Modern Concepts in Crop Production	AGRN-101	3(2+1)

THEORY

UNIT I: Geo-ecological zones of India; Crop growth analysis in relation to environment.

UNIT II: Quantitative agro-biological principles and inverse yield nitrogen law; Mitscherlich yield equation, its interpretation and applicability; Baule unit.

UNIT III: Physiology of grain yield in different crops; optimization of plant population and planting geometry in relation to different resources; Effect of lodging in cereals; Concept of ideal plant type and crop modeling for desired crop yield.

UNIT IV: Scientific principles of crop production; Crop response production functions; Concept of soil-plant relations; Yield and environmental stress; Crop insurance: concept, scope, methodology and applications.

UNIT V: Integrated farming systems, organic farming, and resource conservation technology including modern concept of tillage; Nutrient needs for yield potentiality of crop plants; Energy requirement in cultivation; Precision and sustainable agriculture.

PRACTICAL

- Measurement of root-shoot relationship in crops at different growth stages.
- Estimation of growth evaluating parameters at different stages of crop.
- Assessment of crop yield on the basis of yield attributing characters.
- Study of crop modeling for different crop yield.
- Estimation of moisture index and aridity index.
- Analysis of productivity trend in un-irrigated areas.
- Tours and visits.

Principles and Practices of Soil Fertility and Nutrient Management	AGRN -102	3(2+1)

THEORY

UNIT I: Soil fertility and productivity - factors affecting; features of good soil management; problems of supply and availability of nutrients; relation between nutrient supply and crop growth; organic farming - basic concepts and definitions.

UNIT II: Criteria of essentiality of nutrients; Essential plant nutrients – their functions, nutrient deficiency symptoms; transformation and dynamics of major plant nutrients.

UNIT III: Preparation and use of farm yard manures, vermicompost, bio-fertilizers and other organic concentrates their composition, availability and crop responses; recycling of organic wastes and residue management.

UNIT IV: Commercial fertilizers; composition, relative fertilizer value and cost; crop response to different nutrients, residual effects and fertilizer use efficiency, fertilizer mixtures and grades; agronomic, chemical and physiological methods of increasing fertilizer use efficiency; nutrient interactions.

UNIT V: Time and methods of manures and fertilizers application; foliar application and its concept; relative performance of organic and inorganic manures; economics of fertilizer use; integrated nutrient management; use of vermin-compost and residue wastes in crops.

PRACTICAL

- Determination of soil pH, ECE, organic C, total N, available N, P, K and S in soils
- Determination of total N, P, K and S in plants
- Interpretation of interaction effects and computation of economic and yield optima

Principles and Practices of Weed Management	**AGRN -103**	**3(2+1)**

THEORY

UNIT I: Weed biology and ecology, crop-weed competition including allelopathy; principles and methods of weed control and classification; weed indices.

UNIT II: Herbicides introduction and history of their development; classification based on chemical, physiological application and selectivity; mode and mechanism of action of herbicides.

UNIT III: Herbicide structure - activity relationship; factors affecting the efficiency of herbicides; herbicide formulations, herbicide mixtures; herbicide resistance and management; weed control through bio-herbicides, myco-herbicides and allelochemicals; Degradation of herbicides in soil and plants; herbicide resistance in weeds and crops; herbicide rotation.

UNIT IV: Weed management in major crops and cropping systems; parasitic weeds; weed shifts in cropping systems; aquatic and perennial weed control.

UNIT V: Integrated weed management; cost: benefit analysis of weed management.

PRACTICAL

- Identification of important weeds of different crops
- Preparation of a weed herbarium
- Weed survey in crops and cropping systems
- Crop-weed competition studies
- Preparation of spray solutions of herbicides for high and low-volume sprayers
- Use of various types of spray pumps and nozzles and calculation of swath width
- Economics of weed control
- Herbicide resistance analysis in plant and soil
- Bioassay of herbicide resistance
- Calculation of herbicidal requirement

Principles and Practices of Water Management	**AGRN -104**	**3(2+1)**

THEORY

UNIT I: Water and its role in plants; water resources of India, major irrigation projects, extent of area and crops irrigated in India and different states.

UNIT II: Soil water movement in soil and plants; transpiration; soil-water-plant relationships; water absorption by plants; plant response to water stress, crop plant adaptation to moisture stress condition.

UNIT III: Soil, plant and meteorological factors determining water needs of crops; scheduling, depth and methods of irrigation; micro-irrigation system; fertigation management of water in controlled environments and poly-houses.

UNIT IV: Water management of the crops and cropping systems; quality of irrigation water and management of saline water for irrigation; water use efficiency.

UNIT V: Excess of soil water and plant growth; water management in problem soils; drainage requirement of crops and methods of field drainage, their layout and spacing.

PRACTICAL

- Measurement of soil water potential by using tensiometer, and pressure plate and membrane apparatus
- Soil-moisture characteristics curves
- Water flow measurements using different devices
- Determination of irrigation requirements
- Calculation of irrigation efficiency
- Determination of infiltration rate
- Determination of saturated/unsaturated hydraulic conductivity

Statistical methods and Experimental designs	**AGRN -105**	**3(1+1)**

THEORY

UNIT I: Processing of data: Classification and tabulation of statistical data by categories and measurements, graphical and diagrammatic representation-histogram. Frequency polygon, frequency curve and cumulative frequency curves.

UNIT II: Measure of location and dispersion : Mean, median, mode, partition values (quartiles, deciles and percentiles). Range, quartile deviation, mean deviation about mean and deian, standard deviation coefficient of variation, moment kurtosis.

UNIT III: Probability & distribution : Random experiment, sample space (discrete case only), events mathematical and statistical definition of probability, random variable (discrete and continuous), bermoulli trials, binomial distn. posson distn. Poision distn as a limiting case of the bionominal distn, normal sistn, properties of the above distributions and fitting with available date, Test for their goodness of fit.

UNIT IV: Correlation and regression : Bivariate dats, bivariate frequency distn, correlation coefficient, rank correlation, Regression lines, regression coefficients and their relation with correlation coefficient, Multiple regression, multiple and partial correlation coefficients.

UNIT V: Estimation : Concept of population and sample; parameters and statistics: criteria for a good estimator unbiasedness, consistency of population mean and its confidence internal in the normal case.

UNIT VI: Testing of hypothesis : Null and alternative hypotheses, two type of errors, level of significance, power of the test, one tailed and two tailed tests.

UNIT VII: Tests of significance : (a) large sample tests for mean & equality of means of two populations (2-tests). Students statistic and its use of testing the mean equality of means of two populations (with independent and paired observations) correlation coefficient and

regression coefficients. (b) Chi- Square statistics and its use as a test of goodness of fit, independence of attributes (contingency table) with Yates correction, and testing for the variance of a population. (c) Fishers statistic and its use in testing the equality of two variances and homogeneity of means (analysis of variance).

UNIT VIII: Analysis of variance and covariance (ANOVA and ANCOVA): Analysis of variance and covariance with one way and two-way classifications (one observation per cell). Bartlettin test for testing the homogeneity of variances.

UNIT IX: Design of experiments : Need : uniformity trials, Principles of experimental design-replication, randomization and local control, (a) Completely randomized, randomized block and Latin square designs and their analysis, missing plot technique in RBD. (b) Simple factorial experiments of the type 22, 33, 24, 32, confounding in factorial experiments. (c) Split-plot experiments.

PRACTICALS

- Presentation of data-tabulation, histograms and frequency polygons.
- Calculation of mean, mode, standard deviation, skewness and kurtosis.
- Calculation of expected frequencies in binomial, posson and normal distributions testing the observed results against expected frequencies.
- Tests of significance as prescribed in theory.
- Regression and correlation coefficients and their significance.
- Analysis of variance for different designs prescribed.
- Analysis of covariance.