Module 1 – NUTRIENT OVERVIEW
1. The Essential Elements
2. Functions in Plants
3. Mobility of Elements in Plants and Soils

Module 2 – SOIL pH, SALINITY, SODICITY
1. The pH Scale
2. Optimum pH Levels for Various Crops
3. Factors Influencing Soil pH
4. Soil Salinity and Sodicity

Module 3 – THE NITROGEN CYCLE
1. The Processes of Mineralization
2. Nitrification
3. Immobilization
4. Volatilization
5. Denitrification
6. Leaching: When They Occur
7. What Conditions Influence Transformation and Movement
8. How to Retain Soil Nitrogen for Crop Yield and Quality

Module 4 – THE PHOSPHORUS CYCLE
1. Forms of Phosphorus
2. How Phosphorus Reacts in Different Soil Environments
3. Phosphorus and Other Nutrients Travel Off Site
4. Phosphorus’ Role in Water Quality

Module 5 – SOIL ORGANIC MATTER AND MICROBIOLOGY
1. The Role of Soil Organic Matter
2. Soil Flora and Fauna
3. Influence of Flora and Fauna on Nutrient Amounts
4. Influence of Flora and Fauna on Nutrient Availability and Plant Uptake

Module 6 – PLANT PHYSIOLOGY
1. The Role of Crop Nutrients in Crop Growth and Development
2. Plant Responses to Nutrient Deficiencies and Toxicities

Module 7 – NUTRIENT ASSESSMENT
1. Soil Sampling
2. Soil Sampling Tools
3. Plant Tissue Analysis
4. Chlorophyll and Greenness Sensors
   (Continued on next page)
5. Remote Sensing/Proximal Sensing
6. Managing Field Variability
7. Zones vs. Grids
8. Sampling Through the Soil Profile

Module 8 - FERTILIZERS
1. Fertilizer Production
2. Fertilizer Analyses
3. Fertilizer Additives
4. When to Use Fertilizers
5. Management of Various Sources to Maximize Crop Productivity and Protect Water Quality

Module 9 – MANURES AND SOIL AMENDMENTS
1. Manures
2. Biosolids
3. Lime
4. Gypsum
5. Soil Amendments

Module 10 – FERTILIZER RECOMMENDATIONS AND ECONOMICS
1. Fertilizer Calculations
2. Management Philosophies in Various Regions/Crops
3. How University Recommendations are Derived
4. Nutrient Management Planning
5. Year-to-year and Weather-Specific Variability

Module 11 – FERTILIZER APPLICATION
1. Foliar, Banding, Broadcast, Surface, Sidedress and Row Application
2. Equipment
3. Technology and Placement Options
4. Case Study Examples Exemplifying Evaluation
5. Approaches that Support Crop Productivity and Water Quality

Module 12 – WATER AND AIR QUALITY
1. Nutrient Management’s Effect on Water and Air Quality
2. Greenhouse Gasses
3. Balancing Productivity and Cost with Ecosystem Considerations