**SST151: Principles of Seed Technology**

**Theory** : Introduction to Seed and its importance of in Production system; Seeds structure and their development; Types of seed (Orthodox and Recalcitrant); Deterioration of crop varieties, Factors affecting deterioration and their control; Maintenance of genetic purity during seed production, Seed quality; Definition, Characters of good quality seed. Different classes of seed, Production of nucleus & breeder’s seed; Seed Production, Foundation and certified seed production in maize (varieties, hybrids, synthetics and composites); Foundation and certified seed production of rice (varieties & hybrids); Foundation and certified seed production of cotton and sunflower (varieties and hybrids); Foundation and certified seed production of castor (varieties and hybrids); Foundation and certified seed production of tomato and brinjal (varieties and hybrids); Foundation and certified seed production of chilies and bhendi (varieties and hybrids); Foundation and certified seed production of onion, bottle gourd and ridge gourd (varieties and hybrids); Seed certification, phases of certification, procedure for seed certification, field inspection and field counts etc.; Seed Act, Central Seed Committee, Central Seed Certification Board, State Seed Certification Agency, Central and State Seed Testing Laboratories; Duties and powers of seed inspectors, offences and penalties; Intellectual Property Rights, Patenting, WTO, Plant Breeders Rights, Varietal Identification through different methods;

**Seed Drying** : Forced air seed drying, principle, properties of air and their effect on seed drying, moisture equilibrium between seed and air, Heated air drying, building requirements, types of air distribution systems for seed drying, selection of crop dryers and systems of heated air drying, recommended temperature and depth of the seeds, management of seed drying, Seed processing: air screen machine and its working principle, different upgrading equipments and their use, Seed testing procedures for quality assessment- sampling methods & equipments, it’s importance, test for germination, viability & vigour; Seed treatment, Importance of seed treatment, types of seed treatment, equipment used for seed treatment (Slurry and Mist-O-matic treater), Seed packing and seed storage, stages of seed storage, factors affecting seed longevity during storage and conditions required for good storage, General principles of seed storage, measures for pest and disease control, temperature control, Seed marketing, Factors affecting seed marketing.

**PPH 201: Principles of Crop Physiology**

**Theory** : Introduction - Definition of Crop Physiology - Importance in agriculture and horticulture.

Crop Water Relations - Physiological importance of water to plants - Water potential and its components. Transpiration - Definition, types of transpiration, mechanism, of opening and closing of stomata, transpiration in relation to crop productivity. Water Use Efficiency, WUE in C3, C4 and CAM plants.

Growth and Development - Definition - Types of growth - Determinate and Indeterminate growth - Monocarpic and Polycarpi species with examples. Growth analysis, growth
characteristics - Definitions and mathematical formulae.


Respiration and its significance - Importance of glycolysis, TCA cycle, Pentose phosphate pathway. Salt respiration, cyanide resistant respiration.

Nutrio-physiology - Definition - Classification of plant nutrient. Functions of plant nutrients. Deficiencies and toxicity symptoms of plant nutrients.

Control of flowering - Photoperiodism and Vernalization in relation to crop productivity - Classification of plants - Commercial application of photoperiodism in agriculture and horticulture.

Plant Growth Regulators - Pccurrence, biosynthesis, mechanism of action and physiological role of Auxins, Gibberellins, Cytokinins, ABA and Ethylene in plants. Novel plant growth regulators. Commercial application of plant growth regulators in agriculture and horticulture.

**GPB 251: Principles of Genetics**

**Theory**: Mendel's laws of inheritance and exceptions to the laws. Types of gene action. Multiple alleles, pleiotropism, penetrance and expressivity. Quantitative traits, Qualitative traits and differences between them. Multiple factor hypothesis.

Cytoplasmic inheritance, its characteristic features and difference between chromosomal and cytoplasmic inheritance. Mutation, its characteristic features, methods of inducing mutations and CLB technique. Gene expression, Structure of cell and cell organelles and their functions. Study of chromosome structure, morphology, number and types, karyotype and ideogram. Mitosis and meiosis, their significance and difference between them. DNA, RNA and their structure, function and types. Transcription, translation, genetic code and outline of protein synthesis. Crossing over, factors affecting it, mechanism of crossing over and cytological proof of crossing over. Linkage, types of linkage and estimation of linkage. Numerical chromosomal aberrations (polyploidy) and evolution of different crop species like cotton, wheat, rice, tobacco, triticale and Brassicas. Structural chromosomal aberrations.

**GPB 301: Principles of Plant Breeding**

**Theory**: Classification of plants, Botanical description, Floral biology, Emasculation and pollination techniques in cereals, millets, pulses, oilseeds, fibres, plantation crops etc. Aims and objectives of Plant Breeding; Modes of reproduction, Sexual, Asexual, Apomixis and their classification, significance in plant breeding. Modes of pollination, genetic consequences, difference between self and cross-pollinated crops.

Hybridization - aims and objectives, types of hybridization. Methods of handling segregating generations - Pedigree method, Bulk method, Back cross method and various modified methods.

Incompatibility and male sterility and their utilization in crop improvement. Heterosis, inbreeding depression, various theories of Heterosis, exploitation of hybrid vigour, development of inbred lines, single cross and double cross hybrids Population improvement programmes, recurrent selection, synthetics and composites

Methods for breeding for vegetatively propagated crops. Clonal selection, Mutation breeding-ploidy breeding. Wide hybridization, significance in crop improvement

**ABC 351: Agricultural Biochemistry**


**GPB 351: Breeding of Field Crops**

**Theory:** Breeding objectives and important concepts of breeding self and cross pollinated and vegetatively propagated crops. Hardy-Weinberg law. Study in respect origin and distribution of species, wild relatives and forms for cereals like Rice, wheat, Maize Millets, Sorghum, bajra, ragi. Pulses like Redgrum, green gram, black gram, soybean. Oilseeds like Ground nut, Sesame, safflower sun flower, Castor mustard etc. Fibres like Cotton, Kenaf, Jute etc. Major breeding procedures for development of hybrids / varieties of various crops. Plant Genetic resources their conservation and utilization in crop improvement. Ideotype concept in crop improvement. Breeding for resistance to biotic and abiotic stresses; variability in pathogens and pests. Mechanisms of resistance in plant to pathogen and pests. Genetic basis of adaptability to unfavourable environments. Definition of biometrics, assessment of variability i.e. additive, dominance and epistasis and their differentiation. Genotype X Environment interaction and influence in yield / performance. IPR and its related issues. PPV and FRA.

**ABC 451: Plant and Molecular Biochemistry**

**Theory:** Photosynthesis - introduction, photosynthetic pigments, light and dark reactions, photorespiration, C3 & C4 plants, DNA replication, transcription and translation.

**PPH 451: Principles and practices of Crop Physiology**

**Theory:** Growth analysis formulae, LAI, Specific leaf weight, Crop Growth Rate, RGR, NAR, Harvest index.

**Crop Productivity:**

Morphological and Physiological yield components, brief account of Physiological changes associated with growth, development
and maturation in general.

**Stress Physiology:**

General features of drought stress, Drought tolerance and resistance types. Metabolic processes related to tolerance, Salt tolerance - General features and mechanism of salt tolerance. Water logging - Growth metabolic processes and tolerance to water logging (In all cases the basic aspects only)

**Role of nutrients:**

Brief account of macro and micro nutrients on crop productivity.

**GPB 451: Plant Cell Culture and Genetic Engineering**

**Theory:** Principles of plant cell, tissue and organ culture; Shoot-tip, axillary bud, embryo and nucellus culture; Embryogenesis and organogenesis; Micro-propagation and somaclonal variation; Hardening of tissue culture generated plants; Concept of germplasm and its in-vitro conservation; Secondary metabolites production. Pre- and post fertilization barriers in plants and overcoming the barriers. Techniques used for gene transfer in plants. T\(_1\) plasmid in *Agrobacterium* as a vector for plant transformation; Protoplast culture and its use in gene transfer study; Principles of identifying quality and quantity of integration and expression of foreign genes; Optimization of gene expression in transgenic plants, Co-suppression; Antisense and related RNA technology.

**GPB 452: Practical approaches for advanced plant breeding**

**Theory:**

1. Special approaches for crop improvement in self-pollinated crops
2. Population breeding approach:
3. Selective mating scheme, experimental findings, merits and limitations
4. Rapid isolation of homozygous lines- Anther culture
5. Development of multi-line varieties
6. Development of hybrid varieties of self and cross pollinated crops: Development and maintenance of different male sterile lines, incompatible lines and procedure for hybrid seed production of rice and cotton
7. Development and maintenance of inbreed lines and procedure for hybrid seed production in maize
8. Improvement of medicinal and aromatic crops for their quality
9. Physiological concepts in plant breeding-physiological parameters to crop yield and their application in plant improvement programme with reference to cereals, pulse, oilseeds and fibre crops
10. Breeding for improvement of tree crops
11. Importance and steps for development of transgenic plants
12. Introduction to IPR & Policy, PPV & FRA, Preparation of Passport Data and registration of plant varieties.
**SST 451 : Seed Production Technology**

**Theory** : Concept and importance of quality seeds. Classes of seed and its production technology; Seed sampling; Seed testing; Maintenance of seed purity and its deterioration; Seed certification & its utilization; Hybrid seed production technology

**Practical**: Seed sampling and quality testing (moisture, purity, viability, germination, vigour) of different crops; Quality seed production; Hybrid seed production.