

I Year- II Semester		L	T	P	C
		3	0	0	3
PRINCIPLES OF SOIL SCIENCE AND AGRONOMY (BS)					

Objective: To impart Knowledge on Soil genesis, properties etc., so as to enable students to design implements in related to soil, soil conservation, irrigation and drainage applications. Also, to enable students to understand farming principles, to grow agricultural field and orchard crop and farming practices.

UNIT I: (10h)

Soil: Definition –soil as a three phase four component system-branches of Soil science difference between surface and sub-surface soil, Rocks: Definition – classification of rocks based on mode of formation-igneous, sedimentary and metamorphic rocks, Minerals: Definition, classification, primary, secondary, essential, accessory, silicate, non-silicate minerals, light and heavy minerals primary silicate minerals; quartz, feldspars-micaspyroxene samphiboles secondary silicate; secondary minerals, Ca, Mg, S and Micronutrient containing minerals- chemical formulate, Weathering:- Definition-types of weathering physical weathering of rocks, agents of physical weathering, temperature, water, wind and glaciers, Chemical weathering, solution, hydration, hydrolysis carbonation-oxidation-reduction, biological weathering role of plants and animals in weathering.

Soil formation: Soil forming factors–active and passive soil factors and their role in soil formation, Soil forming processes: Eluviation, illuviation, humification, calcification, laterization, podzoloization, salinization, alkalization and gleization, Soil Profile, Detailed description of theoretical soil profile, Soil physical properties: Soil separates and their properties. Specific surface, soil texture-definition-textural classes-methods of determination of soil texture, importance of soil structure.

UNIT II: (10h)

Soil structure; Definition classification based on type, class and grade, factors influencing formation of aggregates-importance and management of soil structure, Soil structure; Definition-classification based on type, class and grade factors influencing formation of aggregates-importance and management of soil structure, Soil consistency; Definition-forms of consistency and importance of soil consistency, Bulk density and particle density; factors influencing and their importance; porosity –types-calculation-importance, Soil water; structure of water and the effect of H-bonding on properties of water retention of water in soils-soil moisture tension-soil moisture potential–soil moisture constants. Soil water movement; saturated, unsaturated and vapor flows, laws governing water flow-Darcy’s and Poiseuille’s law-Infiltration; Factors-importance. Evaporation; Factors influencing evaporation- Ways to minimize it-soil mulch-organic mulch, etc., Soil air; Composition of soil air-processes of gaseous exchange –soil aeration indices –and their importance (oxygen content-ODR-aeration porosity-redox potential) management of soil air, Soil temperature; influence of soil temperature on plant growth-

factors influencing soil temperature-management of soil temperature. Soil color determination importance, Soil colloids: Definition-general properties-in organic and organic colloids origin of charge on colloids (positive & negative).

UNIT-III: (10h)

Secondary silicate clay minerals(in organic soil colloids) Kaolinite, Montmorillonite and Illite their structures and properties, Ion exchange, Cation and anion exchange–factors influencing ion exchange capacity of soils importance of ion exchange calculation of base saturation and exchangeable acidity, Soil organic matter: importance of organic matter CN ration of organic matter and its importance, Soilbiology;-Soil flora and fauna their characteristics role of beneficial organisms mineralization–immobilization ,nitrogen fixation, nitrification, denitrification, solubilization of phosphorus and sulphur, Soil fertility:- Concepts of soil fertility and soil productivity:- definitions and differences Arnon’s criteria of essentiality-essential and beneficial elements-factors influencing availability of nutrients. Problem Soils: Definition–Physical problems soil depth slope soil crust soil compaction drainage submergence (formation-adverse effects-effect on soil properties and plant growth management), Chemical problems–classification acid, saline, salinesaline-sodic and calcareous soils-characteristics-nutrient availability in problem soils and their reclamation.

UNIT-IV: (10h)

Irrigation water: Quality of irrigation water-classification based on EC, SAR, RSC and Boron content-use of saline waters in agriculture, Soil taxonomy: New comprehensive system of soil classification (7th approximation) soil orders and their characteristics, Important soil groups of India: Alluvial soils-black soils–red soils laterite soils and coastal soils. Meaning and scope of agronomy, History of agricultural development in ancient India, Agriculture in civilization era, National and International Agricultural Research Institutes in India, Classification of crops, Classification of field crops, According to Origin, Botanical Commercial, Economical, seasonal, Ontogeny, Agronomic, Lead Morphology and Special Purpose crops, Definition of climate and weather, Definition of meteorology, Climatology, Agri-meteorology, Introduction, scope and practical utility of Agricultural meteorology, composition and structure of atmosphere, Influence of weather on crop grain development, essential Resources for crop production, factors influencing plant growth, Biotic and Abiotic factors, Crop seasons, Kharif, Rabi and summer seasons in A.P.-Agro-climatic zones of A.P. and India.

UNIT-V: (8h)

Tillage and tith, Objective of tillage, characteristic of good seed bed, effect of tillage on soil properties (Porespace, texture, structure, bulk density, color of the soil), Types of Tillage, preparatory cultivation, inter cultivation, after cultivation and preparatory cultivation for lowl and rice pudding, implement used for seed bed preparation, sowing, inter-cultivation and special operation, Sowing, Methods of sowing, time and depth of sowing ofmajoragriculturalcrops,Methodsandtimeofapplicationofmanureandfertilizers.

Weeds- Influence of weeds on crop production, principles and practices of weed

management, Basics on soil plant-water relationship, Types of Soil Erosion, Factors influencing soil erosion, Soil conservation, erosion preventive measures, Agronomic measures for soil and water conservation, Dry land Agriculture, Problems of Crop production in dry farming, Agronomic measure in reducing evapo-transpiration losses, Watershed management, aims and Objectives, Organic farming-Sustainable Agriculture, Definition, Principles and importance

TEXTBOOKS:

1. Principles of Agronomy, T Yellam and a Reddy & G.H. Shankar Reddy, Kalyani Publishers.
2. Nature and Properties of soils. Brady Nyle C and Ray R Well 2002. Pearson Education Inc., New Delhi.
3. Fundamental of Soil Science. Indian Society of Soil Science 1988. IARI, New Delhi.

REFERENCES:

1. Meteorology, William L Donn, 1965, McGraw-Hill Book Co. New York.
2. Crop Production in Dry Regions, Arnon L 1972, Leonard Hill Publishing Co., London.
3. Manures and Fertilizers, Yawalkar K S and Agrawal J P, 1977, Agricultural Horticultural Publishing House, Nagpur.
4. Principle of Weed Science, Rao V S, 1992, Oxford and IBH Publishing Co. Ltd., New Delhi.
5. Soil Fertility and Fertilizers, Tisdale S L, Nelson W L, Beaton J D and Havlin J L 1995. Prentice-Hall of India, New Delhi.
6. Introduction to Soil Physics, Hillel D 1982. Academic Press, London.

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SOIL SCIENCE AND AGRONOMY FIELD LAB				

PART-A

To impose the knowledge of student on soil genesis, soil farming process structure, soil organic matter and chemical operation, etc. It is helpful to the student to design farm implement in relation to soil and to maintain in soil health. It is fine to the students to know the analysis to irrigation water, based on quality suitable crops will be selected.

PART-B

1. To enable the students to grow suitable agricultural crops and orchard crops and all farming practices.
2. To understand the soil, crop and machine specific parameters for design and development to forms machinery equipment & implements.
3. Students will be acquainted with seed processing equipment, soil and water engineering activating for efficient water and land producing and upcoming organic farm inactivity.

PART-A

Choose any six labs

1. Study of soil profile and collection of soil samples
2. Determination of bulk density and particle density of soils
3. Determination of soil texture
4. Determination of Proctor moisture content
5. Determination of soil moisture at different tensions
6. Determination of hydraulic conductivity of soil
7. Determination of infiltration rate soil
8. Determination of soil strength and soil colour
9. Determination of pH and, Electrical Conductivity (EC) of soils
10. Determination of organic carbon content in soils
11. Estimation of available Phosphorus (P) & Potassium (K) of soils
12. Determination of anions and cations in irrigation water

PART-B

Choose any six labs

1. Visit to college farm
2. Study of meteorological instruments
3. Measurement of rain fall and evaporation
4. Practice of ploughing
5. Practice of puddling
6. Identification of crops and seeds
7. Identification of manures and fertilizers
8. Seedbed preparation of nursery
9. Practice of sowing
10. Soil moisture estimation by direct method
11. Practice of fertilizer application
12. Practice of inter cultivation
13. Practice of weeding
14. Practice of harvesting