

**Syllabus for Ph.D. (Soil Science & Agricultural Chemistry)**

**Paper I: Research methodology, Statistics and Computer Application**

**Paper II: Soil Genesis, Morphology & Chemistry**

**Paper III: Modern Concept in Soil Fertility**

## PAPER-I

### (Compulsory Paper)

#### Course Title - Research Methodology, Statistics and Computer Application

Meaning, objectives, concept and scope of research in Indian agriculture. Types, criteria, process of research and characteristics of good research. Selection of problem and review of literature, Hypothesis- their meaning, types, characteristics and testing of hypothesis. Major problems encountered in the area of agricultural research in India.

Formulation and identification of research in Agriculture. Basic concept and principles of experimental design. Study about different types of experimental design i.e. CRD, RBD, LSD, Factorial design, augmented design, Split plot design and missing plot technique. Features of a good design.

Collections, classifications, tabulation and analysis of data by measures of central tendencies, dispersions, coefficient of correlations and regressions and different test i.e., Z, F, t and "chi square" ( $X^2$ ) Interpretations of analyzed data and preparations of reports and thesis.

Basic knowledge of computer and its applications, input, output and storage devices, applications and working skill in M.S. word, Excel and Power Points.

#### Suggested Readings:

1. Chandel; S.R.S.: (2007): "A Handbook of Agricultural Statistics" Achal Prakashan Mandir, Pandu Nagar, Kanpur-208005
2. Dhondyal; S. P.: (1994): "Social science research and thesis writing." Shiwani Press, Vishnupuri, Kanpur-2.
3. Kothari; C. R.: (1999): "Research Methodology, Methods and Techniques" Wishwa Prakashan, New Delhi.
4. Panse; V. G. and Sukhatme; P.V.: (1967): "Statistical methods for agricultural workers" 2nd edn. ICAR, New Delhi-381
5. Rangaswami; R.: (2011): "A Text Book of Agricultural Statistics" New Age Publications, New Delhi.

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## PAPER-II

**I. Course Title : Soil Genesis, Morphology & Chemistry**

**II. Course Code : SSAC 601**

**III. Credit Hours : 2+0**

### Theory

#### Unit I

Pedogenic evolution of soils; soil composition and characterization, Weathering and soil formation—factors and pedogenic processes; Assessment of soil profile development by mineralogical and chemical analysis.

#### Unit II

Soil crust and clod formation; structural management of puddled rice soils; soil conditioning—concept, soils conditioners—types, characteristics, working principles, significance in agriculture.

#### Unit III

Soil-water interactions, Soil air and aeration, Mass flow Diffusion Processes, Soil plant relation, Plant uptake of Soil moisture, water balance & energy balance in the field.

#### Unit IV

Colloidal chemistry of inorganic and organic components of soils—their formation, clay organic interaction.

#### Unit V

Application of GIS & remote sensing in monitoring, diagnosis and mapping land degradations.

### Suggested Readings

1. Baver LD, Gardner WH and Gardner WR. 1972. Soil Physics. John Wiley & Sons.
2. Bear RE. 1964. Chemistry of the Soil. Oxford & IBH.
3. Brady NC and Weil RR. 2002. The Nature and Properties of Soils. 13th Ed. Pearson Edu.
4. Indian Society of Soil Science 2002. Fundamentals of Soil Science. ISSS, New Delhi.
5. Sehgal J. 2002. Introductory Pedology: Concepts and Applications. New Delhi
6. Sehgal J. 2002. Pedology - Concepts and Applications. Kalyani.

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## PAPER-III

**I. Course Title : Modern Concept in Soil Fertility**

**II. Course Code : SSAC 602**

**III. Credit Hours : 2+0**

### Theory

#### Unit I

Nutrient availability-concept and relationships, modern concepts of nutrients availability; soil colloids and nutrient availability, soil solution and plant growth; nutrient response functions and availability indices.

#### Unit II

Modern concepts of fertilizer evaluation, nutrient use efficiency.

#### Unit III

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 IV

Monitoring physical, chemical and biological changes in soils; permanent manurial trials and long-term fertilizer experiments; soil productivity under long-term intensive cropping.

#### Unit V


Carbon– a nutrient central to soil fertility; carbon cycle in nature, stocks, pools and fluxes; greenhouse effect and climate change, Nitrogen fixing Organism.

#### Unit VI

Organic matter in soils and its maintenance Role of organic matter in soil productivity.

### Suggested Reading

1. Barber SA. 1995. *Soil Nutrient Bioavailability*. John Wiley & Sons.
2. Barker V Allen and Pilbeam David J. 2007. *Handbook of Plant Nutrition*. CRC / Taylor & Francis.
3. Brady NC and Weil RR. 2002. *The Nature and Properties of Soils*. 13th Ed. Pearson Educ.
4. Cooke GW. 1979. *The Control of Soil Fertility*. Crossby Lockwood & Sons.

  
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