Agricultural Chemistry

POST GRADUATE DEGREE STANDARD **PAPER -I CODE:007**

UNIT I
SOIL GENESIS
Soil geology - Geomorphology & Geochemistry - origin of earth - Geological formation of India-Soil forming rocks and minerals and their classification - weathering of rocks and minerals and their classification - weathering of rocks and minerals - weathering stability, sequences - agencies and weathering indices - factors of soil formation - soil forming process .

UNIT II
REMOTE SENSING
Fundamentals of remote sensing - definition, kinds - characteristics of electromagnetic radiation - remote sensors and their application - aerial photography - stereoscopy - kinds merits and demerits of aerial photography and remote sensing - aerial photo interpretations- satellite data acquisition - elements of imagery - kinds - interpretations and classification.

UNIT III
SOIL TAXONOMY AND LANDUSE PLANNING
Soil classification - concepts - early and modern systems of classification - USDA soil taxonomy - Diagnostic horizons - world soil groups - soils of India and Tamil Nadu. Soil survey - concepts and objectives - methods of soil survey - soil resource inventory-soil mapping units - Soil map - cartography and soil survey reports - Land use planning. Land use maps - Soil correlation - Land capability classification - Irrigability classification Soil, land and crop suitability classification - productivity rating of soil - storie index - Soil based agro technology transfer.

UNIT IV
SOIL PHYSICS (Texture, Structure are Soil air)
Physical composition of soil, soil texture - soil separates mechanical analysis. Soil structure - types - structures formation - structural indices - soil structure and plant growth Infiltration rate - Hydraulic conductivity - permeability Laws of soil water movement - Their application in soil system. Soil air - composition, significance -factors influencing composition - soil air indices - ODR - Soil aeration and plant growth.

UNIT V
SOIL PHYSICS (Soil temperature, soil water and soil physical constraints)
Soil temperature - importance - Thermal properties of soils and the factors influencing them - soil temperature and plant growth. Soil moisture - soil water balance - drainage seepage - evaporation - transpiration - nutrient movements - absorption of water - factors affecting absorption - absorptions of solutes - water use efficiencies and plant growth modes. Soil physical constraints and their managements.

UNIT VI
SOIL CHEMISTRY
Chemical composition of soil - mineral and organic constituents - transformation of major and secondary nutrients under upland and gardenland conditions. Clay minerals-Nature and structure - properties -

Nomenclature and classification - fixation of nutrients soil fertility as ibfluenced by clay minerals - Molar ratio - Dispersion and aggregation of clay colloids - clay humus complex - soil colloids - organic and inorganic properties - Electrical double layer - Helmholtz, sterm and Gouy layers - Isoelectric point zeta potential - Flocculation - Absorption and desorption - Ion exchange reactions-cation and anion exchange - Ion exchange equations - Soil reactions - Soil buffering capacity - Genesis, nature and properties of acids, acid sulphate, saline and alkali soils and their managements - Determination of lime and Gypsum requirement.

UNIT VII
SOIL FERTILITY
Soil fertility - concept of nutrient availability - soil fertility evaluation - concept of critical limit - Principles and methods of soil test crop response studies - Response functions. Soil testing - objectives - Soil test and crop response studies - Diagnosis and recommendation integrated system approach.. Fertilizer recommendations for targetted field - Economics of fertilizer use.

UNIT VIII
DYNAMICS OF NUTRIENT IN SOILS
Nitrogen cycle - sources - Nitrogen fixation - Transformation in flooded and upland soils immobilisation - mineralisation - Nitrogen in relation to atmospheric pollution. Phosphorus cycle - sources inorganic and organic fractions of soils - Fixation and transformation - availability - phosphate potential - intensity and quantity factors Phosphate buffering capacity.

UNIT IX
DYNAMICS OF NUTRIENTS IN SOILS
Chemistry of soil potassium - fixation - Activity ratio - Dynamics - equilibirium Factors influencing availability in soil. Secondary and micronutrients - sources, forms, transformation and availability in soil. Chelation - advantages.

UNIT X
SOIL ORGANIC MATTER
Nature, formation and properties of soil organic matter - sources of soil organic matter - Biochemistry of humus formation - Fractionation - Chemical properties -organic mettalic complexes - Nutrient availability - Recycling of organic wastes-organic farming.

PAPER -II

UNIT I
ANALYTICAL CHEMISTRY
Gravimetric estimation - Principles involved in estimation of Calcium, Magnesium and Sulphate. Volumetric estimation - preparation of standard solutions - Indicaters, buffers - Instrumental methods of analysis - colorimetry - Flame Photometry - Automic Absorption Spectrophotometry - Potentiometry Conductometry - Chromotography.

UNIT II
BIO-CHEMISTRY (Carbohydrates & Proteins)
Carbohydrates - occurence and classification, structure, synthesis and properties, Proteins-Classification, structure, synthesis and properties. Aminoacids-Classification, structure and properties

UNIT III
BIO-CHEMISTRY (Lipids, pigments, vitamins, minerals, enzymes, hormones and alkaloids)
Lipids-Classification - properties - Physical and chemical constants of Oils. Phospholipids- types and importance. Plant pigments - structure and functions of chlorophyll and carotenoids. Enzymes - classification - properties affecting enzyme actions. Co-factors and co-enzymes. Vitamins and minerals -

sources - deficiency and corrective measures sures. Harmones-classification and functions. Alkaloids-classification and functions.

UNIT IV
CHEMISTRY OF CROPS
Classification of plant nutrients - requirements -mobility - mechanism of ion absorption - uptake -factors affecting absporption. Biosynthesis of carbohydrates, proteins and fats in cereals, pulses, oilseeds, fibres, sugarcane, fruits, vegetables, tubers, narcotics, beverages and medicinal plants. Deficiency, toxicity and corrective measures of plant nutrients. Chemical changes during germination,growth and maturity. Organic manures, fertilizers and pesticides on quality of crop produce - storage of crop produce - Nutritive value of important crop produce.

UNIT V
CHEMISTRY OF FERTILIZERS
Fertilizer production and consumption - statistics - Chemistry and technology of nitrogenous fertilizers - classification - properties - slow release nitrogenous fertilizers - chemistry and technology of phosphatic fertilizers - classification -properties. Potassic fertilizers - classification - properties. Complex fertilizers mixed fertilizers - chemistry and technology of production. Secondary and micronutrient fertilizers - sources, production and properties. Quality control of fertilizers - Fertilizers control order - physical and chemical standards of straight, complex and mixed fertilizers - fertilizer use efficiency. Role of chemical fertilizers in crop production and environmental pollution. Integrated plant Nutrient system Management.

UNIT VI
FERTILIZER MANAGEMENT
Fertilizer use efficiency with organics, biofertilizers and crop residues fortified and enricxhed organic manures - Integrated plant nutrient system - Management of fertilizers in substainable Agriculture.

UNIT VII
CHEMISTRY OF PESTICIDES
Pesticides - formulation - Insecticides - classification - methods of preparation properties and mode of action. Natural organic and inorganic insecticides - synthetic organic insecticides - Organochlorine, organo phosphorus compounds carbarates - structure and activity relationship. Herbicides - classification - structure - method of preparation - properties - mode of action - principles in the analysis of pesticides - residues of persticides in soils and crops - pesticides and fertilizer interaction - pesticide control order - pesticides in relating to enviornmental pollution-human and animal health.

UNIT VIII
ISOTOPES IN AGRICULTURE
Isotopes in Agriculture - stable and radio active isotopes - properties - energy of radiation - absorption and scattering of particles and radiation - Nuclear fission and fusion - Detection and measurements of radio activity - Mass spectrophotometer - uses and limitations - principles of equipments used in analysis of radioisotopes. Uses of stable and radio isotopes in Agriculture - Nutrient movement, irrigation management,crop growth, plant protection, pollution monitoring - Radiation hazard waste disposal.

UNIT IX
ECOSYSTEM AND SOIL AND WATER POLLUTION
Agricultural ecosystem - climate and agriculture- soil, water, atmosphere and plant relationship - Recycling of agricultural wastes - bioconversion - vermiculture and vermicomposting - pollution - General classification, soil water and air pollution -global warming - Heavy Metal pollution - sources and remedies - solid and sewage waste disposal - recycling - Industrial pollutants - impact on soil and water-management of pollution for sustainable agriculture.

UNIT X
IRRIGATION WATER QUALITY AND ITS MANAGEMENT

Quality of irrigation water - methods of chemical analysis - different idices for fixing the quality. Effect of quality on soil properties and plant growth - classification of irrigation water computation of salts - Principles and management of problem water for irrigation.