

<b>Course No.</b>	<b>Course Title</b>	<b>Credits</b>
STAT 551	MATHEMATICAL METHODS-I	3+0
STAT 552	MATHEMATICAL METHODS-II	2+0
STAT 560	PROBABILITY THEORY	2+0
STAT 561	STATISTICAL METHODS	2+1
STAT 562	STATISTICAL INFERENCE	2+1
STAT 563	MULTIVARIATE ANALYSIS	2+1
STAT 564	DESIGN OF EXPERIMENTS	2+1
STAT 565	SAMPLING TECHNIQUES	2+1
STAT 566	STATISTICAL GENETICS	2+1
STAT 567	REGRESSION ANALYSIS	1+1
STAT 568	STATISTICAL COMPUTING	1+1
STAT 571	BIOINFORMATICS	2+0
STAT 572	ECONOMETRICS	2+0

## **AGRONOMY**

### **Course Structure - at a Glance**

<b>CODE</b>	<b>COURSE TITLE</b>	<b>CREDITS</b>
AGRON 501*	MODERN CONCEPTS IN CROP PRODUCTION	3+0
AGRON 502*	PRINCIPLES AND PRACTICES OF SOIL FERTILITY AND NUTRIENT MANAGEMENT	2+1
AGRON 503*	PRINCIPLES AND PRACTICES OF WEED MANAGEMENT	2+1
AGRON 504*	PRINCIPLES AND PRACTICES OF WATER MANAGEMENT	2+1
AGRON 505	AGROMETEOROLOGY AND CROP WEATHER FORECASTING	2+1
AGRON 506 (CORE)	AGRONOMY OF CEREAL CROP-I (RICE)	2+1
AGRON 507	AGRONOMY OF CEREAL CROPS-II (MAIZE AND MILLETS)	2+1
AGRON 508	AGRONOMY OF CEREAL CROPS II (WHEAT AND BARLEY)	2+1
AGRON 509	AGRONOMY OF PULSE CROPS (KHARIF AND RABI)	2+1
AGRON 510	AGRONOMY OF OIL SEED CROPS (KHARIF AND RABI)	2+1
AGRON 511	AGRONOMY OF FIBRE CROPS	2+1
AGRON 512	AGRONOMY OF SUGAR CROPS	2+1
AGRON 513	AGRONOMY OF TUBER CROPS	2+1
AGRON 514	AGRONOMY OF FODDER AND FORAGE CROPS	2+1
AGRON 515	CROPPING SYSTEMS AND SUSTAINABLE AGRICULTURE	2+0
AGRON 516	DRYLAND FARMING AND WATERSHED MANAGEMENT	2+1
AGRON 517	PRINCIPLES AND PRACTICES OF ORGANIC FARMING	2+1
AGRON 518	DIAGNOSIS OF NUTRITIONAL DEFICIENCY IN FIELD CROPS AND THEIR REMEDIAL MEASURE	2+1
AGRON 591	MASTER'S SEMINAR	1+0

## Course Contents

**AGRON 501                      MODERN CONCEPTS IN CROP PRODUCTION                      3+0**

### **Objective**

To teach the basic concepts of soil management and crop production.

### **Theory**

#### UNIT I

Crop growth analysis in relation to environment; agro-ecological zones of India.

#### UNIT II

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

#### UNIT III

Effect of lodging in cereals; physiology of grain yield in cereals; optimization of plant population and planting geometry in relation to different resources, 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.

#### UNIT V

Integrated farming systems, organic farming, and resource conservation technology including modern concept of tillage; dry farming; determining the nutrient needs for yield potentiality of crop plants, concept of balance nutrition and integrated nutrient management; precision agriculture.

### **Suggested Readings**

Balasubramanian P & Palaniappan SP. 2001. *Principles and Practices of Agronomy*. Agrobios.

Fageria NK. 1992. *Maximizing Crop Yields*. Marcel Dekker.

Havlin JL, Beaton JD, Tisdale SL & Nelson WL. 2006. *Soil Fertility and Fertilizers*. 7<sup>th</sup> Ed. Prentice Hall.

Paroda R.S. 2003. *Sustaining our Food Security*. Konark Publ.

Reddy SR. 2000. *Principles of Crop Production*. Kalyani Publ.

Sankaran S & Mudaliar TVS. 1997. *Principles of Agronomy*. The Bangalore Printing & Publ.

Singh SS. 2006. *Principles and Practices of Agronomy*. Kalyani.

**AGRON 502                      SOIL FERTILITY AND NUTRIENT MANAGEMENT                      2+1**

### **Objective**

To impart knowledge of fertilizers and manures as sources of plant nutrients and apprise about the integrated approach of plant nutrition and sustainability of soil fertility.

### **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 farmyard manure, compost, green manures, vermicompost, biofertilizers 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 vermincompost and residue wastes in crops.

#### Practical

- Determination of soil pH, E<sub>Ce</sub>, 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

#### Suggested Readings

Brady NC & Weil R.R 2002. *The Nature and Properties of Soils*. 13<sup>th</sup> Ed. Pearson Edu.

Fageria NK, Baligar VC & Jones CA. 1991. *Growth and Mineral Nutrition of Field Crops*. Marcel Dekker.

Havlin JL, Beaton JD, Tisdale SL & Nelson WL. 2006. *Soil Fertility and Fertilizers*. 7<sup>th</sup> Ed. Prentice Hall.

Prasad R & Power JF. 1997. *Soil Fertility Management for Sustainable Agriculture*. CRC Press.

Yawalkar KS, Agrawal JP & Bokde S. 2000. *Manures and Fertilizers*. Agri-Horti Publ.

### **AGRON 503      PRINCIPLES AND PRACTICES OF WEED MANAGEMENT      2+1**

#### **Objective**

To familiarize the students about the weeds, herbicides and methods of weed control.

#### **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.

60

## 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

### **Suggested Readings**

Aldrich RJ & Kramer RJ. 1997. *Principles in Weed Management*. Panima Publ.

Ashton FM & Crafts AS. 1981. *Mode of Action of Herbicides*. 2<sup>nd</sup> Ed. Wiley Inter-Science.

Gupta OP. 2007. *Weed Management – Principles and Practices*. Agrobios.

Mandal RC. 1990. *Weed, Weedicides and Weed Control - Principles and Practices*. Agro-Botanical Publ.

Rao VS. 2000. *Principles of Weed Science*. Oxford & IBH.

Subramanian S, Ali AM & Kumar RJ. 1997. *All About Weed Control*. Kalyani.

Zimdahl RL. 1999. *Fundamentals of Weed Science*. 2<sup>nd</sup> Ed. Academic Press.

## **AGRON 504 PRINCIPLES AND PRACTICES OF WATER MANAGEMENT 2+1**

### **Objective**

To teach the principles of water management and practices to enhance the water productivity.

### **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; microirrigation system; fertigation; management of water in controlled environments and polyhouses.

#### 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

#### Suggested Readings

Lenka D. 1999. *Irrigation and Drainage*. Kalyani

Michael AM. 1978. *Irrigation: Theory and Practice*. Vikas Publ.

Paliwal KV. 1972. *Irrigation with Saline Water*. IARI Monograph, New Delhi.

Panda SC. 2003. *Principles and Practices of Water Management*. Agrobios.

Prihar SS & Sandhu BS. 1987. *Irrigation of Food Crops - Principles and Practices*. ICAR.

Reddy SR. 2000. *Principles of Crop Production*. Kalyani.

Singh Pratap & Maliwal PL. 2005. *Technologies for Food Security and Sustainable Agriculture*. Agrotech Publ.

**AGRON 505**

**AGROMETEOROLOGY AND CROP WEATHER**

**2+1**

#### FORECASTING

#### Objective

To impart knowledge about agro-meteorology and crop weather forecasting to meet the challenges of aberrant weather conditions.

#### Theory

#### UNIT I

Agro meteorology - aim, scope and development in relation to crop environment; composition of atmosphere, distribution of atmospheric pressure and wind.

62

#### UNIT II

Characteristics of solar radiation; energy balance of atmosphere system; radiation distribution in plant canopies, radiation utilization by field crops; photosynthesis and efficiency of radiation utilization by field crops; energy budget of plant canopies; environmental temperature: soil, air and canopy temperature.

#### UNIT III

Temperature profile in air, soil, crop canopies; soil and air temperature effects on plant processes; environmental moisture and evaporation: measures of atmospheric temperature and relative humidity vapor pressure and their relationships; evapo-transpiration and meteorological factors determining evapotranspiration.

#### UNIT IV

Modification of plant environment: artificial rain making, heat transfer, controlling heat load, heat trapping and shading; protection from cold, sensible and latent heat flux, controlling soil moisture; monsoon and their origin, characteristics of monsoon; onset, progress and withdrawal of monsoon; weather hazards, drought monitoring and planning for mitigation.

#### UNIT V

Weather forecasting in India – short, medium and long range; aerospace science and weather forecasting; benefits of weather services to agriculture, remote sensing; application in agriculture and its present status in India; atmospheric pollution and its effect on climate and crop production; climate change and its impact on agriculture.

#### Practical

- Visit to agro-meteorological observatory and to record sun-shine hours, wind velocity, wind direction, relative humidity, soil and air temperature, evaporation, precipitation and atmospheric pressure
- Measurement of solar radiation outside and within plant canopy
- Measurement/estimation of evapo-transpiration by various methods
- Measurement/estimation of soil water balance
- Rainfall variability analysis
- Determination of heat-unit requirement for different crops
- Measurement of crop canopy temperature
- Measurement of soil temperatures at different depths
- Remote sensing and familiarization with agro-advisory service bulletins • Study of synoptic charts and weather reports, working principle of automatic weather station
- Visit to solar observatory

#### Suggested Readings

Chang Jan Hu 1968. *Climate and Agriculture on Ecological Survey*. Aldine Publ.

Critchfield HJ.1995. *General Climatology*. Prentice Hall of India.

Das PK.1968. *The Monsoons*. National Book Trust Publ.

Lal DS.1998. *Climatology*. Sharda Pustak Bhawan.  
Lenka D.1998. *Climate, Weather and Crops in India*. Kalyani.  
Mavi H.S.1994. *Introduction to Agro-meteorology*. Oxford & IBH.  
Mavi HS & Tupper GJ. 2004. *Agrometeorology: Principles and Application of Climate Studies in Agriculture*. Haworth Press.  
Menon PA.1991. *Our Weather*. National Book Trust Publ.  
Sahu DD. *Agrometeorology and Remote Sensing: Principles and Practices*. Agrobios.  
Variraju R & Krishnamurthy 1995. *Practical Manual on Agricultural Meteorology*. Kalyani.  
Varshneya MC & Balakrishana Pillai P. 2003. *Textbook of Agricultural Meteorology*. ICAR.

**AGRON. 506 (CORE): Agronomy of Cereal Crop-I (Rice)**

**2+1**

**Objective:**

To teach the crop husbandry of rice crop

**Theory:**

Origin, antiquity of rice, area and production, distribution, classification, description and varietal improvement. Adaptability, Agro-climatic different zones of rice in India, growth of rice, effect of temperature on growth, nutrition and yield of rice, fertilizer-soil interaction in relation to nutrition and yield of rice, cultural practices including integrated weed management for rice. Water & fertilizer management practices for rice. Rice culture in problematic soil conditions. Rice-based cropping systems Yield gap analysis concept and package of practices of hybrid rice. Post harvest Technology and crop quality. Handling and processing of the produce for maximum production of rice.

**Practical**

- Phenological studies at different growth stages of crop
- Estimation of crop yield on the basis of yield attributes
- Formulation of cropping schemes for various farm sizes and calculation of cropping and rotational intensities
- Working out growth indices (CER, CGR, RGR, NAR, LAD), aggressiveness, relative crowding coefficient, monetary yield advantage and ATER of prominent intercropping systems of different crops
- Planning and layout of field experiments
- Judging of physiological maturity in different crops
- Intercultural operations in different crops
- Determination of cost of cultivation of different crops
- Working out harvest index of various crops
- Study of seed production techniques in various crops



- Visit of field experiments on cultural, fertilizer, weed control and water management aspects
- Visit to nearby villages for identification of constraints in crop production

**Suggested Readings**

Das NR. 2007. *Introduction to Crops of India*. Scientific Publ.

Hunsigi G & Krishna KR. 1998. *Science of Field Crop Production*. Oxford & IBH.

Khare D & Bhale MS. 2000. *Seed Technology*. Scientific Publ.

Pal M, Deka J & Rai RK. 1996. *Fundamentals of Cereal Crop Production*. Tata McGraw Hill.

Prasad, Rajendra. 2002. *Text Book of Field Crop Production*. ICAR.

Singh C, Singh P & Singh R. 2003. *Modern Techniques of Raising Field Crops*. Oxford & IBH.

Singh, SS. 1998. *Crop Management*. Kalyani.

**AGRON 507: Agronomy of Cereal Crops-II (Maize and Millets)**

**2+1**

**Objective:**

To teach the crop husbandry of Maize and Millets crop

**Theory:**

Origin & history, area & production, distribution, botany, classification, description and varietal improvement, adaptability, climate, soil water and cultural requirement, development and nutrition of the crop plant based on agronomic investigation. Crop protection, Cost of cultivation, Crop quality, Industrial uses of byproducts. Handling and processing of the produce for maximum production of Maize and Millets.

**Practical**

- Phenological studies at different growth stages of crop
- Estimation of crop yield on the basis of yield attributes
- Formulation of cropping schemes for various farm sizes and calculation of cropping and rotational intensities
- Working out growth indices (CER, CGR, RGR, NAR, LAD), aggressiveness, relative crowding coefficient, monetary yield advantage and ATER of prominent intercropping systems of different crops
- Planning and layout of field experiments
- Judging of physiological maturity in different crops
- Intercultural operations in different crops

- Determination of cost of cultivation of different crops
- Working out harvest index of various crops
- Study of seed production techniques in various crops
- Visit of field experiments on cultural, fertilizer, weed control and water management aspects
- Visit to nearby villages for identification of constraints in crop production

### **Suggested Readings**

Das NR. 2007. *Introduction to Crops of India*. Scientific Publ.

Hunsigi G & Krishna KR. 1998. *Science of Field Crop Production*. Oxford & IBH.

Khare D & Bhale MS. 2000. *Seed Technology*. Scientific Publ.

Kumar Ranjeet & Singh NP. 2003. *Maize Production in India: Golden Grain in Transition*. IARI, New Delhi.

Pal M, Deka J & Rai RK. 1996. *Fundamentals of Cereal Crop Production*. Tata McGraw Hill.

Prasad, Rajendra. 2002. *Text Book of Field Crop Production*. ICAR.

Singh C, Singh P & Singh R. 2003. *Modern Techniques of Raising Field Crops*. Oxford & IBH.

Singh, SS. 1998. *Crop Management*. Kalyani.

**AGRON 508:                      Agronomy of Cereal Crops II (Wheat and Barley)                      2+1**

#### **Objective:**

To teach the crop husbandry of Wheat and Barley crop

#### **Theory:**

Origin & history, area & production, distribution, place of wheat and barley crops position in India, description, Varieties and their improvements, adaptability, climatic requirements and soil management, tillage and other special cultural practices in respect of rice-wheat cropping sequence. Growth phases of wheat and barley and its relation with temperature. Agronomic appraisal of varieties, crop quality, handling and processing of the produce, crop protection-weed control, cultivation cost, wheat and barley cultivation with special references to West Bengal conditions. Industrial uses of byproducts. Handling and processing of the produce for maximum production of Wheat and Barley.

#### **Practical**

- Phenological studies at different growth stages of crop
- Estimation of crop yield on the basis of yield attributes

- Formulation of cropping schemes for various farm sizes and calculation of cropping and rotational intensities
- Working out growth indices (CER, CGR, RGR, NAR, LAD), aggressiveness, relative crowding coefficient, monetary yield advantage and ATER of prominent intercropping systems of different crops
- Planning and layout of field experiments
- Judging of physiological maturity in different crops
- Intercultural operations in different crops
- Determination of cost of cultivation of different crops
- Working out harvest index of various crops
- Study of seed production techniques in various crops
- Visit of field experiments on cultural, fertilizer, weed control and water management aspects
- Visit to nearby villages for identification of constraints in crop production

### **Suggested Readings**

Das NR. 2007. *Introduction to Crops of India*. Scientific Publ.

Hunsi G & Krishna KR. 1998. *Science of Field Crop Production*. Oxford & IBH.

Khare D & Bhale MS. 2000. *Seed Technology*. Scientific Publ.

Pal M, Deka J & Rai RK. 1996. *Fundamentals of Cereal Crop Production*. Tata McGraw Hill.

Prasad, Rajendra. 2002. *Text Book of Field Crop Production*. ICAR.

Singh C, Singh P & Singh R. 2003. *Modern Techniques of Raising Field Crops*. Oxford & IBH.

Singh, SS. 1998. *Crop Management*. Kalyani.

**AGRON 509:                      Agronomy of Pulse Crops (Kharif and Rabi)                      2+1**

**Objective:**

To teach the crop husbandry of Pulse crops

**Theory:**

Origin & history, area & production, distribution, botany, classification, description and agronomic appraisal of the varietal improvement. Role of green legumes in building of soil fertility and moisture conservation. Adaptability, climate, soil, water and cultural requirements, development and nutrition of the crop plant based on agronomic investigation. Kharif and Rabi legumes based crop

rotations and cropping systems. Crop protection. Cost of cultivation, industrial uses of by-products, Crop quality, handling and processing of the produce for maximum production of Kharif and Rabi Pulses.

### **Practical**

- Phenological studies at different growth stages of crop
- Estimation of crop yield on the basis of yield attributes
- Formulation of cropping schemes for various farm sizes and calculation of cropping and rotational intensities
- Working out growth indices (CER, CGR, RGR, NAR, LAD), aggressiveness, relative crowding coefficient, monetary yield advantage and ATER of prominent intercropping systems of different crops
- Estimation of protein content in pulses
- Planning and layout of field experiments
- Judging of physiological maturity in different crops
- Intercultural operations in different crops
- Determination of cost of cultivation of different crops
- Working out harvest index of various crops
- Study of seed production techniques in various crops
- Visit of field experiments on cultural, fertilizer, weed control and water management aspects
- Visit to nearby villages for identification of constraints in crop production

### **Suggested Readings**

Das NR. 2007. *Introduction to Crops of India*. Scientific Publ.

Hunsigi G & Krishna KR. 1998. *Science of Field Crop Production*. Oxford & IBH.

Jeswani LM & Baldev B. 1997. *Advances in Pulse Production Technology*. ICAR.

Khare D & Bhale MS. 2000. *Seed Technology*. Scientific Publ.

Prasad, Rajendra. 2002. *Text Book of Field Crop Production*. ICAR.

Singh C, Singh P & Singh R. 2003. *Modern Techniques of Raising Field Crops*. Oxford & IBH.

Singh, SS. 1998. *Crop Management*. Kalyani.

Yadav DS. 1992. *Pulse Crops*. Kalyani.

**Objective:**

To teach the crop husbandry of Oil Seed crops

**Theory:**

Origin & history, area & production, distribution, botany, classification, description and varietal improvement of the crop. Adaptability, climate, soil, water and cultural requirements, development and nutrition of the crop plant based on agronomic investigation. Crop protection, cost of cultivation, industrial uses of byproducts. Crop quality, handling and processing of the produce for maximum production of Kharif (Ground nut, Soybean, Sesame, Castor etc) and Rabi (Rapeseed and Mustard, Linseed, Sunflower, Safflower, Niger and Taramira) Oil Seeds.

**Practical**

- Planning and layout of field experiments
- Intercultural operations in different crops
- Working out growth indices (LER, CGR, RGR, NAR, LAD) aggressivity, relative crowding coefficient, monetary yield advantage and ATER of prominent intercropping systems
- Judging of physiological maturity in different crops and working out harvest index
- Working out cost of cultivation of different crops
- Estimation of crop yield on the basis of yield attributes
- Formulation of cropping schemes for various farm sizes and calculation of cropping and rotational intensities
- Determination of oil content in oilseeds and computation of oil yield
- Study of seed production techniques in various crops
- Visit of field experiments on cultural, fertilizer, weed control and water management aspects
- Visit to nearby villages for identification of constraints in crop production

**Suggested Readings**

Das NR. 2007. *Introduction to Crops of India*. Scientific Publ.

Das PC. 1997. *Oilseed Crops of India*. Kalyani.

Prasad, Rajendra. 2002. *Text Book of Field Crop Production*. ICAR.

Singh C, Singh P & Singh R. 2003. *Modern Techniques of Raising Field Crops*. Oxford & IBH.

Singh SS. 1998. *Crop Management*. Kalyani.

**AGRON 511:**

**Agronomy of Fibre Crops**

**2+1**

**Objective:**

To teach the crop husbandry of Fibre crops

**Theory:**

Origin & history, area & production, distribution, botany, classification, description and agronomic appraisal of the varietal improvement of the crops (Jute, Sunhemp, Cotton). Adaptability, climate, soil, water and agricultural requirements, development and nutrition of the crop plant based on agronomic investigation. Crop quality, handling and processing of the produce for maximum production of Jute, Sunhemp, Cotton .

**Practical**

- Planning and layout of field experiments
- Intercultural operations in different crops
- Cotton seed treatment
- Working out growth indices (LER, CGR, RGR, NAR, LAD) aggressivity, relative crowding coefficient, monetary yield advantage and ATER of prominent intercropping systems
- Judging of physiological maturity in different crops and working out harvest index
- Working out cost of cultivation of different crops
- Estimation of crop yield on the basis of yield attributes
- Formulation of cropping schemes for various farm sizes and calculation of cropping and rotational intensities
- Estimation of quality of fibre of different fibre crops
- Study of seed production techniques in various crops
- Visit of field experiments on cultural, fertilizer, weed control and water management aspects
- Visit to nearby villages for identification of constraints in crop production

**Suggested Readings**

Das NR. 2007. *Introduction to Crops of India*. Scientific Publ.

Prasad, Rajendra. 2002. *Text Book of Field Crop Production*. ICAR.

Singh C, Singh P & Singh R. 2003. *Modern Techniques of Raising Field Crops*. Oxford & IBH.

Singh SS. 1998. *Crop Management*. Kalyani.

**AGRON 512:**

**Agronomy of Sugar Crops**

**2+1**

**Objective:**

To teach the crop husbandry of Sugar crops

**Theory:**

Origin & history, area & production, distribution, botany, classification, description and varietal improvement. Adaptability, climate, soil, water and cultural requirements. Development and nutrition of the crop plant based on agronomic investigations. Crop protection. Cost of cultivation. Industrial uses of byproducts. Crop quality, handling and processing of the produce for maximum production of sugar crops (sugar cane, sugar beet).

**Practical**

- Planning and layout of field experiments
- Cutting of sugarcane setts, its treatment and methods of sowing, tying and propping of sugarcane
- Determination of cane maturity and calculation on purity percentage, recovery percentage and sucrose content in cane juice phenological studies at different growth stages of crop
- Intercultural operations in different crops
- Working out growth indices (LER, CGR, RGR, NAR, LAD) aggressivity, relative crowding coefficient, monetary yield advantage and ATER of prominent intercropping systems
- Judging of physiological maturity in different crops and working out harvest index

- Working out cost of cultivation of different crops
- Estimation of crop yield on the basis of yield attributes
- Formulation of cropping schemes for various farm sizes and calculation of cropping and rotational intensities
- Study of seed production techniques in various crops
- Visit of field experiments on cultural, fertilizer, weed control and water management aspects
- Visit to nearby villages for identification of constraints in crop production

### **Suggested Readings**

Das NR. 2007. *Introduction to Crops of India*. Scientific Publ.

Lakshmikantam N. 1983. *Technology in Sugarcane Growing*. 2<sup>nd</sup> Ed. Oxford & IBH.

Prasad, Rajendra. 2002. *Text Book of Field Crop Production*. ICAR.

Singh C, Singh P & Singh R. 2003. *Modern Techniques of Raising Field Crops*. Oxford & IBH.

Singh SS. 1998. *Crop Management*. Kalyani.

**AGRON 513:**

**Agronomy of Tuber Crops**

**2+1**

#### **Objective:**

To teach the crop husbandry of Tuber crops

#### **Theory:**

Origin & history, area & production, distribution, botany, classification, description and agronomic appraisal of the varietal improvement of the crop, adaptability, climate, soil, water and cultural requirements, development and nutrition of the crop plant based on agronomic investigation. Crop protection, cost of cultivation, industrial uses of by products, individual crop-based cropping system. Crop quality, handling and processing of the produce for maximum production of Tuber crops: potato and other tuber crops [sweeppotato, cassava, yams (*Dioscorea*), aroids (*Colocasia*, *Amorphophallus*, *Alocasia*, *Zanthosoma*), yam bean (*Pachyrrhisus*)].



**Practical**

- Planning and layout of field experiments
- Intercultural operations in different crops
- Working out growth indices (LER, CGR, RGR, NAR, LAD) aggressivity, relative crowding coefficient, monetary yield advantage and ATER of prominent intercropping systems
- Judging of physiological maturity in different crops and working out harvest index
- Working out cost of cultivation of different crops
- Estimation of crop yield on the basis of yield attributes
- Formulation of cropping schemes for various farm sizes and calculation of cropping and rotational intensities
- Estimation of quality for different tuber crops
- Study of seed production techniques in various crops
- Visit of field experiments on cultural, fertilizer, weed control and water management aspects
- Visit to nearby villages for identification of constraints in crop production

**Suggested Readings**

Das NR. 2007. *Introduction to Crops of India*. Scientific Publ.

Prasad, Rajendra. 2002. *Text Book of Field Crop Production*. ICAR.

Singh C, Singh P & Singh R. 2003. *Modern Techniques of Raising Field Crops*. Oxford & IBH.

Singh SS. 1998. *Crop Management*. Kalyani.

To teach the crop husbandry of different forage and fodder crops along with their processing.

### **Theory**

#### **UNIT I**

Adaptation, distribution, varietal improvement, agro-techniques and quality aspects including anti-quality factors of important fodder crops like maize, *bajra*, *guar*, cowpea, oats, barley, berseem, *senji*, lucerne etc.

#### **UNIT II**

Adaptation, distribution, varietal improvement, agro-techniques and quality aspects including anti-quality factors of important forage crops/grasses/lime, napier grass, *Panicum*, *Lasiurus*, *Cenchrus* etc.

#### **UNIT III**

Year-round fodder production and management, preservation and utilization of forage and pasture crops.

#### **UNIT IV**

Principles and methods of hay and silage making; chemical and biochemical changes, nutrient losses and factors affecting quality of hay and silage; use of physical and chemical enrichments and biological methods for improving nutrition; value addition of poor quality fodder.

#### **UNIT V**

Economics of forage cultivation uses and seed production techniques.

### **Practical**

- Practical raising of farm operations in raising fodder crops;
- Canopy measurement, yield and quality estimation, viz. crude protein, NDF, ADF, lignin, silica, cellulose etc. of various fodder and forage crops
- Anti-quality components like HCN in sorghum and such factors in other crops
- Hay and silage making and economics of their preparation

### **Suggested Readings**

Chatterjee BN. 1989. *Forage Crop Production - Principles and Practices*. Oxford & IBH.

Das NR. 2007. *Introduction to Crops of India*. Scientific Publ.

Narayanan TR & Dabaghao PM. 1972. *Forage Crops of India*. ICAR.

Singh P & Srivastava AK. 1990. *Forage Production Technology*. IGFRI, Jhansi.

Singh C, Singh P & Singh R. 2003. *Modern Techniques of Raising Field Crops*. Oxford & IBH.

Tejwani KG. 1994. *Agroforestry in India*. Oxford & IBH.

## **AGRON 515 CROPPING SYSTEMS AND SUSTAINABLE AGRICULTURE 2+0**

### **Objective**

To acquaint the students about prevailing cropping systems in the country and practices to improve their productivity.

### **Theory**

#### **UNIT I**

Cropping systems: definition, indices and its importance; physical resources, soil and water management in cropping systems; assessment of land use.

## UNIT II

Concept of sustainability in cropping systems and farming systems, scope and objectives; production potential under monoculture cropping, multiple cropping, alley cropping, sequential cropping and intercropping, mechanism of yield advantage in intercropping systems.

## UNIT III

Above and below ground interactions and allelopathic effects; competition relations; multi-storied cropping and yield stability in intercropping, role of non-monetary inputs and low cost technologies; research need on sustainable agriculture.

## UNIT IV

Crop diversification for sustainability; role of organic matter in maintenance of soil fertility; crop residue management; fertilizer use efficiency and concept of fertilizer use in intensive cropping system.

## UNIT V

Plant ideotypes for drylands; plant growth regulators and their role in sustainability.

### **Suggested Readings**

Palaniappan SP & Sivaraman K. 1996. *Cropping Systems in the Tropics; Principles and Management*. New Age.

Panda SC. 2003. *Cropping and Farming Systems*. Agrobios.

Reddy SR. 2000. *Principles of Crop Production*. Kalyani.

Sankaran S & Mudaliar TVS. 1997. *Principles of Agronomy*. The Bangalore Printing & Publ. Co.

Singh SS. 2006. *Principles and Practices of Agronomy*. Kalyani.

Tisdale SL, Nelson WL, Beaton JD & Havlin JL. 1997. *Soil Fertility and Fertilizers*. Prentice Hall.

## **AGRON 516      DRYLAND FARMING AND WATERSHED MANAGEMENT      2+1**

### **Objective**

To teach the basic concepts and practices of dry land farming and soil moisture conservation.

### **Theory**

#### UNIT I

Definition, concept and characteristics of dry land farming; dry land versus rainfed farming; significance and dimensions of dry land farming in Indian agriculture.

#### UNIT II

Soil and climatic parameters with special emphasis on rainfall characteristics; constraints limiting crop production in dry land areas; types of drought, characterization of environment for water availability; crop planning for erratic and aberrant weather conditions.

#### UNIT III

Stress physiology and resistance to drought, adaptation of crop plants to drought, drought management strategies; preparation of appropriate crop plans for dry land areas; mid contingent plan for aberrant weather conditions.

#### UNIT IV

Tillage, tith, frequency and depth of cultivation, compaction in soil tillage; concept of conservation tillage; tillage in relation to weed control and moisture conservation; techniques and practices of soil moisture conservation (use of mulches, kinds, effectiveness and economics); antitranspirants; soil and crop management techniques, seeding and efficient fertilizer use.

#### UNIT V

Concept of watershed resource management, problems, approach and components.

##### **Practical**

- Seed treatment, seed germination and crop establishment in relation to soil moisture contents
- Moisture stress effects and recovery behaviour of important crops
- Estimation of moisture index and aridity index
- Spray of anti-transpirants and their effect on crops
- Collection and interpretation of data for water balance equations
- Water use efficiency
- Preparation of crop plans for different drought conditions
- Study of field experiments relevant to dryland farming
- Visit to dryland research stations and watershed projects

##### **Suggested Readings**

- Das NR. 2007. *Tillage and Crop Production*. Scientific Publishers.
- Dhopte AM. 2002. *Agrotechnology for Dryland Farming*. Scientific Publ.
- Dhruv Narayan VV. 2002. *Soil and Water Conservation Research in India*. ICAR.
- Gupta US. (Ed.). 1995. *Production and Improvements of Crops for Drylands*. Oxford & IBH.
- Katyaj JC & Farrington J. 1995. *Research for Rainfed Farming*. CRIDA.
- Rao SC & Ryan J. 2007. *Challenges and Strategies of Dryland Agriculture*. Scientific Publishers.
- Singh P & Maliwal PL. 2005. *Technologies for Food Security and Sustainable Agriculture*. Agrotech Publishing Company.
- Singh RP. 1988. *Improved Agronomic Practices for Dryland Crops*. CRIDA.
- Singh RP. 2005. *Sustainable Development of Dryland Agriculture in India*. Scientific Publ.
- Singh SD. 1998. *Arid Land Irrigation and Ecological Management*. Scientific Publishers.
- Venkateshwarlu J. 2004. *Rainfed Agriculture in India. Research and Development Scenario*. ICAR.

#### **AGRON 517 PRINCIPLES AND PRACTICES OF ORGANIC FARMING 2+1**

##### **Objective**

To study the principles and practices of organic farming for sustainable crop production.

##### **Theory**

#### UNIT I

Organic farming - concept and definition, its relevance to India and global agriculture and future prospects; land and water management - land use, minimum tillage; shelter zones, hedges, pasture management, agro-forestry.

#### UNIT II

Organic farming and water use efficiency; soil fertility, nutrient recycling, organic residues, organic manures, composting, soil biota and decomposition of organic residues, earthworms and vermicompost, green manures and biofertilizers.

#### UNIT III

Farming systems, crop rotations, multiple and relay cropping systems, intercropping in relation to maintenance of soil productivity.

#### UNIT IV

Control of weeds, diseases and insect pest management, biological agents and pheromones, biopesticides.

#### UNIT V

Socio-economic impacts; marketing and export potential: inspection, certification, labeling and accreditation procedures; organic farming and national economy.

#### **Practical**

- Aerobic and anaerobic methods of making compost
- Making of vermicompost
- Identification and nursery raising of important agro-forestry trees and trees for shelter belts
- Efficient use of biofertilizers, technique of treating legume seeds with *Rhizobium* cultures, use of *Azotobacter*, *Azospirillum*, and PSB cultures in field
- Visit to an organic farm
- Quality standards, inspection, certification and labeling and accreditation procedures for farm produce from organic farms

#### **Suggested Readings**

Ananthakrishnan TN. (Ed.). 1992. *Emerging Trends in Biological Control of Phytophagous Insects*. Oxford & IBH.

Gaur AC. 1982. *A Manual of Rural Composting*, FAO/UNDP Regional Project Document, FAO.

Lampin N. 1990. *Organic Farming*. Press Books, Ipswich, UK.

Palaniappan SP & Anandurai K. 1999. *Organic Farming – Theory and Practice*. Scientific Publ.

Rao BV Venkata. 1995. *Small Farmer Focused Integrated Rural Development: Socio-economic Environment and Legal Perspective*: Publ.3, Parisaraprajna Parishtana, Bangalore.

Reddy MV. (Ed.). 1995. *Soil Organisms and Litter Decomposition in the Tropics*. Oxford & IBH.

Sharma A. 2002. *Hand Book of Organic Farming*. Agrobios.

Singh SP. (Ed.) 1994. *Technology for Production of Natural Enemies*. PDBC, Bangalore.

Subba Rao NS. 2002. *Soil Microbiology*. Oxford & IBH.

Trivedi RN. 1993. *A Text Book of Environmental Sciences*, Anmol Publ.

Veeresh GK, Shivashankar K & Suiglachar MA. 1997. *Organic Farming and Sustainable Agriculture*. Association for Promotion of Organic Farming, Bangalore.

WHO. 1990. *Public Health Impact of Pesticides Used in Agriculture*. WHO.

Woolmer PL & Swift MJ. 1994. *The Biological Management of Tropical Soil Fertility*. TSBF & Wiley.

**AGRON 518:**

**Diagnosis of Nutritional Deficiency in Field Crops  
and their Remedial Measure**

**2+1**

**Objective**

To teach the basic concepts of nutritional deficiency in field crops and their remedial measures.

**Theory**

Deficiency symptoms of individual elements- macro, micro exhibited by cereals, oilseeds, pulses, fibre crops, forage crops, sugar crops, tuber crops, causes of deficiency, physiological changes brought about in plants due to deficiency. Plants parts showing the symptoms critical level of nutrient elements of deficiency, indicator plants for different elements. Toxicity limits of different elements. Toxicity systems. Prevention alleviation of deficiency toxicity, similarity of deficiency symptoms with disease symptoms.

**Practical**

- Principles of colorimetry
- Flame-photometry and atomic absorption spectroscopy
- Chemical analysis of soil for total and available nutrients
- Analysis of plants for essential elements

**Suggested Readings**

- Brady NC & Weil RR. 2002. *The Nature and Properties of Soils*. Pearson Edu.
- Kabata-Pendias A & Pendias H. 1992. *Trace Elements in Soils and Plants*. CRC Press.
- Kanwar JS. (Ed.). 1976. *Soil Fertility: Theory and Practice*. ICAR.
- Mengel K & Kirkby EA. 1982. *Principles of Plant Nutrition*. International Potash Institute, Switzerland.
- Mortvedt JJ, Shuman LM, Cox FR & Welch RM. 1991. *Micronutrients in Agriculture*. 2<sup>nd</sup> Ed. SSSA, Madison.
- Prasad R & Power JF. *Soil Fertility Management for Sustainable Agriculture*. CRC Press.
- Tisdale SL, Nelson SL, Beaton JD & Havlin JL. 1999. *Soil Fertility and Fertilizers*. 5<sup>th</sup> Ed. Prentice Hall of India.
- Troeh FR & Thompson LM. 2005. *Soils and Soil Fertility*. Blackwell.
- Vogel AI. 1979. *Textbook of Quantitative Inorganic Analysis*. ELBS.

**MODIFIED POST-GRADUATE SYLLABUS  
DEPARTMENT OF AGRICULTURAL EXTENSION  
UBKV, Pundibari, Cooch Behar  
COURSE-SUMMARY**

**Course**

**No. Course-Title Credit**

**Hour Remarks**

**Master Degree Major/Core Courses**

EXT-501 DEVELOPMENT PERSPECTIVES OF EXTENSION  
EDUCATION

2+0 Semester-I

EXT-502 DEVELOPMENT COMMUNICATION,  
INFORMATION MANAGEMENT AND EXTENSION

3+1 Semester-I

EXT-503 RESEARCH METHODS IN BEHAVIORAL SCIENCES 3+1 Semester-I

EXT-504 DIFFUSION AND ADOPTION OF INNOVATIONS 2+1 Semester-II

EXT-505 ENTREPRENEURSHIP DEVELOPMENT AND  
MANAGEMENT IN EXTENSION

3+1 Semester-II

EXT-506 HUMAN RESOURCE DEVELOPMENT 2+1 Semester-II

EXT-591 MASTER'S SEMINAR 0+1 Semester-IV

EXT-599 MASTER'S RESEARCH 20 All Semesters

**Minor Courses**

EXT-507 PARTICIPATORY METHODS FOR TECHNOLOGY  
DEVELOPMENT AND TRANSFER

1+1 Semester-I

EXT-508 VISUAL COMMUNICATION 1+2 Semester-II

EXT-509 GENDER SENSITIZATION FOR DEVELOPMENT 1+1 Semester-III

EXT-510 MARKET-LED EXTENSION 1+1 Semester-III

EXT-511 PERSPECTIVES OF DISTANCE EDUCATION 1+1 Not offered

EXT-512 BASIC IMAGING TECHNOLOGY 1+2 Not offered

EXT-513 RURAL SOCIOLOGY 2+0 Not offered

EXT-514 EDUCATIONAL PSYCHOLOGY 2+0 Not offered

**Supporting Courses**

ANY COURSES FROM OTHER DEPARTMENTS  
ESPECIALLY FROM AGRICULTURAL ECONOMICS  
AND AGRICULTURAL STATISTICS DEPARTMENT

05 Semester-I

Semester II

Semester III

**AGRICULTURAL EXTENSION**

**Course contents**

**EXT 501 DEVELOPMENT PERSPECTIVES OF EXTENSION 2+0  
EDUCATION**

**Objective**

The course is intended to orient the students with the concept of extension education and its importance in Agriculture development and also to expose the students with various Rural development programmes aimed at poverty alleviation and to increase employment opportunities and their analysis. Besides, the students will be learning about the new innovations being brought into the Agricultural Extension in India.

**Theory**

## UNIT I

Extension Education – Meaning, objectives, concepts, principles and philosophy, critical analysis of definitions – Extension Education as a Profession – Adult Education and Distance Education.

## UNIT II

Pioneering Extension efforts and their implications in Indian Agricultural Extension – Analysis of Extension systems of ICAR and SAU – State Departments Extension system and NGOs – Role of Extension in Agricultural University.

## UNIT III

Poverty Alleviation Programmes – SGSY, SGRY, PMGSY, DPAP, DDP, CAPART – Employment Generation Programmes – NREGP, Women Development Programmes – ICDS, MSY, RMK, Problems in Rural Development.

## UNIT IV

Current Approaches in Extension: Decentralised Decision Making, Bottom up Planning, Farming System Approach, Farming Situation Based Extension, Market – Led – Extension, Farm Field School, ATIC, Kisan Call Centres, NAIP.

### **Suggested Readings**

Chandrakandan KM, Senthil Kumar & Swatilaxmi. PS. 2005. *Extension Education What? And What Not ?* RBSA Publ.

Gallagher K. 1999. *Farmers Field School (FFS) – A Group Extension Process based on Non-Formal Education Methods*. Global EPM Facility, FAO.

Ganesan R, Iqbal IM & Anandaraja N. 2003. *Reaching the Unreached: Basics of Extension Education*. Associated Publishing Co.

Jalihal KA & Veerabhadraiah V. 2007. *Fundamentals of Extension Education and Management in Extension*. Concept Publ.

Khan PM. 2002. *Textbook of Extension Education*. Himalaya Publ.

Ray GL. 2006. *Extension Communication and Management*. Kalyani Publ.

Van Den Ban AW & Hawkins HS. 1998. *Agricultural Extension*. 2nd Ed. CBS.

Viswanathan M. 1994. *Women in Agriculture and Rural Development*. Printwell Publ.

## **EXT 502 DEVELOPMENT COMMUNICATION, 3+1 INFORMATION MANAGEMENT AND E-EXTENSION**

### **Objective**

In this course, students will learn about the concept, meaning and process of communication and various methods and modern media of communication. Besides, the students will also learn the information management and journalistic writing of various information materials and also study their readability.

### **Theory**

#### UNIT I

Communication process – concept, elements and their characteristics – Models and theories of communication – Communication skills– fidelity of communication, communication competence and empathy, communication effectiveness and credibility, feedback in communication, social networks and Development communication – Barriers in communication, Message – Meaning, dimensions of a message, characteristics of a good message,



Message treatment and effectiveness, distortion of message.

#### UNIT II

Methods of communication – Meaning and functions, classification. Forms of communication – Oral and written communication, Non-verbal communication, interpersonal communication, organizational communication. Key communicators – Meaning, characteristics and their role in development.

#### UNIT III

Media in communication – Role of mass media in dissemination of farm technology, Effect of media mix for Rural People. Modern communication media – Electronic video, Tele Text, Tele conference, Computer Assisted Instruction, Computer technology and its implications.

#### UNIT IV

Agricultural Journalism as a means of mass communication, Its form and role in rural development, Basics of writing – News stories, feature articles, magazine articles, farm bulletins and folders. Techniques of collection of materials for news stories and feature articles; Rewriting Art of clear writing. Readability and readership analysis.

#### UNIT-V

Information and Communication Technology (ICT) and cyber extension meaning, tools and application in Extension, Pioneering ICT projects in India.

#### **Practical**

Practical on organizational communication-identification of types and channels, Message distortion, feedback mechanism in organization, message treatment, communication fidelity, credibility and effectiveness  
Practical on journalistic writing and readability study, readership analysis.  
Preparation of ICT enabled information material

#### **Suggested Readings**

Dahama OP & Bhatnagar OP. 2005. *Education and Communication for Development*. Oxford & IBH.

Grover I, Kaushik S, Yadav L & Varma SK. 2002. *Communication and Instructional Technology*. Agrotech Publ. Academy.

Jana BL & Mitra KP. 2005. *Farm Journalism*. Agrotech Publ. Academy.

Ray GL. 2006. *Extension Communication and Management*. Kalyani Publ.

Rayudu CS. 2002. *Communication*. Himalaya Publ. House.

Reddy AA. 1987. *Extension Education*. Sree Lakshmi Press, Bapatla.

Sandhu AS. 2004. *Textbook on Agricultural Communication Process and Methods*. Oxford & IBH.

### **EXT 503 RESEARCH METHODS IN BEHAVIOURAL SCIENCE 3+1**

#### **Objective**

This course is designed with a view to provide knowledge and skills in methods of behavioural sciences research and student will learn the Statistical Package for Social Sciences ( SPSS) for choosing appropriate statistics for data analysis.

#### **Theory**

##### UNIT I

Research – Meaning, importance, characteristics. Behavioural sciences research – Meaning, concept and problems in behavioural sciences research. Types and methods of Research – Fundamental, Applied and Action research, Exploratory, Descriptive, Diagnostic, Evaluation, Experimental, Analytical, Historical, Survey and Case Study. Review of

literature – Need, Search Procedure, Sources of literature, Planning the review work. Research problem – Selection and Formulation of research problem and guiding principles in the choice of research problem, Factors and criteria in selection of research problem, statement of research problem and development of theoretical orientation of the research problem.

#### UNIT II

Objectives – Meaning, types and criteria for judging the objectives. Concept and Construct – Meaning, role of concepts in research and Conceptual frame work development in research. Variable – Meaning, types and their role in research. Definition – Meaning, characteristics of workable definitions, types and their role in research. Hypothesis – Meaning, importance and functions of hypothesis in research, Types of hypothesis, linkages, sources, problems in formulation and criteria for judging a workable hypothesis. Measurement – Meaning, postulates and levels of measurement, Use of appropriate statistics at different levels of measurement, criteria for judging the measuring instrument and importance of measurement in research. Validity – Meaning and methods of testing. Reliability – Meaning and methods of testing. Sampling – Universe, Sample and Sampling-Meaning, basis for sampling, advantages and limitations, size and factors affecting the size of the sample and sampling errors – Methods of elimination and minimizing, Maximincon Principle, Sampling – Types of sampling and sampling procedures.

#### UNIT III

Research Designs – Meaning, purpose and criteria for research design, Types, advantages and limitations of each design. Experimental design – Advantages and limitations. Data Collection devices - Interview – Meaning, purpose, types, techniques of interviewing and advantages and limitations. Enquiry forms and Schedules – Meaning, types of questions used, steps in construction and advantages and limitations in its use. Questionnaires – Meaning, difference between schedule and questionnaire, types of questions to be used, pre – testing of the questionnaires or schedules and advantages and limitations. Check lists – Meaning, steps in construction, advantages and limitations in its use. Rating scales – Meaning, types, limits in construction, advantages and limitations in its use. Observation – Meaning, types, tips in observation, advantages and limitations in its use. Case studies – Meaning, types, steps in conducting, advantages and limitations in its use. Social survey – Meaning, objectives, types and steps in conducting, advantages and limitations.

#### UNIT IV

Data processing – Meaning, coding, preparation of master code sheet, analysis and tabulation of data, Statistical Package for Social Sciences ( SPSS) choosing appropriate statistics for data analysis based on the level of measurement of variables. Report writing – Meaning, guidelines to be followed in scientific report writing, References in reporting.

#### **Practical**

Selection and formulation of research problem - Formulation of objectives and hypothesis-Selection of variables based on objectives-Developing the conceptual framework of research. Operationally defining the selected variables-Development of data collection devices.-Testing the validity and reliability of the data collection instruments.- Pre-testing of the data collection instrument-Techniques of interviewing and collection of data

using the data collection instruments-Data processing, hands on experiences on SPSS, coding, tabulation and analysis. Formulation of secondary tables based on objectives of research. Writing report, Writing of thesis and research articles-Presentation of reports.

### **Suggested Readings**

- Chandrakandan K, Venkatapirabu J, Sekar V & Anand Kumar V. 2000. *Tests and Measurements in Social Research*. APH Publ.
- Kerlinger FN. 1973. *Foundations of Behavioural Research*. Holt Rhinehart.
- Kothari CR. 1984. *Research Methodology, Methods and Techniques*. Chaitanya Publ. House.
- Krishnaswami OR & Ranganatham M. 2005. *Methodology of Research in Social Sciences*. Himalaya Publ. House.
- Mulay S & Sabaratnam VE. 1983. *Research Methods in Extension Education*. Manasavan.
- Ranjit Kumar. 1999. *Research Methodology - A Step by Step Guide for Beginners*. Sage Publ.
- Ray GL & Sagar Mondal. 1999. *Research methods in Social Sciences and Extension Education*. Naya Prokash.
- Wilkinson TS & Bhandarkar PC. 1993. *Methodology and Techniques of Social Research*. Himalaya Publ. Home.

## **EXT 504 DIFFUSION AND ADOPTION OF INNOVATIONS 2+1**

### **Objective**

The students will learn how the agricultural innovations spread among the farmers in the society by getting into the insights of diffusion concept and adoption process, stages of adoption and innovation decision process, adopter categories and their characteristics, opinion leaders and their characteristics, attributes of innovations, and factors influencing adoption. In addition, the students would be learning various concepts related to diffusion and adoption of innovations.

### **Theory**

#### **UNIT I**

Diffusion – concept and meaning, elements; traditions of research on diffusion; the generation of innovations; innovation-development process; tracing the innovation-development process, converting research into practice.

#### **UNIT II**

The adoption process- concept and stages, dynamic nature of stages, covert and overt processes at stages, the innovation-decision process – a critical appraisal of the new formulation.

#### **UNIT III**

Adopter categories – Innovativeness and adopter categories, adopter categories as ideal types, characteristics of adopter categories; Perceived attributes of Innovation and their rate of adoption, factors influencing rate of adoption.

#### **UNIT IV**

Diffusion effect and concept of over adoption, opinion leadership measurement and characteristics of opinion leaders, monomorphic and polymorphic opinion leadership, multi-step flow of innovation; concepts of homophily and heterophily and their influence on flow of innovations;

Types of innovation-decisions – Optional, Collective and Authority and contingent innovation decisions; Consequences of Innovation-Decisions – Desirable or Undesirable, direct or indirect, anticipated or unanticipated consequences; Decision making – meaning, theories, process, steps, factors influencing decision – making.

### **Practical**

Case studies in individual and community adoption process, content analysis of adoption studies, Identification of adopter categories on a selected technology, study of attributes of current farm technologies, Identification of opinion leaders, Sources of information at different stages of adoption on a selected technology, study of factors increasing or retarding the rate of adoption, presentation of reports on adoption and diffusion of innovations.

### **Suggested Readings**

Dasgupta. 1989. *Diffusion Agricultural Innovations in Village India*. Wiley Eastern.

Jalihal KA & Veerabhadraiah V. 2007. *Fundamentals of Extension Education and Management in Extension*. Concept Publ. Co.

Ray GL. 2005. *Extension Communication and Management*. Kalyani Publ.

Reddy AA. 1987. *Extension Education*. Sree Lakshmi Press, Bapatla.

Rogers EM. 2003. *Diffusion of Innovations*. 5th Ed. The Free Press, New York.

## **EXT 505 ENTREPRENEURSHIP DEVELOPMENT AND 3+1 MANAGEMENT IN EXTENSION**

### **Objective**

The first part of the course is intended to provide overall picture of planning and development of enterprises for extending sustainable livelihoods for rural people. The second part of the course is structured to help the students to gain knowledge and skills in different concepts and techniques of management in extension organizations.

### **Theory**

#### **UNIT I**

Entrepreneurship – Concept, characteristics, Approaches, Theories, Need for enterprises development. Agri – entrepreneurship – Concept, characteristics, Nature and importance for sustainable Livelihoods. Traits of entrepreneurs – Risk taking, Leadership, Decision making, Planning, Organising, Coordinating and Marketing, Types of Entrepreneurs. Stages of establishing enterprise – Identification of sound enterprise, steps to be considered in setting up an enterprise, feasibility report, product selection, risk and market analysis, legal requirements. Project Management and Appraisal – Market, Technical, Financial, Social Appraisal of Projects.

#### **UNIT II**

Micro enterprises – Profitable Agri enterprises in India – Agro Processing, KVIC industries. Micro financing – meaning, Sources of Finance, Banks, Small scale industries development organizations. Marketing for enterprises – Concept, planning for marketing, target marketing, Competition, market survey and strategies, Product sales and promotion. Gender issues in entrepreneurship development – Understanding gender and subordination of women, Gender as a development tool, Policy approaches for women entrepreneurship development. Success and Failure stories for enterprises – Issues relating to success and failure of enterprises

– Personal, Production, Finance, Social, Marketing.

### UNIT III

Management – Meaning, concept, nature and importance, Approaches to management, Levels of management, Qualities and skills of a manager.

Extension Management – Meaning, Concept, Importance, Principles of management, Classification of Functions of Management. Planning – Concept, Nature, Importance, Types, Making planning effective. Change Management – factors, process and procedures. Decision making – Concept, Types of decisions, Styles and techniques of decision making, Steps in DM Process, Guidelines for making effective decisions.

Organizing – Meaning of Organization, Concept, Principles, Organizational Structure, Span of Management, Departmentalization, Authority and responsibility, Delegation and decentralization, line and staff relations. UNIT IV

Coordination – Concept, Need, Types, Techniques of Coordination.

Interpersonal relations in the organization. Staffing – Need and importance, Manpower planning, Recruitment, Selection, Placement and Orientation, Training and Development – Performance appraisal – Meaning, Concept, Methods. Direction – Concept, Principles, Requirements of effective direction, Giving orders, Techniques of direction. Leadership – Concept, Characteristics, Functions, Approaches to leadership, Leadership styles. Organizational Communication – Concept, Process, Types, Net Works, Barriers to Communication. Managing work motivation – Concept, Motivation and Performance, Approaches to motivation. Supervision – Meaning, Responsibilities, Qualities and functions of supervision, Essentials of effective supervision. Managerial Control – Nature, Process, Types, Techniques of Control, Budgeting, Observation, PERT and CPM, MIS.

### Practical

Field visit to Successful enterprises-Study of Characteristics of Successful entrepreneurs Development of Project Proposal -Case Studies of Success / Failure enterprises-Exercise on Market Survey-Field visit to Financial institutions-Simulated exercise to understand management process-Field visit to extension organizations to understand the functions of management -Group exercise on development of short term and long term plan-Simulated exercise on techniques of decision making-Designing organizational structure -Group activity on leadership development skills.

### Suggested Readings

Gupta CB. 2001. *Management Theory and Practice*. Sultan Chand & Sons.

Indu Grover. 2008. *Handbook on Empowerment and Entrepreneurship*.

Agrotech Public Academy.

Khanka SS. 1999. *Entrepreneurial Development*. S. Chand & Co. Singh D.

1995. *Effective Managerial Leadership*. Deep & Deep Publ. Tripathi PC &

Reddy PN. 1991. *Principles of Management*. Tata McGraw Hill.

Vasanta Desai. 1997. *Small Scale Industries and Entrepreneurship*.

Himalaya Publ. House.

### EXT 506 HUMAN RESOURCE DEVELOPMENT (HRD) 2+1

#### Objective

To orient the students about key concepts importance, scope & conceptual

frame work, growth & development of Human Resource Development, Subsystems of Human Resource Development for extension organization and process of HRD.

### **Theory**

#### UNIT I

Human Resource Development – Definition, Meaning, Importance, Scope and Need for HRD; Conceptual frame work, inter disciplinary approach, function systems and case studies in HRD; HRD Interventions – Different Experiences; Selection, Development & Growth- Selection, Recruitment, Induction Staff Training and Development, Career planning; Social and Organizational Culture: Indian environment perspective on cultural process and social structure, society in transition; Organizational and Managerial values and ethics, organizational commitment ; Motivation productivity - job description – analysis and evaluation; Performance Appraisal.

#### UNIT II

Human Resource management: Collective bargaining, Negotiation skills; Human Resource Accounting (HRA): What is HRA? Why HRA? Information Management for HRA and Measurement in HRA; Intra personal processes: Collective behaviour, learning, and perception ; Stress and coping mechanisms; Inter-Personal Process, Helping Process – communication and Feedback and interpersonal styles; Group & Inter group process: group information and group processes; Organizational communication, Team building Process and functioning, Conflict management, Collaboration and Competition; HRD & Supervisors: Task Analysis; Capacity Building – Counseling and Mentoring; Role of a Professional Manager: Task of Professional Manager – Responsibility of Professional Manager; Managerial skills and Soft Skills required for Extension workers; Decision Making: Decision Making models, Management by Objectives; Behavioural Dynamics :Leadership styles – Group dynamics.

#### UNIT III

Training – Meaning, determining training need and development strategies – Training types, models, methods and evaluation; Facilities for training – Trainers training – techniques for trainees participation; Research studies in training extension personnel; Main issues in HRD: HRD culture and climate – organizing for HRD – emerging trends and Prospective.

### **Practical**

Visit to different training organizations to review on going activities & facilities; Analysis of Training methods followed by training institutions for farmers and extension workers Studies on evaluation of training programmes; Study of HRD in organization in terms of performance, organizational development, employees welfare and improving quality of work life and Human resource information, Presentation of reports.

### **Suggested Readings**

- Agochiya D. 2002. *Every Trainer's Handbook*. Sage Publ.  
David Gross. 1997. *Human Resource Management - The Basics*. TR Publ.  
Davis Keth & Newston W John 1989. *Human Behaviour at Work*. 8th Ed. McGraw-Hill.  
Hersey Paul & Balanchard H Kenneth. 1992. *Management of Organizational Behaviour Utilizing Human Resource*. 5th Ed. Prentice-Hall of

India.

Knoontz Harold & Weihhrich Heinz 1990. *Essentials of Management*. 5<sup>th</sup> Ed. McGraw-Hill.

Lynton RP & Pareek U. 1993. *Training for Development*. DB.

Taraporewale Sons & Co.

Punna Rao P & Sudarshan Reddy M. 2001. *Human Resource Development Mechanisms for Extension Organization*. Kalyani Publ.

Rao TV. 2003. *Readings in Human Resource Development*. Oxford Publ. Co.

Silberman Mel. 1995. *Active Training*. Press Johnston Publ. Co., New Delhi.

Singh RP. 2000. *Management of Training Programmes*. Anmol Publ.

Subba Rao P. 2005. *Management & Organizational Behaviour*. Himalaya Publ. House.

Sundaram RM, Gupta V, George SS. 2006. *Case Studies in Human Resource Management*. ICFAI, Hyderabad.

Tripati & Reddy. 2004. *Principles of Management*. Tata McGraw-Hill.

Wayne MR & Robert MN. 2005. *Human Resource Management*.

International Ed. Pearson Prentice Hall.

## **EXT 507 PARTICIPATORY METHODS FOR TECHNOLOGY 1+1 DEVELOPMENT AND TRANSFER**

### **Objective**

This course is intended to orient the students with the key concepts, principles process of different participatory approaches for technology development and transfer and also to expose the students with various participatory tools and techniques like space related, time related, relation oriented methods. Besides the students will be learning the preparation of action plans participatory monitoring and evaluation.

### **Theory**

#### **UNIT I**

Participatory extension – Importance, key features, principles and process of participatory approaches; Different participatory approaches (RRA, PRA, PLA, AEA, PALM, PAR, PAME, ESRE, FPR) and successful models.

#### **UNIT II**

Participatory tools and techniques. Space Related Methods : village map (social & resource), mobility services and opportunities map and transect; Time related methods : time line, trend analysis, seasonal diagram. Daily activity schedule, dream map; Relation oriented methods : cause and effect diagram (problem tree), impact – diagram, well being ranking method, Venn diagram, matrix ranking, livelihood analysis.

#### **UNIT III**

Preparation of action plans, concept and action plan preparation; Participatory technology development and dissemination; Participatory planning and management, phases and steps in planning and implementation aspects; Process monitoring, participatory evaluation.

### **Practical**

Simulated exercises on space related methods, time related method and relation oriented methods; Documentation of PTD and dissemination; Preparation of action plan; Participatory monitoring and evaluation of developmental programmes.

### **Suggested Readings**

Adhikary. 2006. *Participatory Planning and Project Management in Extension Science*. Agrotech Publ. Academy.

Mukharjee N. 2002. *Participatory Learning and Action*. Concept Publ. Co.

Singh BK. 2008. *PRA/PLA and Participatory Training*. Adhyayan Publ. & Distr.

Somesh Kumar. 2002. *Methods for Community Participation*. Vistaar Publ.

### **EXT 508 VISUAL COMMUNICATION 1+1**

#### **Objective**

This course is intended to give a clear perspective about the importance of visuals and graphics in communication. The course starts with the delineating about the characteristics of visuals and graphics followed by its main functions, theories of visual perception and its classification and selection. Further, the course deals with the designing the message, graphic formats and devices and presentation of data. It makes the students to understand, prepare and present the scientific data effectively by using low cost visuals. The course also exposes the students to various Digitized video material in multimedia and also enable to design visuals for print, TV and know-how about scanning of visuals.

#### **Theory**

##### **UNIT I**

Visual Communication-meaning, definition and concepts. Visual perception role of eye and light energy in perception. Steps in visual perception, Gestalt principles, depth, distance and shape perception, perceptual set and optical illusion.

##### **UNIT-II**

Role of visuals in Communication. Classification, characteristics and selection of visuals. Designing message for visuals-elements and principles for visual design.

##### **UNIT III**

Photojournalism-definition, types and principles. Principles of photography. Captions and cutlines. Computer based and video based visuals-preparation principles.

##### **UNIT IV**

Presentation of visuals-principles and devices, different types of projectors and their projection principles. Evaluation of visuals-Methods

#### **Practicals**

Preparation of low cost Projected and Non-Projected visuals. Designing and layout of charts, posters, flash cards etc. Practical on photojournalism-Writing photofeatures, captions and cutlines. Designing of layout and preparation of agricultural information materials. Computer and video based presentation material-preparation and presentation. Evaluation of visuals.

#### **Suggested Readings**

Bhatia A. 2005. *Visual Communication*. Rajat Publications, New Delhi.

Edgar Dale 1970. *Audio Visual methods in Teaching*. Holt, Rinehart & Winston.

James WB, Richard BL, Fried F Harclerod. 1952. *A.V. Instructional Material & Methods*. Mc.Graw Hill.

Reddy YN. 1998. *Audio Visual Aids in Teaching, Training and Extension*.

Haritha Publ. House, Hyderabad.



## **EXT 509 GENDER SENSITIZATION FOR DEVELOPMENT 1+1**

### **Objective**

In this course the students will learn about an overview of the concept of gender and gender balance on development and develop skills of identifying gender roles, rights, responsibilities and relationships on development. Besides the students will also learn the attitudinal change to internalize gender equity concerns as fundamental human rights and also enhance the capability for identifying and analyzing gender issues in agriculture and allied sectors.

### **Theory**

#### **UNIT I**

Gender concepts, issues and challenges in development; Gender roles, gender balance, status, need and scope; Gender analysis tools and techniques.

#### **UNIT II**

National policy for empowerment of women since independence; Developmental programmes for women; Gender mainstreaming in agriculture and allied sectors –need and relevance; Gender budgeting – A tool for empowering women.

#### **UNIT III**

Women empowerment –Dimensions; Women empowerment through SHG approach; Women entrepreneurship and its role in economic development; Public Private Partnership for the economic empowerment of women; Building rural institution for women empowerment; Women human rights ; Action plans for gender mainstreaming.

### **Practical**

Visits to rural institutions of women for studying in the rural institutions engaged in Women empowerment; Visits to entrepreneurial unit of women for studying the ways and means of establishing entrepreneurship units for Women and their development and also SWOT analysis of the Unit; Visit to Center for women development - NIRD to study the different activities related to projects and research on gender; Visit to gender cell, Office of the Commissioner and Director of Agriculture, Hyderabad, to study the mainstreaming of gender concerns and gender budget of the department.

### **Suggested Readings**

Grover I & Grover D. 2002. *Empowerment of Women*. Agrotech Publ. Academy.

Porter F, Smyth I & Sweetman C.1999. *Gender Works: Oxfarm Experience in Policy and Practice*. Oxfarm Publ.

Raj MK. 1998. *Gender Population and Development*. Oxford Univ. Press.

Sahoo RK & Tripathy SN. 2006. *SHG and Women Empowerment*. Anmol Publ.

Sinha K. 2000. *Empowerment of Women in South Asia*. Association of Management Development Institution in South Asia, Hyderabad.

Thakur Joshi S. 1999. *Women and Development*. Mittal Publ.

Vishwanathan M. 1994. *Women in Agriculture & RD*. Rupa Books.

## **EXT 510 MARKET LED EXTENSION MANAGEMENT 1+1**

### **Objective**

The student will learn the significance of post harvest management & value addition in present market environment and the challenges and future strategy for market led extension management. Also identifies the

information sources and develop strategy for market intelligence and the marketing infrastructure, multilevel marketing and linkages for market led extension. In addition the students would be learning the public private partnerships for market led extension management, the features of contract farming, WTO its implications on agriculture and Understanding the role of IT for market intelligence.

### **Theory**

#### **UNIT I**

Agricultural extension at cross roads; Changing scenario of agricultural extension at the national level; Market led extension – emerging perspectives; Market led extension – issues and challenges; Dimensions of market led extension.

#### **UNIT II**

Agricultural marketing an overview; Development of a marketing plan, pricing concepts and pricing strategy; Consumer behaviour; Marketing communication and promotional strategies; The marketing research process; Agricultural trade liberalization and its impact; International marketing opportunities; Implications of AOA, TRIPS and IPRs agreements on agriculture; Agreement on SPS and TBT - an over view; Commodity features marketing.

#### **UNIT III**

Public private linkages in market led extension; Role of SHG in market led extension; Contact farming – a viable approach to meet market challenges; IT enabled approaches for market led extension and communication; Weather service and crop modeling – An effective tool in market led extension.

### **Practical**

Identification and analysis of different marketing sources for agricultural commodities. Development of strategy for an effective market intelligence system; Development of suitable marketing plan to suite rural situation; Visit to APEDA, Rythu Bazaars to study the processes and procedures related to market-led extension.

### **Suggested Readings**

Kaleel FMH & Krisnamurthy J. 2007. *Market Led Extension Dimensions and Tools*. Agro Tech Publ. Academy.

Rajmanohar TP & Kumaravel KS. 2006. *Contract Farming in India*. ICFAI Univ. Press, Hyderabad.

Subbalakshmi V. 2005. *Globalization - Indian Experience*. ICFAI Univ. Press, Hyderabad.

Suresh K. 2005. *Rural Markets - Emerging Opportunities*. ICFAI Univ. Press, Hyderabad

## **EXT 511 PERSPECTIVES OF DISTANCE EDUCATION 1+1**

### **Objective**

The course is intended to orient the students with the concept of Distance Education, Characteristics of Distance Education, Evolution, Methods of Distance Education, Different Approaches in Planning Distance Education, Educational Technology in Distance Education, Management of Resources for distance education, Strategies for maximizing the reach and programme evaluation and quality assessment.

### **Theory**

#### **UNIT I**

Distance Education – Introduction Meaning, Concept, Philosophy and its work ethics, characteristics of Distance Education – Evolution and Historical view of Distance Education – Theory Methodology, and Epistemology. Dimensions of Distance Education, Scope and difficulties. Open Education – Non-formal Education, Continuing Education, Education by correspondence.

#### UNIT II

Forms and systems of Distance and Open Education, Modes of Teaching and Learning in Distance Education, Methods of Distance Education, Significance of Distance Education in Teacher Education.

#### UNIT III

Planning Distance Education – A Systems Approach Student Learning – Course Planning, The target groups – Barriers to learning in Distance Education – Planning and Management of Networked Learning.

#### UNIT IV

Educational Technology is Distance Education Application of information and Educational Technologies in Distance Education, Development of Course and Course material, Management of resources, processes, Forms of Instructional material in Distance Education and Media Development and Production in Distance Education - Video Classroom Strategy in Distance Education – Strategies for maximizing the reach – services to students, programme Evaluation - performance indicators and Quality Assessment.

#### **Practical**

Visit to the University which is implementing the Distance Education Programmes. Detailed Study of their programme in relation to Educational Technology, Methodology, Curriculum Development, Evaluation and Assessment. Exercise on development of curriculum for Distance Education exclusively for farming community.

#### **Suggested Readings**

Holmberg B. 1995. *Theory and Practice of Distance Education*. Routledge Publ..

Lakshmi Reddy MV. 2001. *Towards Better Practices in Distance Education*. Kanishka Publ.

More MG. 2003. *Hand Book of Distance Education*. Lawrence Erlbaum Associates Publ.

Panda.S. 2003. *Planning & Management in Distance Education*. Kogan Page Publ.

Pathak CK. 2003. *Distance Education: Prospects and Constraints*. Rajat Publ.

Sharma DC. 2005. *Management of Distance Education*. Anmol Publ. Sharma

M. 2006. *Distance Education: Concepts and Principles*. Kanishka Publ.

#### **EXT 512 BASIC IMAGING TECHNOLOGY 1+2**

#### **Theory**

##### UNIT I

Photo Journalism Concept, Scope and Importance, Theory and principles of photography; role of photography in extension; types of camera and their use; essential of a camera; taking indoor and outdoor pictures;

##### UNIT II

Type of films; darkroom and its requirements; choice of papers; developing agents and their

preparation Principles, Selection and Editing of photographs, writing photo features and captions.

#### UNIT III

Video Production Technology - Concepts, Types of Cameras & Parts, Different formats, Techniques of Planning, Production and Editing, Types of Shots. Audio & Video mixing. Desk Top Publishing

#### **Practicals**

Designing of layout and Preparation of Agricultural Information Materials, Method of holding and Exposing a Still camera. Writing captions for photographs. Writing Photo features for photographs. Studying various parts of video camera and Handling of video camera. Audio & Video mixing. Desk Top Publishing

#### **EXT 513 RURAL SOCIOLOGY 2+0**

#### **Theory:**

##### UNIT I

Rural Sociology, concept, scope; Importance of Rural Sociology in Development Extension Work; Rural Sociology and other social sciences, Basic concepts in sociology - society, social structure, community, social organisation, social institution, culture, social change, cultural change, social system, social processes, social values, norms, folkways, mores, customs, sanctions;

##### UNIT II

Culture - Concept, types, patterns, cultural relativism, cultural integration, developmental activities; Social Institutions in development; Family - concept, functions, types families, psycho-social relationship in the family, as a factor in rural development, Kin and clan - Definition, characteristics, functions, its relationship with group behaviour, kinship types: Socialisation - concept and its role in personality formation as progressive and nonprogressive rural person; Social Stratification - concept, status, role, rank, class structure, change in class system in rural India, class and caste system, origin, characteristics, Differences between class and caste. Groups - Definition, types of groups; Leadership concept, types and range of leadership behaviour and principles of leadership in community development work.

##### UNIT III

Religious Belief System - Superstitions, rituals, festivals; Belief system and its significance in rural development; Social Structure - Social organisation and social system, concepts, conceptual differences, types of social structure, social structure as a social factor in rural development process, Social control - Different components of social control, its significance in rural development, Social Change - Concept, cultural change, technological change, planned change, concept of diffusion, acculturation, Important theories of social change;

##### UNIT IV

Social Processes/Social Interaction - Definition, concept, types, Competition, Conflict, Cooperation, Accommodation, and Assimilation, and change in social processes due to development programmes.

#### **EXT 514 EDUCATIONAL PSYCHOLOGY 2+0**

#### **Theory:**

##### UNIT I

Psychology as science, its scope and importance in extension education, Perception: nature of perception, laws of perception, selectivity in perception, sensory factors in perception, importance of perception in extension work,

##### UNIT II

Attitude: meaning and characteristics, formation of stereotypes and prejudices, factors in attitude change, Emotion: its nature, types of emotional response, theories of emotion, the role of emotion in regulating human behaviour,

### UNIT III

Learning: indicators of learning, definition and principles of learning, theories of learning, experiential learning, Defence mechanisms, types and importance, Personality and Individual differences: Personality as a set of traits, personality as the self, Roger's self theory, Maslow's self-actualisation theory.

# Plant Pathology

## **INTRODUCTORY MYCOLOGY**

Introduction, definition of different terms, basic concepts; Importance of mycology in agriculture, relation of fungi to human affairs, history of mycology. Fungal biodiversity, reproduction in fungi, Concepts of nomenclature and classification The comparative morphology, ultrastructure, characters of different groups of fungi up to generic level: i) Chytridiomycota ii) Zygomycota, iii) Ascomycota, iv) Basidiomycota, v) Deuteromycota. vi) Oomycota. Lichens types and importance, Mycorrhiza, types and importance.

## **INTRODUCTORY PLANT VIROLOGY**

History of plant viruses, shape, size, composition, structure and physical properties of viruses. Symptomatology of important plant viral diseases, transmission, virus vector relationship. Virus nomenclature and classification, genome organization, replication and movement of viruses. Isolation and purification, electron microscopy, protein and nucleic acid based diagnostics. Mycoviruses, phytoplasma arbo and baculoviruses, satellite viruses, satellite RNAs, phages, viroids, prions. Mechanism of resistance, genetic engineering and management of plant viruses.

## **INTRODUCTORY PLANT BACTERIOLOGY**

History and introduction to phytopathogenic prokaryotes, viz., bacteria, MLOs, spiroplasmas and other fastidious prokaryotes. Importance of phytopathogenic bacteria; Bacterial cell structure, shape, size, flagellation, etc. Classification and nomenclature of phytopathogenic prokaryotes; Growth, nutrition requirements, reproduction, preservation of bacterial cultures and variability among phytopathogenic bacteria. General biology of bacteriophages, L form bacteria, plasmids and bdellovibrios. Prokaryotic inhibitors and their mode of action against phytopathogenic bacteria. Survival and dissemination of phytopathogenic bacteria. Management of bacterial diseases.

## **PRINCIPLES OF PLANT PATHOLOGY**

Importance, definitions and concepts of plant diseases, history and growth of plant pathology, biotic and abiotic causes of plant diseases. Growth, reproduction, survival and dispersal of important plant pathogens, role of environment and host nutrition on disease development. Host parasite interaction, recognition concept and infection, symptomatology, disease development- role of enzymes, toxins, growth regulators; defense strategies pre and post infectional structural and biochemical defense mechanisms; oxidative burst; Phenolics, Phytoalexins, PR proteins, Elicitors. Altered plant metabolism as affected by plant pathogens. Genetics of resistance; 'R' genes; mechanism of genetic variation in pathogens; molecular basis for resistance; marker-assisted selection; genetic engineering for disease resistance.

## **PRINCIPLES OF PLANT DISEASE MANAGEMENT**

History of plant disease management; Principles of plant disease management by cultural, physical, biological, chemical, organic amendments and botanicals methods of plant disease control, integrated control measures of plant diseases. Disease resistance and molecular approach for disease management. History of fungicides, bactericides, concepts of pathogen immobilization, chemical protection and chemotherapy, nature, properties and mode of action of antifungal, antibacterial and antiviral chemicals. Foliage, seed and soil application of chemicals, role of stickers, spreaders and other adjuvants, health vis-a-vis environmental hazards, residual effects and safety measures.

### **DISEASES OF FIELD CROPS**

Diseases of Cereal crops- wheat, rice, pearl millet, sorghum, bajra, maize, etc.

Diseases of Pulse crops- gram, urdbean, mungbean, lentil, pigeonpea, soybean, etc..

Diseases of Oilseed crops- rapeseed and mustard, sesame, linseed, sunflower, groundnut, etc.

Diseases of Cash crops- cotton, potato sugarcane, jute, etc..

Diseases of Fodder legume crops- berseem, lucerne, cowpea, etc..

### **DISEASES OF FRUITS, PLANTATION AND ORNAMENTAL CROPS**

Introduction, symptoms, etiology, perpetuation and management of different fruit diseases like apple, pear, strawberry, citrus, mango, grapes, guava, banana, pineapple, papaya, etc.

Introduction, symptoms, etiology, perpetuation and management of diseases of plantation crops such as tea, coffee, rubber, coconut, betelvine, arecanut, etc.

Introduction, symptoms, etiology, perpetuation and management of ornamental plants such as roses, gladiolus, carnation, marigold, chrysanthemum, etc.

### **DISEASES OF VEGETABLE, SPICES AND MEDICINAL CROPS**

Symptoms, etiology and management of diseases of different root, bulb, leafy vegetables, crucifers, cucurbits and solanaceous vegetable crops.

Symptoms, etiology and management of diseases of different spice crops such as black pepper, cumin, coriander, turmeric, fennel, fenugreek and ginger.

Symptoms, etiology and management of diseases of Belladonna, Cinchona, Plantago, Rauwolfia, Withania and Opium Poppy

### **EPIDEMIOLOGY AND FORECASTING OF PLANT DISEASES**

Epidemic concept and historical development, pathometry and crop growth stages, epidemic growth and analysis. Common and natural logarithms, function fitting area under disease progress curve and correction factors, inoculum dynamics, population biology of pathogens, temporal spatial variability in plant pathogens. Survey, surveillance and vigilance, crop loss assessment and models. Principles and pre-requisites of forecasting, systems and factors affecting various components of forecastings, some early forecasting, procedures based on weather and inoculum potential, modeling disease growth and disease prediction.