

problems, graphical method of solution for problems in two variables, feasible and infeasible regions, feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints).

**Unit-7: Mathematical Reasoning**

**Mathematical Reasoning:** Mathematically acceptable statements. Connecting words/ phrases - consolidating the understanding of “if and only if (necessary and sufficient) condition”, “implies”, “and/or”, “implied by”, “and”, “or”, “there exists” and their use through variety of examples related to real life and Mathematics. Validating the statements involving the connecting words, difference between contradiction, converse and contrapositive.

**Unit-8: Statistics & Probability**

1. **Statistics:** Measures of central tendency, mean, median and mode from ungrouped/grouped data. Measures of dispersion, mean deviation, variance and standard deviation from ungrouped/grouped data. Correlation, regression lines.
2. **Probability:** Random experiments: outcomes, sample spaces (set representation). Events: occurrence of events, ‘not’, ‘and’ and ‘or’ events, exhaustive events, mutually exclusive events Axiomatic (set theoretic) probability, Probability of an event, probability of ‘not’, ‘and’ & ‘or’ events. Multiplication theorem on probability. Conditional probability, independent events, total probability, Bayes’ theorem, Random variable and its probability distribution, mean and variance of stochastic variable. Repeated independent (Bernoulli) trials and Binomial distribution.

**Unit-9: Statics**

Introduction, basic concepts and basic laws of mechanics, force, resultant of forces acting at a point, parallelogram law of forces, resolved parts of a force, Equilibrium of a particle under three concurrent forces. Triangle law of forces and its converse, Lami’s theorem and its converse, Two Parallel forces, like and unlike parallel forces, couple and its moment.

**Unit-10: Dynamics**

Speed and velocity, average speed, instantaneous speed, acceleration and retardation, resultant of two velocities. Motion of a particle along a line, moving with constant acceleration. Motion under gravity. Laws of motion, Projectile motion.

## **AGRICULTURE**

**Unit-1: Agrometeorology, Genetics and Plant Breeding, Biochemistry and Microbiology**

**Agrometeorology:** Elements of Weather-rainfall, temperature, humidity, wind velocity, Sunshine weather forecasting, climate change in relation to crop production.

**Genetics & Plant Breeding :** (a) Cell and its structure, cell division-mitosis and meiosis and their significance (b) Organisation of the genetic materials in chromosomes, DNA and RNA (c) Mendel’s laws of inheritance. Reasons for the success of Mendel in his experiments, Absence of linkage in Mendel’s experiments. (d) Quantitative inheritance, continuous and discontinuous variation in plants. (e) Monogenic and polygenic inheritance. (f) Role of Genetics in Plant breeding, self and cross-pollinated crops, methods of breeding in field crops-introduction, selection, hybridization, mutation and polyploidy, tissue and cell culture. (g) Plant Biotechnology-definition and scope in crop production.

**Biochemistry:** pH and buffers, Classification and nomenclature of carbohydrates; proteins; lipids; vitamins and enzymes.

**Microbiology:** Microbial cell structure, Micro-organisms- Algae, Bacteria, Fungi, Actinomycetes, Protozoa and Viruses. Role of micro-organisms in respiration, fermentation and organic matter decomposition

**Unit-2: Livestock Production**

**Scope and importance :** (a) Importance of livestock in agriculture and industry, White revolution in India. (b) Important breeds Indian and exotic, distribution of cows, buffaloes and poultry in India.

**Care and management :** (a) Systems of cattle and poultry housing (b) Principles of feeding, feeding practices. (c) Balanced ration-definition and ingredients. (d) Management of calves, bullocks, pregnant and milch animals as well as chicks cockrels and layers, poultry. (e) Signs of sick animals, symptoms of common diseases in

cattle and poultry, Rinderpest, black quarter, foot and mouth, mastitis and haemorrhagic septicaemia, coccidiosis, Fowl pox and Ranikhet disease, their prevention and control.

**Artificial Insemination** : Reproductive organs, collection, dilution and preservation of semen and artificial insemination, **role of artificial insemination in cattle improvement**. **Livestock Products**: Processing and marketing of milk and Milk products.

### Unit-3: Crop Production

**Introduction** : (a) Targets and achievements in foodgrain production in India since independence and its future projections, sustainable crop production, commercialization of agriculture and its scope in India. (b) Classification of field crops based on their utility-cereals, pulses, oils seeds, fibre, sugar and forage crops.

**Soil, Soil fertility, Fertilizers and Manures**: (a) Soil, soil pH, Soil texture, soil structure, soil organisms, soil tilth, soil fertility and soil health. (b) Essential plant nutrients, their functions and deficiency symptoms. (c) Soil types of India and their characteristics. (d) Organic manure, common fertilizers including straight, complex, fertilizer mixtures and biofertilizers; integrated nutrient management system.

**Irrigation and Drainage**: (a) Sources of irrigation (rain, canals, tanks, rivers, wells, tubewells). (b) Scheduling of irrigation based on critical stages of growth, time interval, soil moisture content and weather parameters. (c) Water requirement of crops. (d) Methods of irrigation and drainage. (e) Watershed management

**Weed Control** : Principles of weed control, methods of weed control (cultural, mechanical, chemical, biological and Integrated weed management).

**Crops**: Seed bed preparation, seed treatment, time and method of sowing/planting, seed rate; dose, method and time of fertilizer application, irrigation, interculture and weed control; common pests and diseases, caused by bacteria, fungi virus and nematode and their control, integrated pest management, harvesting, threshing, post harvest technology: storage, processing and marketing of major field crops-Rice, wheat, maize, sorghum, pearl millet, groundnut, mustard, pigeon-pea, gram, sugarcane, cotton and berseem.

### Unit-4: Horticulture

- (a) Importance of fruits and vegetables in human diet, Crop diversification & processing Industry. (b) Orchard-location and layout, ornamental gardening and kitchen garden. (c) Planting system, training, pruning, intercropping, protection *from frost* and sunburn. (d) Trees, shrubs, climbers, annuals, perennials-definition and examples. Propagation by seed, cutting, budding, layering and grafting. (e) Cultivation practices, processing and marketing of: (i) Fruits - mango, papaya, banana, guava, citrus, grapes. (ii) Vegetables - Radish, carrot, potato, onion, cauliflower, brinjal, tomato, spinach and cabbage. (iii) Flowers - Gladiolus, canna, chrysanthemums, roses and marigold. (f) Principles and methods of fruit and vegetable preservation. (g) Preparation of jellies, jams, ketchup, chips and their packing.

**Note:** Besides above syllabi, any other question of scientific and educational importance may be asked.