth Agricultural Bureau International (CABI), Co-operative Research Center for Tropical Pest Management (CRTPM), Food And Agricultural Organization, (FAO)

International Agricultural Research Center (IARC) World Health Organization (WHO)

3. Plant Protection Organization in India :

3.1 Plant protection Directorate ,structural units and their functions. (3)

3.2 Central Plant protection Research Station, Plant protection Training Institutes and ateir working. (2)

4. **Disease forecasting** - Concept , Prevailing conditions in some diseases, Models in diseases forecasting. (5)

5**. IDM** - Concept, definition Components of IDM, output of IDM in managing various diseases, Limitations of IDM. (3)

6**. IPM -** Concept, definition, Historical account, Need and objectives , Strategies and tactics (Direct and indirect). (5)

7**. Autocidal methods** - Concept, Male sterility method, Attractants, Repellents, Pheromones, Juvenile hormones, Antifeedants. (5)

8. **Weeds as Pathogens** - Weeds and damages caused by them, Exotic Weeds. (2)

9. Weed Management:

8.1 Weed research in India. (2)

8.2 Mycoherbicides and insects in weed management.

(1)

8.3 Integrated weed management. (1)

10. **Plant Protection and sutainable Agriculture**.

Concepts, Asian and Indian scenario and future outlooks. (2)

Total Lectures : 40.

BO – 404. Special Paper IV: Plant Protection : Plant Protection Techniques

1. Koch's Postulates, Uses and Limitations. (3)
2. Study of special culture media for Fungi, Bacteria and Mycoplasma. (3)
3. Biostatistics : Mean, Mode and Median, Standarad.deviation., Frequency histogram Polygon, Line graph and Pie diagram. (5)
4. Use of computers in plant protection. (4)
5. Use of remote sensing and aerial photography and lasers in plant protection. (5)
6. Mycorrhiza and their applications in plant protection. (2)
7. Biotechnology in plant protection :
   7.1 Herbicide resistance and genetic engineering in weed management. (4)
   7.2 Transgenic plants, use of viruses in developing transgenic plants. BT cotton. (4)
8. Biological control with microbial pesticides for control of insects and plant diseases. (4)
9. Residual analysis of pesticides by TLC, GC and HPLC. (4)
10. Farmer's friendly pesticides, their preparation an uses. (2)

Total Periods : 40.

BO - 403. Special Paper III : Plant Biodivesity

1 **Biodiversity levels** : Global level, country level .India as a megabiodiversity country, Hot Spots of biodiversity ,concept of global hot sports , Hot spots in India -Eastern Himalaya and western Ghats ,Biogeographic Zones of India (6)

2 **Endemism :-** Concept ,Kinds, Significance, Endemism in India with reference to Angiosperms, Hot spots of endemism in India. Endangered endemic
Plant Species of India (at least 10 with brief information) (5)

3 **IUCN: -** Criteria & categories,RET plants of Western Ghats with Special
. reference to . Maharashtra , Red Data Book -concept & importance (at least 10 plants from every category is expected) (5)

4 :- **Plant Bioresources of Northern Western Ghats -** wild edible fruit Plants, Gums,resins, dyes, medicine, fodder, ornamentals, fibre, timber,essential oil ,fuel,honey (Minimum five plants from each category) (10)

5 **Environmental accounting** :- Values of Biodiversity -consumptive ,productive, ethical ,aesthetic and optional. Merits & Demerits Of environmental accounting, valuation techniques , General ,Specific, Valuation of welfare losses. (6)

6 **Biodiversity and Sustainable development** : Prospects and concern
Biodiversity education ecological conservation , community participation for sustainable development (4)

7 **Conservation in India,** National Parks **,** Bioreserves ,Wildlife Sancturies, World Heritage, Botanical Gardens and their role in conservation of Biodiversity (4)

Total Lectures :40

BO 404. Special Paper IV : Plant Biodiversity

1 **Methods for Biodiversity** to study sampling to determine alpha, beta , aquatic Biodiversity and Biodiversity of Soil. (5)

2 **Remote sensing technique to study Biodiversity** - concept, technique in brief remote sensing of vegetation and water. (5)

3 **Biostatistics –** Introduction, applications, uses of Biostatistics. Mean, Mode, Median, Standard deviation, Frequency, Histogram, Polygon, Line graph, Pie diagram. (6)

4 Role of Biotechnology, in conservation of biodiversity, Restoration and Species recovery programs. (3)

5 **Domesticated Biodiversity** in India and its conservation ,NBPGR, organization working and role. (3)

6 **Biodiversity conservation in India -** National Policy and Goals, Need for Conservation, Approach, current efforts, Gaps and Action programs with reference to survey of Biodiversity and national data base. (8)

7 **International conventions –** (3)

1) Ramsar convention on wetland (1971)
2) Paris convention on Natural Heritage (1972)
3) Washington convention on trade of wild flora and fauna (1973)
4) Convention on Biodiversity (1992)

8 **Tourism and Biodiversity** Eco-tourism, Ecocide. Sustainable tourism, development, public awareness and using environmental calendar activities. (4)

9 **Global warming :** causes, effects and remedies, Green warriors and Green organizations of India. (3)

10 **Biodiversity** Angiosperms of Satara with special reference to Mahabaleshwar, Kas, Khatav, Ajinkyatara fort and Vasota using floristic work

Total Lectures : 40

BO – 411. Practicals based on BO – 401 and BO – 402

I. Practicals based on BO – 401 : Plant Physiology

1. To determine the activity of enzyme ATPase.
2. To determine chlorophyll a:b ratio in C3 and C4 plants.
3. Study of enzyme lipase.
4. Estimation of total nitrogen and crude proteins.
5. Estimation of sucrose.
6. To determine the rate of respiration in germinating seeds.
7. To Study free proline accumulation in plants under stress.
8. To determine the relative water content.

9To determine the Km value.

10.To study the effect of ultraviolet radiations on anthocyanin content.

11. Submission of short term project on any one topic in plant physiology.

II. Practicals based on BO – 402:Plant Propogation and Utilization of Resources

1. Study of budding and grafting.
2. Study of layering and cutting.
3. Study of food crops : wheat, maize, soybean, sugarcane, groundnut.
4. Study of forage / fodder crops : *Sesbania*, Lucern, Elephant grass etc.
5. Study of Plant fibers : a. Textile fibers – Cotton, *Agave*.
   b. Cordage fibers – Coir.
   c. Stuffing – Silk cotton.
6. Study of Medicinal and Aromatic plants – *Withania somnifera*.

Asparagus racrmosus, Adhatoda zeylanica, Jasminum sp., Cymbopogon sp.

7. Prepatation of ayurvedic drugs (any two)
8. Study of plants yielding essential oils.
9. Study of plants as Petro crops, Sericulture Rubber, Timber yielding plants.
10. Study of gums, resins tannins and dyes (simple tests)
11. Field survey : Visit to nursery, report.

BO – 412. Practicals based on BO – 403 and BO – 404 : Plant Protection

I. Practicals based on BO - 403 : Plant Protection

1 To survey and study of pests of locally available crop fields.

2 To survey of plant diseases from the local crop fields.

3 To Study common weeds from the local crop fields.

4 To study viability of weed seeds and germination rate.

5 To study microbial culture of soil from crop fields.

6 To9 study microbial culture of aerospora from the crop fields.

7 To study aquatic fungi by culture methods

8 To study autocidal control equipments.

9 To Study common herbicides used in weed of control.

10 To Study effect of herbicides on weeds regarding.

1) Relative water content.
2) Chlorophyll content

11 Study of fungal diseases of weeds

1) Powdery mildew of *Portulaca*
2) *Cercospora* on *Eicchornia*
3) Rust of *Euphorbia*
4) Tar Spot disease *Cynadon*
5) Powdery mildew on *Xanthium.*

II. Practicals based on BO – 404. Plant Protection

1. Collection and preservation of plant diseases and pests.
2. Verification of Koch's postulates. (2 P)
3. Preparation of special culture media for pathogenic fungi.
4. Study of soil fungi.
5. Study of Mycorrhiza and VAM fungi.
6. Mictometry and Biostatistics as per theory syllabus. (2P)
7. Aerobiological survey of crop fields.
8. Study of mycoflora of crop seeds.
9. Pathophysiology – Estimation of plant pigments.
10. Pathophysiology – Estimation of proteins.
11. Pathophysiology – Estimation of polyphenols.
12. Residual analysis of methyl parathion by TLC.

BO 412 Practicals based on BO - 403 and BO - 404

I. Practicals based on BO – 403 : Biodiversity

1 and 2 Preparation of culture media and propagation using suitable explants.

3 To study principle and method of cryopreservation .

4 To study quantitative estimation of plant biodiversity.

5 To study floral biology of wild plants.

6.& 7 To discover and describe an inventory of local species diversity

8 & 9 Preparation of maps showing natural vegetation zones of the world, floristic regions and vegetation zones of India.

10. Mapping of biodiversity by using convenient method.

II. Practical based on BO – 404 : Biodiversity

1 To study wild species used in crop improvement and suitable for energy crisis.

2 To study wild species of legumes and grasses.

3 To study wild species suitable for human health and in industries

4 To study lichen types & internal structure.

5 To study role of flowering plants as indicators of pollution.

6 to 9 To study domestication of wild / ornamental /edible/medicinal plants

a. Germination studies.
b. Water requirement
c. Soil requirement
d. Light requirement.

10 To survey of exotic plants by suitable method .

SUGGESTED READINGS

BO – 301. Plant Ecology, Forestry and Phytogeography

1 Ecology Principles and Applications 2nd Edition J.L. Chapman 1999

2 Ecology and quality of our environment 2nd Edition C.H. Southwick 1976

3 Tropical ecosystems ecology & Management 1992, Editors .K.P. Singh & J.S. Singh 1992.

4 . V.P.Agrwal 1990 Forests in India.

5 M.P. Singh, S. Chinnamani R.N. Trivedi 1993 forestry & environment

6 A.P. Dwivedi , 1992.Agro forestry, Principles & practices

7 R. Mishra.Ecology Workbook

8 R.S. Ambasht 1990. Plant Ecology

9 R. Mishra 1993 Progress of Plant Ecology in India.

10 E. J. Koromand. 1996. Concept of Ecology. E

BO – 302. Plant Biochemistry

1. Buchanan . B.B. Gruissem, W. and Jones .R.L. 2000 Biochemistry and Molecular Biology of Plants , American Society of Plant Physiologists, Maryland ,USA.
1. Collins, S.A. and Edwards, D.H. Lefebyre ,S.D. and Layzell, D.B. (eds) 1997 .Plant Metabolism (IIEds) Longmann, Essex .England.
2. Darnel, J. 2000. Molecular Cell Biology (4th Ed.) W. H. Freeman and Co. New York U.S.A.
3. Dryer, R. L. and Lata G. F. 1989. Experimental biochemistry. Oxford University Press, New York.
4. Hackett, P. B. Fuchs, J. A. and Messing J. W. 1988. An Introduction to Recombinant DNA Techniques : Basic Experiments in Gene Manipulation. The Bengamin/Curnmings Publishing Co, Inc., Menlo Park California.
5. Harborne J. B. Phytochemical Methods.
6. Jain J. L., Jain, Sanjay, and Jain Nitin, 1979. Fundamentals of Biochemistry (6th revised Edition). S. Chand and Chand Company. LTD. New Delhi.
7. Lea P.J. and Leegood ,R.C. 1999 Plant Biochemistry and Molecular Biology (2 nd Edition) John Wiley and sons. Chichester, England.
8. Lodish . H. Berk ,A. Zipursky .S.L. Matsudaira. P. Baitimo D and Old .R.W. and Primrose, S.B. 1989. Principles of Gene Manipulation Blackwell Scientific Publications Oxford UK.

BO – 401. Plant Physiology

1. Buchanan. B.B. Gruissem, W and Jones. R.L. 2000 Biochemistry and Molecular Biology of plants. American society of plant physiologists, Maryland USA.
2. Dennis D.T. Turpin. D.H. Lefebyre, D.D. and Layzell, D.B.(eds) 1997. Plant metabolism (sec. Edn) Longman, Essex, England.
3. Galston, A.W. 1989. Life processes in plants. Physiology, John wiley and sons Inc new. York USA
4. Hopking W.G. 1995. Introduction to plant physiology John wiley and sons Inc.New York USA.
5. Moore .T.C. 1989 . Biochemistry and Physiology of plant Hormones springer-verlag. New York , USA.
6. Nobel P.s. 1999, Physiochemical and Environmental plan Physiology
7. (2^{nd} Edn.) Academic press. San Diego.USA.
8. Salisbury. F.B. and Ross c.W. 1992 plantPhysiology (4^{th} edns). Wadsworth publishing co. California USA.
9. Singhal .G.Sopory,S.K. INgang.K.D. and Govindjee 1999 Concept in photobiology; Photosynthesis and morphogenesis. Narosa Publishing House. New Delhi.
10. Taiz .L.and Zeiger, E. 1998 plant physiology (2^{nd} Edn) Sinayer E. Associates. Inc. publishers. Massachusetts, USA.
11. Thomas. B.And Vince- prue.D. 1997 Photoperiodism in plants (2^{nd} Edn) Academic press san Diego. USA.
12. West Hoff, P.1998 Molecular plant development from Gen to plant , oxford university press, Oxford,UK.

BO – 402. Plant Propagation and Utilization of Resources

1. Anonymous. The Wealth of India – Raw Materials All Volumes CSIR New Delhi.
2. Atkinson E. T. 1980. Economic Botany of Himalayan Regions. Corned Pub. New Delhi.
3. Chandrasekharan S. N. and Parthasarathy S. V. 1948. Cytogenetics and Plant Breeding. P. Varadacharry and Co. Madras.
4. Chopra R. N. 1933. Indigenous Drugs of India. The Art Press Calcatta.
5. Dastur J. F. 1951. Medicinal Plants of India and Pakistan D. B. Taraporwala and Sons. Bombay.
6. Hayes W. B. 1953. Fruit Growing in India Kitabestan Alhabad.
7. Harttman. Plant Propagation.
8. Jayaraman J. 1981. Laboratory Manual in Biochemistry. Willey Eastern Ltd. New Delhi.
9. Sambamurthy A. V. S. S. and Subrahmanian N. S. 2000. Economic Botany of Crop Plants. Asiatech Pub. Inc. New Delhi.

Suggested Readings for Plant Protection Special Papers

1) Atwal,A.S. (1936) Agricultural Pest of India and South East Asia.
2) Chattopadhyays, S. P. (1987) Principles and Procedures of Plant Protection.
3) Dhaliwal, G. S. and Arora Ramesh (19940) Trends in Agricultural Pest Management.
4) Jha, D. G. (1987) Applied Agricultural Entomology.
5) Metcalf, C. L. and Flint, W. P. (19830) Destructive and Useful Insects.
6) Pedigo, L. P. (1996) Entomology and pest Management
7) Saha, L. R. and Dhaliwal G. S. (2006) Handbook of Plant Protection
8) Suliman, M. (1920) A Textbook of Entomology.
9) Shrivastava, V. P. A Textbook of Applied Entomology.
10) H. K. Baruah, P Baruah, A (1984) – Textbook of plant pathology
11) Bilgrami K. S. and Dube H. C. (1990) Text book of Modern pathology
12) Diskson J. C. (1964) Diseases of Field crop
13) Jones D. G. (1987) Plant pathology – Principles and practices.
14) Mehrotra R. S. and Ashok Aggarwal (2005) Plant Pathology.
15) Nagarajan S. (1999) Plant Diseases and Epidemiology
16) Pathak V. N. (1980) Diseases of Fruit crops.

17) Rama Krishnan T. S. (1974) Diseases of Millets.
18) Rangaswamy G (1975) Diseases of crop plants in India.
19) Suryanaryana D. (1974) Seed pathology
20) Singh R. S. (1998) Plant Diseases
21) Rodertis D. A. and Botherayd C. W. (1995) Fundamental Plant Pathology.
22) L. R. Saha.Hand :Book of Plant Protection
23) P. B. Chatterjee :Plant Protection Techniques
24) H. Sill (Jr): Webster,Plant Protection
25) S. Nagarajan and K. Mualidharan:Dynamics of Plant Protection .
26) ICAE, Publication.:Crop Diseases Calender
27) K. R. Aneja.: Experiments in Microbiology, Plant Pathology and Tissue Culture
28) D. G. Jones:Plant Pathology : Principals and Practices.
29) V. S. Rao. : Principles of Weed Science
30) N. C. Joshi:Manual of Weed Control.
31) S. N. Rashid and M. M. A. Khan : Dictionary of Remote Sensing
32) R. S. Metrotra. : Plant Pathology
33) S. N. Chandrashekhar : Cytogenetics and Plant Breeding
34) S. Subramanian and A. Mohamedoli R. Jaykumar. : All About Weed Control

Journals :
1. Crop Protection
2. Geobios
3. Journal of Entomological Society of India.

Suggested Reading for Biodiversity :

1) Veena Arora 202 Natraj Publishers, Dehradun Publisher : The Biological Diversity Act ,
2) Edt Heyword, V.H.: Global Biodiversity Assessment Part I
3) M.S. Prashanth : Environmental Studies
4) M.C. Dash : Fundamental of Ecology
5) D.K. Asthana ,Meera Asthana : Environment :- Problems & Solutions
6) D.K.Belsare : Introduction to Biodiversity
7) Surendra Singh : Geomorphology and Remote Sensing in Environmental Management
8) N.Das Gupta : Environmental Accounting
9) Erach Bharucha : Textbook of Environmental Studies
10) M.L. Narasaiah : Biodiversity & Sustainable Development
11) M.L.Narasaiah : Education & Biodiversity
12) R.L. Panigrahy, Lingaraj Patro : Biodiversity Conservation and Sustainable Development
13) John R. Jensen : Remote Sensing of the Enviroment
14) M.M. Anji Reddy.: Remote Sensing and Geographical Information Systema
15) Veer Bala Rastogi : Fundamentals of Biostatics
16) P.K. Banerjec : Introduction to Biostatistics

Semester I

Sr No	Old Course	New Course
	BO – 101 Biology and Diversity of Viruses Bacteria and Fungi	BO – 101 Biology and Diversity of Viruses Bacteria and Fungi
	BO- 102 Biology and Diversity of Algae, Bryophytes and Pteridophytes	BO- 102 Biology and Diversity of Algae, Bryophytes and Pteridophytes

	BO – 103 Biology and Diversity of Gymnosperms and Paleobotany	BO – 103 Biology and Diversity of Gymnosperms and Paleobotany
	BO –104 Taxonomy of Angiosperms	BO –104 Taxonomy of Angiosperms
	BO – 111 Practical course based on BO – 101 and BO – 102	BO – 111 Practical course based on BO – 101 and BO – 102
	BO – 112 Practical course based on BO – 103 and BO – 104	BO – 112 Practical course based on BO – 103 and BO – 104

Semester II

Sr No	Old Course	New Course
	BO – 201 Plant Structure,Development and Palynology	BO – 201 Plant Structure,Development and Palynology
	BO –202 Tools and Techniques in Botany	BO –202 Tools and Techniques in Botany
	BO – 203 Cell and Molecular Biology of Plants	BO – 203 Cell and Molecular Biology of Plants
	BO – 204 Cytogenetics and Evolution.	BO – 204 Cytogenetics and Evolution.
	BO – 211 Practical course based on BO – 201 and BO – 202	BO – 211 Practical course based on BO – 201 and BO – 202
	BO – 212 Practical course based on BO – 203 and BO – 204	BO – 212 Practical course based on BO – 203 and BO – 204

Semester III

Sr No	Old Course	New Course
	BO – 301 Plant Ecology, Forestry and Phytogeography	BO – 301 Plant Ecology, Forestry and Phytogeography
	BO- 302 Plant Biochemistry	BO- 302 Plant Biochemistry

	BO – 303 Special Paper I : Plant Protection / Plant Biodiversity BO – 304 Special Paper II : Plant Protection / Plant Biodiversity	BO – 303 Special Paper I : Plant Protection / Plant Biodiversity BO – 304 Special Paper II : Plant Protection / Plant Biodiversity
	BO – 311 Practical based on BO – 301 and BO – 302	BO – 311 Practical based on BO – 301 and BO – 302
	BO – 312 Practical based on BO – 303 and BO – 304	BO – 312 Practical based on BO – 303 and BO – 304

Semester IV

Sr No	Old Course	New Course
	BO – 401 Plant Physiology	BO – 401 Plant Physiology
	BO – 402 Plant Propagation and Utilization of resources	BO – 402 Plant Propagation and Utilization of resources
	BO – 403 Special Paper III : Plant Protection / Plant Biodiversity	BO – 403 Special Paper III : Plant Protection / Plant Biodiversity
	BO – 404 Special Paper IV : Plant Protection / Plant Biodiversity	BO – 404 Special Paper IV : Plant Protection / Plant Biodiversity
	BO – 411 Practical course based on BO – 401 and BO – 402	BO – 411 Practical course based on BO – 401 and BO – 402
	BO – 412 Practical course based on BO – 403 and BO – 404	BO – 412 Practical course based on BO – 403 and BO – 404