Syllabus of Research Methodology for RET in Agriculture

Unit 1: Concepts of research methodology

Importance and scope of research in agriculture, Types of research: Fundamental vs. Applied, Concept of researchable problem, Research prioritization, Selection of research problem, Approach to research, Research process.

Unit 2: Hypostheis Testing

Hypothesis- meaning- characteristics- types of hypotheses- Review of literature, Setting of course objectives and Hypothesis, Testing of hypothesis, z, t, chi-square and f-distribution

Unit 3: Data collection and descriptive analysis

Data- meaning, assessment of data needs, sources of data collection, collection of data in different fields of agriculture, Types of data, Classification, tabulation, and graphical representation of data, measures of central values, measures of dispersion, correlation and regression analysis.

Unit 4: Sampling

Sampling Theory and sampling design, methods of sampling; probability and non-probability sampling methods, Research design and techniques, Types of research design.

Unit 5: Probability

Theory of probability, Random experiment, Mathematical or classical definition of probability, Statistical definition of probability, conditional probability, Mathematical expectation.

Unit 6: Data analysis

Data coding, cleaning, transformation of data, Universal procedures for preparation of bibliography, writing of research articles, Project proposal, Introduction to ANOVA: One way and two-way, Introduction to SPSS

अधिष्ठाता
कृषि संकाय
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SYLLABUS FOR RESEARCH ENTRANCE TEST (RET)
SOIL SCIENCE AND AGRICULTURAL CHEMISTRY
PAPER-I
(SUBJECT CONTENT)

UNIT I

Pedogenic evolution of soils, soil composition and characterization; Weathering and soil formation-factors and pedogenic processes, stability and weathering sequences of minerals. Assessment of soil profile development by mineralogical and chemical analysis, micro-pedological features of soils, soil taxonomy.

UNIT II

Soil-water interactions, soil water potential, free energy and thermodynamic basis of potential concept, chemical potential of soil water and entropy of the system. Fundamentals of fluid flow, Poiseuilles law, Laplace's equation, Darcy's law in saturated and unsaturated flows; development of differential equations in saturated and unsaturated water flow, capillary conductivity and diffusivity; limitations of Darcy's law; numerical solution for one dimensional water flow and Theories of horizontal and vertical infiltration under different boundary conditions. Movement of salts in soils, models for miscible-immiscible displacement, diffusion, mass flow and dispersion of solutes and their solutions through differential equations; break-through curves. Soil air and aeration, mass flow and diffusion processes; thermal properties of soil, heat transfer in soils, differential equation of heat flow, measurement of thermal conductivity of soil. Soil crust and clod formation; structural management of puddled rice soils; soil conditioningconcept, soils conditioners-types, characteristics, working principles, significance in agriculture.

UNIT III

Colloidal chemistry of inorganic and organic components of soils-their formation, clay organic interaction. Predictive approaches for cation exchange equilibria-thermodynamics, empirical and diffuse double layer theory (DDL)-relationships among different selectivity coefficients; structure and properties of diffuse double layer. Thermodynamics of nutrient transformations in soils; cationic and anionic exchange and their models, molecular interaction. Adsorption/desorption isotherms-Langmuir adsorption isotherm, Freundlich adsorption isotherm, normalized exchange isotherm, BET equation; selective and non-selective adsorption of ions on inorganic surfaces and organic surfaces of soil materials (citation of utility in agricultural system). Common solubility equilibria-carbonates, iron oxide and hydroxides, aluminum silicate, aluminum phosphate; electrochemical properties of clays (citation of examples from agricultural use); acidic and salt affected soils.

UNIT IV

Modern concepts of nutrient availability; soil solution and plant growth; nutrient response functions and availability indices. Nutrient movement in soils; nutrient absorption by plants;

mechanistic approach to nutrient supply and uptake by plants; models for transformation and movement of major micronutrients in soils. Chemical equilibria (including solid-solution equilbria) involving nutrient ions in soils, particularly in submerged soils. Modern concepts in fertilizer application; soil fertility evaluation techniques; role of soil tests in fertilizer use recommendations; site-specific nutrient management for precision agriculture.

UNIT V
Organic matter pools in soil; composition and distribution of organic matter in soil and its functions; environmental significance of humic substances; decomposition of organic residues in soil in relation to organic matter pools. Biochemistry of the humus formation; different pathways for humus synthesis in soil; soil carbohydrates and lipids. Nutrient transformation – N, P, S; trace metal interaction with humic substances, significance of chelation reactions in soils. Reactive functional groups of humic substances, adsorption of organic compounds by clay and role of organic substances in pedogenic soil aggregation processes; clay-organic matter complexes; humus - pesticide interactions in soil, mechanisms.

UNIT WISE ITEM COMPOSITION (TOTAL: 50 Items)

UNIT I	**10**
UNIT II	**05**
UNIT III	**10**
UNIT IV	**10**
UNIT V	**15**