

**Department of Botany, University of Allahabad**  
**M.Sc. Ag. BOTANY SYLLABUS**  
**Choice Based Credit System (CBCS)**  
**(To be implemented from the Academic Year 2016-17)**  
**(Distribution of different courses and credits in various semesters)**

**SEMESTER-I**

Course Code	Marks	Course Title	Credits
AGB 501	100	Introductory Microbiology and Plant Pathology	3
AGB 502	100	Cytogenetics, Molecular Genetics and Plant Breeding	3
AGB 503	100	Crop Physiology, Growth and Nutrition and Soil-Water Relation	3
AGB 504	100	Horticulture and Social Forestry	3
AGB 531	100	Lab Work I ( based on Course AGB 501and AGB 502 (Excursion/field work/ Project)	4
AGB 532	100	Lab Work II (based on Course AGB 503 and AGB 504 (Excursion/field work/Project)	4
	Total 600		Total credits: 20

**SEMESTER- II**

Course Code	Marks	Course Title	Credits
AGB 505	100	Principles of Plant Disease Control	3
AGB 506	100	Breeding of Crop Plants	3
AGB 507	100	Cell Biology and Bioenergetics	3
AGB 508	100	Seed Technology and Seed Biology	3
AGB 533	100	Lab Work III ( based on Course AGB 505 and AGB 506)	4
AGB 534	100	Lab Work IV ( based on Course AGB 507 and AGB 508)	4
	Total 600		Total credits: 20

**SEMESTER-III**

Course Code	Marks	Course Title	Credits
AGB 601	100	Microbiology and Plant Pathology	3
AGB 602	100	Seed Processing and Storage	3
AGB 603	100	Weed Control	3
AGB 604	100	Plant Metabolism and Special Problems of Crop Physiology	3
AGB 631	100	Lab Work V ( based on Course AGB 601 and AGB 602)	4
AGB 632	100	Lab Work VI (based on Course AGB 603 and AGB 604)	4
	Total 600		Total credits: 20

**SEMESTER IV**

Course Code	Marks	Course Title	Credits
AGB 605	100	Agro-ecology of Crop Plants	3
AGB 606	100	Problems in Crop Production	3
AGB 607	100	Dissertation/Thesis	3
AGB 633	100	Lab Work VII (based on Course AGB 605 and AGB 606)	4

Course Code	Marks	Elective*	Credits
AGB 651	100	Crop physiology, soil and water management	3
AGB 652	100	Cytogenetics and Plant Breeding	3
AGB 653	100	Microbiology and Plant pathology	3
AGB 634	100	Lab Work VIII( based on Course AGB 651 and AGB 607	2
AGB 635	100	Lab Work VIII (based on Course AGB 652 and AGB 607	2
AGB 636	100	Lab Work VIII (based on Course AGB 653 and AGB 607	4
	Total 600		Total credits <b>20</b>

\*The candidates are required to choose only one elective paper.

## **M.Sc. Ag. BOTANY**

### **INSTRUCTION FOR THE PAPER- SETTER**

The question paper will consist of five units I, II, III, IV and V. Each unit will have two questions, out of that one question must be answered, and each question will carry 12 marks. Total five questions must be answered.

### **INSTRUCTION FOR THE CANDIDATES**

Candidates are required to attempt FIVE questions; each question will carry 12 marks.

### **Semester I**

#### **AGB 501: Introductory Microbiology and Plant Pathology**

**L—T—P—C**  
**3--- --4----5**

#### **Unit I**

Historical, symptomology, properties and nature of plant viruses, modes of transmission of plant viruses, serology and mutations in plant viruses. General principle of control of virus diseases of potato, Hibiscus cucurbits, beans and banana.

#### **Unit II**

Historical, broad outlines of morphology, reproduction, nomenclature and classification of plant pathogenic bacteria and mycoplasmas. A knowledge of more important bacterial diseases with special reference to crown gall, citrus canker, fire blight of pear, sugarcane stripe and bacterial stripe and bacterial wilt of crops.

#### **Unit III**

History of Mycology, Taxonomy and nomenclature of fungi, Origin of phylogeny of fungi, different systems of classification and their basis, Physiology of fungi, structure and life history of the chief representatives of fungi.

#### **Unit IV**

Detailed study of fungal diseases of bajra, maize, wheat, barley, rice, cotton, sugarcane, potato, arhar, pea, groundnut, mustard, linseed, coriander, peach, mango and papaya.

### **Unit V**

History of plant pathology dissemination of diseases, modes of infection symptomology, physiology of parasitism mechanism of disease resistance, fungicides and their action effect of parasitism, principles and methods for the prevention and control of disease, toxicity caused by control measures.

## **AGB 502: Cytogenetics, Molecular Genetics and Plant Breeding**

**L—T—P—C**  
**3--- --4----5**

### **Unit I**

Interphasic nucleus- its structure and chemical composition. Cell division- A detailed study of mitosis and meiosis. Morphology of chromosomes, special types of chromosomes. Identification of the probable parents of allopolyploids, Methods of nullisomic analysis, alien chromosomal manipulation studies. Role of polyploidy in plant evolution.

### **Unit II**

Chromosome theory of mendelian inheritance, special consequences of differences in gametogenesis in higher plants and animals. Genetic control of chromosomal behaviour. Hypothesis of chromosomal crossing over and chiasmata type theory, sex determination, structural changes in chromosomes, their cytogenetics, breeding behaviour and evolutionary significance, Cytogenetics of haploids, autopolyploids, allopolyploids trisomics, monosomics, nullisomics and breeding behaviour.

### **Unit III**

Chromosomal crossing over, linkage maps, double crossing over coincidence and interference, test courses, evidence that crossing over is associated with chromosomal exchange factors affecting crossing over polyploids and inversions. Male dressophila crossing over by breakage of chiasmata, chiasmata terminalization, multiple allelism, pseudoalleles, position, mutation rates, mutator genes, radiation and chemical induced mutations. Mechanism of induction of chromosomal structural changes paramutation.

### **Unit IV**

Structure and replication of DNA and RNA, DNA theory as the classical basis of heredity. Recombination in micro-organisms, structure of genes, Molecular aspects of chromosome structure, Molecular aspects of mutation, Genetic code and genetic control of protein synthesis.,

### **Unit V**

History of Plant breeding, its present status and scope, Mode of reproduction in crop plants, Heterosis and its application, Plant introduction and its utility in crop improvement, general methods of crop improvement, Elementary knowledge of statistics as applied to agriculture.

## **AGB 503: Crop Physiology, Growth and Nutrition and Soil-Water Relation**

**L—T—P—C**  
**3--- --4----5**

### **Unit I**

Nature of plant cell membranes, permeability and absorptions, methods measuring permeability and absorptions, methods of measuring permeability of protoplasmic membranes to solute, cellular physiology. Mineral nutrition of plant, uptake and translocation of solutes

### **Unit II**

Regional soils of India in relation to crops and their production, Secondary effects on micro flora Formation of usar soils and types of usar, control of alkalinity and salinity, salt tolerance of crops with examples of improved varieties, effects of salinity of plant growth and metabolic processes.

### **Unit III**

Absorption of water, mechanism of water movement in the soil and plant water potential in relation to evaporation and soil water condition, Characteristics of root systems, Drought resistance, chemical control of water relations, Concept of water requirement of crop and the critical period of water requirement of plants and its significance in crop production.

### **Unit IV**

Growth, methods of growth analysis, control of growth by hormones, mechanism of action of growth regulators, control of differentiation, flowering, dormance and senescence.,:

### **Unit V**

Physiology of flowering, photoperiodism and vernalization – their impact on crop production, Physiology of fertilization, fruit growth and ripening.

## **AGB 504: Horticulture and Social Forestry**

**L—T—P—C**  
**3--- --4----5**

### **Unit I**

Horticulture- Importance, present position, scope with reference to production, productivity and marketing both in India and abroad, production and marketing problems and remedial measures, rootstocks, special structures for propagation like mist chambers, hot beds, cold frames etc. Physiology of rooting, nurseries and their management.

### **Unit II**

Origin, history, breeding and production technology of important fruits such as mango, banana, citrus, guava, papaya, grape, pineapple, litchi, pomegranate, ber, apple, pear and walnut with special reference to climate, soil, propagation, cultivars, nutrition, irrigation and other orchard management practices, Origin, history, breeding and production technology of important plantation crops like coconut, rubber, tea with special reference to climate, soil, propagation, cultivars, nutrition, irrigation and other management practices.

### **Unit III**

Origin, history, breeding and production of important vegetables, spices and condiments like tomato, brinjal, chillies, radish, turnip, carrot, beans, peas, onion, potato, okra, cucurbits, coriander, garlic etc. with special reference to climate, soil, seed production including development of hybrids, cultivars, nutrition, irrigation and other management practices.

### **Unit IV**

History of gardening in India, their principles and practices with special reference to Nunggal, Japanese and English gardens. Garden parts ( features ), their materials and methods of development including garden ornaments. Classification and utilization of ornamental trees, shrubs, climbers, herbaceous, perennials, annuals and foliage plants.

### **Unit V**

Preparation and management Bonsai, Home gardens, Production of important flower crops like orchids, marigold, chrysanthemum, rose, jasmine, dahlia with reference to climate, soil, propagation, cultivars, planting methods, nutrition, irrigation etc. Prolonging, storage adverse life of cut flowers and their utilization.

## **AGB 531: Lab WorkI based on Course AGB 501 and AGB 502**

## **Semester II**

### **AGB 505: Principles of Plant Disease Control**

**L—T—P—C**  
**3--- --4----5**

#### **Unit I**

Quarantines and prohibitions, general idea of quarantine regulations in force in India and Uttar Pradesh, Crop rotation, field sanitation, eliminations of alternate hosts, chemical eradication.

#### **Unit II**

Biological, cultural and chemical concept of plant diseases, Effect of environment in pathogenesis, Defense mechanisms in plants, Disease control through disease resistance varieties.

#### **Unit III**

Genetics of host-parasite interactions. Toxins and plant disease, accumulation of toxic substances, Enzymes and plant disease, Nutrition of plant pathogens, Physiology of diseased plants.

#### **Unit IV**

Physical means of plant disease control, Chemotherapy and chemotherapeutant,

#### **Unit V**

Topical mechanism and systemic chemotherapy, Systemic fungicides and bacteriocides, Biological control of plant diseases.

### **AGB 506: Breeding of Crop Plants**

**L—T—P—C**  
**3--- --4----5**

#### **Unit I**

Origin and evolution with reference to some important crop plants, Genome differentiation in cultivated polyploidy species, Biological system of plant introduction, its scope and importance in plant breeding, acclimatization.

#### **Unit II**

Reproductive systems in cultivated plants, their genetic consequences and their relationship with plant breeding methods. Significance of genetic diversity and recombination in plant breeding, Genetic basis of breeding, self pollinated crop and their breeding methods.

#### **Unit III**

Genetic basis of breeding, self pollinated crop and their breeding methods, hybrid varieties and synthetic varieties, Breeding for disease and pest resistance, host parasite relationship, concept of horizontal and vertical resistance.

#### **Unit IV**

Polyploidy in plant breeding, breeding behaviour of aneuploids, autopolyploid, allopolyploids and role in induced polyploidy, Macro and micro mutations and plant breeding. Breeding for drought resistance, lodging resistance, dwarfing genes plant type rain fed conditions, saline resistance and clone resistance.

Release of new varieties, multiplication and distribution, seed certification, seed labeling and testing, maintenance of pure seed stocks.

### **Unit V**

Statistical methods and experimental designs for plant breeding experiments. Cytogenetics and improvement work done in India on wheat, rice, sugarcane, cotton, potato and mustard, Frequency distribution, mean, median and mode. Test of significance-t, f and Chi square test. Experimental designs, basic principles. Completely randomized, randomized block, latin square, split plot, Application of computer in data collection.

## **AGB 507: Cell biology and Bioenergetics**

**L—T—P—C**  
**3--- --4----5**

### **Unit I**

Cell structure and function, cell wall, nucleus, mitochondria, Golgi apparatus, chloroplasts and other cell organelles, their structure and function,

### **Unit II**

Some important techniques related to crop physiology, determination of water potential, technique related to crop plants.

### **Unit III**

General characters of enzymes with special reference to oxidizing and hydrolyzing enzymes, effects to substrate concentration, temperature, pH, inhibitors and activators on enzyme action, allosteric control, feedback control and genetic control.

### **Unit IV**

Biological oxidation, their mechanisms- The electron transfers in biological systems, oxidases, dehydrogenases and terminal oxidases.

### **Unit V**

Types of energy rich bonds, their formation and role in plant metabolism, Energy relation of plant cells. Oxidative and photophosphorylation, their mechanism and role in plant metabolism.

## **AGB 508: Seed Technology and Seed Biology**

**L—T—P—C**  
**3--- --4----5**

### **Unit I**

Fruit and seed development. Apomixis, parthenocarpy, polydembryony and somatic embryos. Seed structure of monocot and dicot, Chemical composition of seeds, seed dormancy- types, causes mechanisms in induction and release, factors affecting, methods to overcome, dormancy and significance in agriculture.

### **Unit II**

Seed germination- requirement, imbibitions pattern, physiological and biochemical changes and role of hormones. Ballers seed or nuclear seed, foundation seed, certify seed testing, Introduction to crop breeding methods, Variety testing, release and notification, Seed production agencies, Factors affecting pollination and seed set, Male sterility, self incompatibility and their role in hybrid seed production.

**Unit III**

Principles and methods of seed production of varieties and hybrids of cereals like wheat, paddy, sorghum, pearl millet and maize. Pulses like chick pea, pigeonpea, green gram, black gram, soybean and cowpea, Oil seeds like groundnut, brassica, sesame, sunflower and castor, fiber crops like cotton and jute.

**Unit IV**

Vegetable crops like tomato, brinjal, okra, chilly, important cucurbitaceous crops, important forages legumes and grasses and true seed production in potato with reference to land requirements, isolation, roguing, seed crop management, time of harvesting, threshing, extraction methods.

**Unit V**

Seed production technology of plantation crops like potato, sugarcane, mango, citrus, banana, guava, sapota, pineapple, grapes, apple, pear and seed production and clonal propagation of annual and perennial flowers like rose, gladiolus, chrysanthemum, marigold and dahlia.

**AGB 533: Lab III Work based on Course AGB 505 and AGB 506**

**AGB 534: Lab IV Work based on Course AGB 507 and AGB 508**

## **Semester III**

### **AGB 601: Microbiology and Plant Pathology**

**L—T—P—C**  
**3--- --4----5**

**Unit I**

History of Mycology, Physiology of fungi, structure and life history of chief representatives of fungi, Morphology, classification and characteristics of plant pathogenic bacteria, Symptoms and transmission of viral diseases of plants.

**Unit II**

Physiological plant diseases- Diseases due to unfavorable environmental condition with particular reference to the following: Black tip of mango, chlorosis and sun scald,

**Unit III**

Physiology of penetration and infection in fungi. Pathogen factors in the physiology of disease- toxins, enzymes and other metabolites. Factors governing resistance and susceptibility of the host of disease.

**Unit IV**

Influence of environmental factors on plant disease, Epiphytotic and conditions necessary for its establishment, Physiological specialization in parasitic fungi, forecasting of plant diseases.

**Unit V**

Study of important bacterial, viral, mycoplasma and fungal diseases of wheat, barley, rice, gram, maize, bazra, potato, brassica, groundnut, linseed, sugarcane, guava, papaya, apple, peach, pear, cucurbits and banana, A study of the economically important flowering parasites, Orobanche, Cuscuta, Striga, Loranthus and Biscum, Important nematode diseases of plants.

## **AGB 602: Seed Processing and Storage**

**L—T—P—C**  
**3--- --4----5**

### **Unit I**

Principles of seed processing, seed drying principles and methods, Pre-cleaning, grading, treating and packaging.

### **Unit II**

Need for storage, Storage behaviour of orthodox. Factors affecting seed storage and role of moisture, temperature, RH and moisture equilibrium, Storage structures, Methods of stacking and their impact, Germplasm storage.

### **Unit III**

Significance of seed health, Mode of mechanism of transmission of micro-organisms- Fungi, bacteria and viruses. Procedures for seed health test and rules. Externally and internally seed-borne pathogens, mode of infection, development and spread. Methods of detection of seed-borne diseases.

### **Unit IV**

Important seed-borne diseases of cereals, oilseeds, pulses, fiber, crops, vegetables and their control measures.

### **Unit V**

Important storage pests, their identification, monitoring and detection, Biology, ET value, nature and extent of damage, natural enemies and management. Important insecticides and their uses.

## **AGB 603: Weed Control**

**L—T—P—C**  
**3--- --4----5**

### **Unit I**

Characteristics and classification of weeds: Harmful effect and usefulness of weeds.

### **Unit II**

A study of Botany of important weeds associated with the crop plants of the region.

### **Unit III**

Methods of preventing introduction and spread of weeds, principles and procedure of weed control.

### **Unit IV**

Ecological study of weeds, Mechanical, Biological and chemical methods of weed control.

### **Unit V**

Classification of pesticides, problems of pesticidal residue in soil, Effect of weed control methods on environment, Calibration of sprayers.



## **AGB 604: Plant Metabolism and Special Problems of Crop Physiology**

**L—T—P—C**  
**3--- --4----5**

### **Unit I**

General properties of amino acids, protein-amino acids and protein in amino acids, polypeptides, primary, secondary and tertiary structure of proteins, Detailed study of nitrogen metabolism. Biosynthesis of proteins

### **Unit II**

Role of nucleic acids, bases, nucleotides, DNA, RNA, role of nucleic acids, genetic code and control,

### **Unit III**

Naturally occurring growth substances, auxins, gibberellins, cytokines, inhibitors and vitamins in plants.

### **Unit IV**

Detailed study of photosynthesis and role of carbon assimilation in crop production, Respiration, respiratory substrates, factors affecting respiration, aerobic and alcoholic fermentation and their inter-relationships, Metabolisms of organic acids, Metabolism of fats.

### **Unit V**

Physiological basis of pruning, lodging unfruitfulness and yield. Factors affecting root ratio, Special physiological problems connected with crops like sugarcane, cotton, hemp, wheat, tobacco, rice and groundnut etc.

**AGB 631: Lab Work V based on Course AGB 601 and AGB 602**

**AGB 632: Lab Work VII based on Course AGB 603 and AGB 604**

## **Semester IV**

## **AGB 605: Agro-ecology of Crop Plants**

**L—T—P—C**  
**3--- --4----5**

### **Unit I**

Concept of crop ecology and its scope in agronomic pursuits, Plant succession, units of vegetation competition and invasion, reaction and stabilization, factors of habitat and development. The ecological optimum and crop distribution, Plant and plant communities as indicators of soil and weather conditions.

### **Unit II**

Temperature effects on plants, length of growing season, thermal and physiological growing season, limits of crop production, Effects of low temperature, chilling and freezing of plants, low night temperature, concepts of freezing injury, Ice crystal formation in intercellular spaces, desiccation theory, chemical injury to protoplasm, evaluation of the degree of hardness, Plant characteristics associated with drought and cold resistance.

### **Unit III**

Responses of crop plants to humidity, evaporation and wind variation crop and ecosystem. Physical Environment, biotic environment, biotic and abiotic interactions.

#### **Unit IV**

Structure of function, energy flow and mineral cycling (CNP) primary production and decomposition, structure and function of some Indian ecosystems,

#### **Unit V**

Environmental pollution, global environment change, biodiversity status, monitoring and documentation, major drivers of biodiversity change, biodiversity management approaches.

### **AGB 606: Problems in Crop Production**

**L—T—P—C**  
**3--- --4----5**

#### **Unit I**

Problems relating to the production of major crops, Maximization of crop yields and their apparent limitations.

#### **Unit II**

Fertility evaluation, fertility management in relation to physico-chemical properties of soils, Phosphorus deficiency and soil fertility, Fixation of nutrients in soil, Soil potassium in relation to soil fertility and plants growth and development, C/ N ratio as a function of growth and development. P

#### **Unit III**

lant problems and methods with special reference to N, P, K and Ca. The problems of irrigated soils, Tillage and influence of plant growth.

#### **Unit IV**

Soil microorganisms and their role in production, Principles and practices of dry farming, special problems in during mixed cropping and strip cropping in agriculture in India, Agronomic practices in relation to soil acidity and alkalinity.

#### **Unit V**

Soil fertility and soil productivity, assessment of soil fertility, crop planning and budgeting, crop rotation, cropping scheme, cropping intensity, rotational intensity, system of cropping, water management, soil conservation.

**AGB 633: Lab Work VII based on Course AGB 605 and AGB 606**

### **AGB 607: Dissertation / thesis**

**L—T—P—C**  
**3-- 4----5**

**The topic would be decided by the candidate in consultation with the respective supervisor. Dissertation / thesis will be based on**

**Crop Physiology and Soil and Water Management**

**Or**

**Genetics and Plant Breeding**

**Or**

**Microbiology and Plant Pathology**

Pand the title will be decided keeping the view on the modern aspect in the related discipline. It will be the part of semester IV; however, the title of dissertation / thesis will be assigned by concerned faculty member/board in the beginning of semester III to provide sufficient time to complete dissertation / thesis

**Elective paper: Candidate has to choose only one elective paper**

**AGB 651: Crop physiology, soil and water management**

**L—T—P—C**  
**3--- --4----5**

**UNIT-I**

Cell membrane structure and functions. Water and its role in plant cells. Mechanism of water uptake by roots transport in roots, movement of water in plants, water loss from plants. Mechanism of stomatal movement, anti-transpirants. Physiology of water under high temperature and salinity stress in plants. Influence of water stresses at cell, organ, plant and canopy levels. Indices for assessment of drought resistance.

**UNIT-II**

Mechanism and concepts of ion uptake. Short distance transport pathway from external solution (Apoplast) to sieve across the root cortical cells, factors contributing to xylem loading. Long distance transport in xylem and phloem, xylem unloading in leaf cells. Uptake and release of mineral nutrients by foliage. Rhizosphere and root biology, root growth, influence of microorganisms in nutrients acquisition, release and uptake by plant roots. Yield and mineral nutrition-concept of nutrient use efficiency.

**UNIT-III**

Mineral nutrition under adverse soil situations-drought, salinity, acidity etc. Heavy metal toxicity and concept of phytoremediation. Interaction of phytohormones and nutrients. Molecular aspects – uptake and transport, role of transporter genes, genetics of nutrient uptake, identification and transfer of genes for tolerance to nutrient deficiencies, etc.

**UNIT-IV**

Photosynthesis, translocation and respiration as key processes regulating carbon metabolism and plant growth. Photosynthesis and bioproductivity. Synthesis of sucrose, starch, oligo and polysaccharides. Translocations of photosynthates and its importance in sink growth. Mitochondrial respiration, growth and maintenance respiration, cyanide resistant respiration and its significance. Nitrogen metabolism. Inorganic nitrogen species (N<sub>2</sub>, NO<sub>3</sub>, NH<sub>3</sub>) and their reduction, protein synthesis, nucleic acids. Role of crop physiology in agriculture, crop growth and productivity, crop growth. Biomass and yield relations. Assimilate partitioning, yield and yield structure analysis. Concept of source and sink.

**UNIT-V**

Abiotic stresses affecting plant productivity. Basic principles of a crop improvement programme under stress, interactions between biotic and abiotic stresses. Physiological process affected by drought. Drought resistance mechanisms. Oxidative stress : reactive oxygen species – role of scavenging system (SOD, Catalase etc.). High temperature stress: tolerance mechanism, function of HSPs, Chilling stress ; effects on physiological processes. Crucial role of membrane lipids. Salinity variation in salt tolerance. Salinity effects at cellular and whole plant level, tolerance mechanism. Breeding for salt resistance. Heavy metal stress: aluminium and cadmium toxicity in acid soils. Role of phytochelatin (heavy metal binding protein).

**AGB 634: Lab Work VIII based on Course AGB 651 and AGB 607**

## AGB 652: Cytogenetics and Plant Breeding

L—T—P—C  
3--- --4----5

### Unit I

**Basic concept and organization:** Chromosome structure, nucleosome, solenoid nucleolus, euchromatin and heterochromatin, special type of chromosomes- Polytene chromosomes, lampbrush chromosomes, B chromosomes. Gene concept; allele concept, multiple alleles, isoalleles, Pseudoalleles, Cell division.

### Unit II

**Inheritance Genetics:** Principles of Mendelian Inheritance and interaction of genes, Cytoplasmic inheritance involving chloroplast and mitochondria, mitochondrial and chloroplast genomes, interaction between nuclear and cytoplasmic genes, Sex determination in plants.

### Unit III

**Cytogenetics and Induced Variations:** Linkage and recombination: Concept of Linkage, evolution of linkage concept, cis and trans arrangement of linked gene, kinds of linkage, germinal and somatic crossing over, detection of crossing over, kinds of crossing over.

### Unit IV

**Mutation:** Spontaneous and induced mutations, point mutation, transitions, transversions, physical and chemical mutagens, molecular basis of mutations.

**Numerical alterations in chromosomes:** Euploidy, polyploidy and its significance, aneuploidy. autopolyploidy, allopolyploidy, Induction of trisomics and monosomics

Structural changes in chromosomes: Deficiency, duplication, inversion, translocation heterozygotes.

### Unit V

**Plant Breeding:** Breeding systems, methods, selection in self and cross pollinated crops, male sterility, self-incompatibility, heterosis and hybrid vigour,

AGB 635: Lab Work VIII based on Course AGB 652 and AGB 607

## AGB 653: Microbiology and Plant pathology

L—T—P—C  
3--- --4----5

### Unit :I

**Physiological and molecular Plant Pathology:** Molecular mechanism of pathogenesis: recognition phenomenon, penetration, invasion, primary disease resistance . Phytoalexins, PR proteins, Antiviral proteins. Tissue culture, Somaclonal variations and somatic hybridization. Elementary genetic engineering. Ribozyme , coat protein.

### Unit :II

**Plant Bacteriology:** Identification and classification of bacteria, morphology, ultrastructure and chemical composition of prokaryotic cell in relation to function. Growth curve, nutrition and auxotrophic mutants. Resting cell in prokaryotic, elementary bacterial genetics and variability : transformation, conjugation, transduction. Bacteriophages : lytic and lysogenic cycle. Economic uses of prokaryotes. Morphology, Biochemical characteristics, reproduction and life cycle of phytoplasma.

### **Unit : III**

**Plant Virology:** Nature, composition and architecture of viruses and viroids. Property of viruses, variability in viruses. Satellite viruses and satellite RNA. Assay of plant viruses including biological, physical, chemical, serological and molecular methods. Histopathological changes induced by viruses in plants. Transmission of viruses : virus – vector relationship. Nomenclature and classification of viruses.

### **Unit : IV**

**Plant disease epidemiology:** Concept of epidemiology. Development of disease in plant population. Monocyclic and Polycyclic pathogen. Role of environment and meteorological factor in the development of plant disease epidemic. Survey, surveillance and prediction and forecasting of disease. Phanerogamic parasite and nonparasitic diseases. Diseases caused by phanerogamic parasite and their management. Disease due to unfavourable soil environment, drought and flooding stress etc. Nutritional deficiencies. Primary/Secondary air pollutant and acid rain. Etiology, disease cycle, perpetuation epidemiology and management. Post harvest disease in transit and storage. Aflatoxins and their integrated management.

### **Unit: V**

#### **Management of plant diseases**

General principle of plant quarantine. Exotic pathogen and pathogens introduced in India. Sanitary and phyto sanitary issue under WTO, TRIPS and PRA. Genetic basis of disease resistance and pathogenicity-gene for gene hypothesis, breeding for disease resistance. production disease free seeds and planting materials. seeds certifications. chemical nature and classification of fungicides and antibiotics : their bioassay and compatibility with other agricultural chemicals, resistant to fungicides / antibiotics, effect on environment. Spraying and dusting equipments, their care and maintenance. Important cultural practices and their role in disease management, solarization, integrated disease management. microorganisms antagonistic to plant pathogens in soil, rhizosphere and phyllosphere and their uses in the control of plant diseases, soil fungistasis. plant growth promoting rhizobacteria.

**AGB 636: Lab Work VIII based on Course AGB 653 and AGB 607**