

**SYLLABUS FOR UNDERGRADUATE PROGRAMME IN APPLIED
LIFE SCIENCES WITH AGROCHEMICALS AND PEST
MANAGEMENT**

(CHEMISTRY- COMPONENT)

DISCIPLINE SPECIFIC CORE COURSE – 2:

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Soil Fertility, Fertilizers and Micronutrients; ALS CHEM DSC-2	4	2	0	2	Class XII pass with Biology and Chemistry	NA

Learning Objectives:

The Learning Objectives of this course are as follows:

- To make students aware of different types of soils, soil composition and soil fertility.
- To provide an understanding of the role of different plant nutrients, as soil is the natural resource for many nutrients which are required during the growth and development of plants.
- To familiarize students to fertilizers and their use as supplementary nutrients, as they contribute to the healthy growth of the plants.

Learning Outcomes:

By studying this course, students will be able to:

- Understand about the different types of soils, soil composition and important physical properties of soil.

- Know the importance and use of different fertilizers and to apply this knowledge for agriculture purpose to get better crop productivity.

Unit 1 (6 Hours)

Nature, origin, composition, and types of soil. Chemistry of weathering of soils and clay minerals. Soil acidity, salinity, and alkalinity. Liming of soil. Introduction to soil fertility and productivity. Factors affecting soil fertility and productivity. Organic matter (OM), Cation exchange capacity (CEC), Anion exchange capacity (AEC) of agricultural soils.

Unit 2 (8 Hours)

Plant nutrients- Definition, classification of nutrients as: Primary nutrients, Secondary nutrients, Macronutrients (N, P, K, Ca, Mg, S) and Micronutrients (Cl, Fe, B, Mn, Zn, Cu, Mo, Ni): Properties, uses and deficiency symptoms of nutrients. Definition and uses of beneficiary elements (Co, Na, Si, Se and V). Nitrogen cycle, Nitrification, denitrification, and ammonification.

Unit 3 (12 Hours)

Functions and forms of Nitrogen, Phosphorous and Potassium in plants. Available nitrogen, phosphorous and potassium in fertilizers.

Nitrogen fertilizers: Urea, ammonium nitrate, calcium ammonium nitrate, sodium nitrate, ammonium chloride and their uses. Slow-release fertilizers. Neem coated urea (NCU) Sulphur coated urea (SCU) and polymer coated urea (PCU). Manufacturing of urea by Haber-Bosch process. Synthesis of ammonium nitrate, calcium ammonium nitrate, sodium nitrate and ammonium chloride.

Phosphorous fertilizers: Rock phosphate, Bone meal, basic slag, super phosphate of lime, single super phosphate, triple super phosphate, ammonium phosphates: manufacturing and uses.

Potassium fertilizers: Potassium nitrate, potassium chloride, potassium sulphate: synthesis and uses.

Unit 4 (4 Hours)

Complex fertilizers and Mixed fertilizers. Advantages of NPK fertilizers. Introduction to Organic Manures and Biofertilizers, Residual effect of Fertilizers and impact on Environment.

PRACTICAL (60 hours)

1. To determine soil texture by different size of sieves.
2. To determine moisture content in given soil sample.
3. To determine bulk density of given soil sample.
4. To determine water retention capacity of soil sample.
5. Estimation of organic matter in given soil sample volumetrically.
6. Qualitative estimation of nitrogen, phosphorous, potassium and calcium carbonate in given soil sample.
7. Determination of conductivity of given soil sample.
8. Determination of acidity of soil using pH meter.
9. To determine the phenolphthalein alkalinity and total alkalinity of given soil sample volumetrically.
10. To determine total phosphate in given fertilizer sample volumetrically.
11. Qualitative analysis for the type of fertilizer in a given sample.
12. To determine concentration of nitrate, ammonia and phosphate by spectrophotometer with the help of calibration curve.

Essential/recommended readings

1. Havlin, J. L., Tisdale, S. L., Nelson, W. L., & Beaton, J. D. (2016). *Soil fertility and fertilizers*. Pearson Education India.
2. Gupta A. K., & Varshney M. L. (2007). *Practical manual for Agriculture Chemistry*. Kalyani Publishers Pvt. Ltd., New Delhi.
3. Handbook of agriculture. Indian Council of Agricultural Research.
4. Yawalker, K.S., Agrawal, J.P., & Bokde, S. (1992). *Manures and Fertilizers*. Agricultural Publishing House, Nagpur (Maharashtra).

Suggestive readings

1. Tandon, H.L.S. (2008). *Fertilizers and Their Composition, Characteristics, Quality, Transformations and Applications*. Fertiliser Development Consultation Organisation.
2. Langdon R., Elsworth, Paley, & W.O., Nova. (2008). *Fertilizers: Properties, Applications and Effects*. Science Pub.

3. Chopra, S. L., & Kanwar, J. S. (1976). *Analytical Agricultural Chemistry*. Kalyani Publishers.
4. Das, P. C., (2015). *Manures and fertilizers*. Kalyani Publishers Pvt. Ltd.
5. Nagornny, V. D., & Raghav, J. S. (2015). *Soil Fertility Management*. Kalyani Publishers Pvt.Ltd.
6. Snyder H. (2008). *The Chemistryof soils and Fertilizers*. Easton, Pa., The Chemical PublishingCo.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.