



# **BACHELOR OF SCIENCE (B.Sc.)**

**(THREE YEAR DEGREE COURSE)**

**SUBJECT**

**SEED TECHNOLOGY**

# **B.Sc.(SEED TECHNOLOGY)**

## **COURSE STRUCTURE**

### **FIRST YEAR**

PAPER – 101: Seed Development & Morphology	50 MARKS
PAPER – 102: Seed Physiology	50 MARKS
PAPER – 103: Plant Breeding for Crop Improvement	50 MARKS
PAPER – 104: PRACTICAL	50 MARKS

### **SECOND YEAR**

PAPER – 201: Seed Productions : Principles & Practices	50 MARKS
PAPER – 202: Hybrid Seed Production : Vegetables Seed Production	50 MARKS
PAPER – 203: Seed Technology & Seed Quality Control	50 MARKS
PAPER – 204: PRACTICAL	50 MARKS

**THIRD YEAR**

PAPER – 301: Seed Pathology & Entomology 50 MARKS

PAPER – 302: Seed Processing & Storage 50 MARKS

PAPER – 303: Seed Farm Management & Marketing 50 MARKS

PAPER – 304: PRACTICAL 50 MARKS

# **B.Sc. (SEED TECHNOLOGY)**

## **FIRST YEAR DETAILED SYALLBUS**

### **PAPER – 101**

#### **Seed Development & Morphology**

##### **UNIT I**

Classification of angiosperms & major families of dicotyledonous and monocotyledons.

##### **UNIT II**

Mode of reproduction in plants –

- (a). Anexual.
- (b). Sexual Reproduction.
- (c). Flower Structure, Placentation & Types of Ovules.

##### **UNIT III**

- Megasporogenesis, development of female gametophyte, anther, anther development, male gametophytes development.
- Pollination, types and methods. Improvements of pollination for hybrid seed production, Floral contrivances.

##### **UNIT IV**

Fertilization: Endosperm and embryo development, in nature seed germination. Apomixes.

**UNIT V**

Development of fruit and seed, factors affecting seed set classification of fruits.

Morphology of seeds for variety identification & seed viability.

# **B.Sc. (SEED TECHNOLOGY)**

## **FIRST YEAR DETAILED SYALLBUS**

### **PAPER – 102**

#### **Seed Physiology**

##### **UNIT I**

- Physiology of seed development, factors affecting seed set. Seed ripening and maturation process.
- Chemical composition of seeds.
- Synthesis of food reserves (Carbohydrates, proteins & fats). Germination and factors affecting germination its implications. Seedling abnormalities.

##### **UNIT II**

- Breakdown of different seed storage products during germination.
- Respiratory pathways during germination.
- Enzymatic activities during germination.
- Hormonal regulation during germination.
- Germination stimulators and inhibitors.

##### **UNIT III**

- Dormancy, Types, causes and implications in crop production.
- Seedling establishment & role of endosperm and embryoseize on seedling establishment.
- Seed deterioration during storage, factors affecting physiological change, its implications of seed quality.

#### **UNIT IV**

- Seed vigour, its measurement and crops productivity.
- Methods to minimize seed aging and deterioration.
- Seed longevity and specific problems of dormancy and seed longevity in some important crop species.

#### **UNIT V**

- Micro propagation techniques, its significance, uses, scope and limitations.
- Biochemical methods, electrophoresis, phenol colour, peroxidase test, GA3 test RELP maps.

# **B.Sc. (SEED TECHNOLOGY)**

## **FIRST YEAR DETAILED SYALLBUS**

### **PAPER – 103**

#### **Plant Breeding for Crop Improvement**

##### **UNIT I**

- Definition, history, nature, scope and objectives.
- Breeding system in plants.
- Plant breeding techniques & hybridization in self and cross pollinated crops, selfing and crossing techniques in various crops vegetables, tropical crops.

##### **UNIT II**

- Heterosis, fixation, haploid breeding and its role in development of in breeds maize.
- Handling of segregating population, F<sub>1</sub> Hybrids.
- Hybrids seed production in various crops.

##### **UNIT III**

- Sterility including incompatibility, Definition, types, uses in hybrid seed production.
- Morphological, genetic and biochemical basis of self incompatibility and its uses.
- Use of chemical hybridizing agents.
- Gametocytes and use of hybrid seed production.



#### **UNIT IV**

- Genetics basis of crop improvement :-
  - Mendelian Principles of inheritance.
  - Law of Probability.
  - Gene Interaction.
  - Gene and Environment.
  - Inheritance of quantitative traits.

#### **UNIT V**

- Methods of plant breeding.
  - Exploration – Introduction, Acclimatization.
  - Pure line selection.
  - Clonal selection.
  - Mass selection.
- Mutation in crop improvement.
- Polyploidy breeding.
- Breeding for disease resistance.
- Organization for crop improvement in India.

# **B.Sc. (SEED TECHNOLOGY)**

## **FIRST YEAR DETAILED SYALLBUS**

### **PAPER – 104**

### **PRACTICAL**

- Morphological description of seeds, seedling, flower, fruits of the given specimen.
- Phenol/ Peroxides / Gibberellic Acid test of given seeds.

# **B.Sc. (SEED TECHNOLOGY)**

## **SECOND YEAR DETAILED SYALLBUS**

### **PAPER – 201**

#### **Seed Production : Principles & Practices**

##### **UNIT I**

###### **General Introduction:**

- Seed Definition – Difference between seed and grain.
- Seed as a basic input in agriculture.
- Role of high quality seed in increasing and sustaining crop production.
- Seed quality concept, quantity control in seed production characteristics of sowing quality seeds.
- Mode of reproduction in relation to seed production – classification of corps plants in relation of mode reproduction and choice of methods for seed production.

##### **UNIT II**

###### **Development & Training of varieties:**

- System of breeding and testing of crop varieties and hybrids in self, often and cross pollinated crops.
- System of release and notification of varieties for general cultivation.

###### **Varietals purity and its maintenance:**

- Genetic purity of varieties – concepts.
- Life span of varieties and factors responsible for their deterioration.

- Methods of maintenance of genetics purity and techniques of maintenance breeding.
- Generation system of seed multiplication.
- System and methods of production of nucleus, breeder, foundation and certified seed.

### **UNIT III**

#### **Flowering & Seed Production:**

- Flowering in crop plants, its modification for hybrid seed production.
- Factors affecting seed set – temperature, relative humidity, day length, wind velocity and directions of flowering, anthesis, pollen viability, stigma receptivity, nutrition and irrigation.

#### **Male Sterility & Self Incompatibility:**

- Male sterility, its genetics and use in hybrid seed production.
- Self incompatibility – its genetics and use in hybrid seed production.

### **UNIT IV**

#### **Pollination & Seed Production:**

- Improvement of pollination and seed production forage legumes – tripping process and vegetables.
- Improvement of pollination for hybrid seed production.

**Hybrid Seed Production:**

- Feasibility of hybrid seed production by use of hand emasculation and pollination supplementary pollination, detarseling male sterility, geametocides and self incompatibility.

**Areas of Seed Production:**

- Choice of area of seed production, factors affecting the choice of area of seed production – soil types, climate, nutrition and weed status, insect – pest and diseases incidence.
- Compact area approach in seed production.
- Seed village concept germination system of multiplication.

**Agronomic Management in Seed Production:**

- Selection of land for seed production.
- Previous crop effect.
- Effect of environment before and after harvest on seed quality.
- Special agronomic management of seed crops.
- Benevolent malevolent affects of germination quality.
- Harvesting and threshing of seeds factors affecting time of harvesting and threshing, precautions at these operations especially in high value seeds.

**UNIT V**

**Seed Production System & Management:**

- System of seed production in India.
- Agencies responsible for seed production.

- Indian and International seed industry.
- Planning, organizing and managing a seed production programme.

**Seed Production Procedures:**

- Detailed seed production of procedures in following crops with special reference to land and insulation requirements, special agronomic management, segueing harvesting and threshing –
  - Wheat.
  - Rice (Sorghum, Bajra, Maze).
  - Chickpea, Lentile.
  - Cowpea, Mung, Urdbeans,
  - Soybeans.
  - Groundnut.
  - Rapeseed mustard / sesame / sunflower.
  - Forages.
  - Potato.
  - Seed plot technique of potato multiplication.
  - Production of hybrid.
  - True potato seeds.

# **B.Sc. (SEED TECHNOLOGY)**

## **SECOND YEAR DETAILED SYALLBUS**

### **PAPER – 202**

#### **Hybrid Seed Production: Vegetables Seed Production**

##### **UNIT I**

###### **Introduction:**

- Definition of heterosis and inbreeding depression and brief history of the development of these concepts.
- Genetics, physiologic and biochemical basis of heterosis.
- Calculation of heterosis and its importance in crop improvement.
- Exploitation of heterosis at commercial scale in crops.
- Maze, Perlmillet, Sorghum, Sunflower, Castor, Pigeonpea and Cotton.

###### **Fixation of Interosis – An Approach:**

- Apomiksis and its exploitation hybrid sorghum rice.
- Vegetative multiplication of ratoon – hybrid, rice and splitting of early tillers in rice seedlings in nursery.

###### **Haploid Breeding and its role in development of inbreeds – Maze.**

###### **Definition of Incompatibility, Its kinds and Importance:**

- Exploitation of incompatibility for hybrid seed production, its advantages and disadvantages.
- Maintenance of self incompatible parental lines.
- Differences between sterility and incompatibility.

### **Devices for Hybrid Seed Production:**

- Genetic male sterility and hybrid seed production.
- Advantages and disadvantages of genetics male sterility. Role of marker genes linked with genetics male sterility. Procedure of hybrid seed production and maintenance of seed parent – Pigeonpeas, Cotton and Sunflower.

## **UNIT II**

### **Cytoplasmic – Genetic Male Sterility:**

- Introduction to the systems.
- Synchronization methods of achievement.
- Seed production of CMS line 'A'.
- Seed production of maintainer line 'B'.
- Seed production of restorer line 'R'.
- Border rows, planting ration, live rear-ker.

### **Hybrid Seed Production Based in Functional Male Sterility System:**

- Limitation and scope e.g. Tomato gametocides and their use in Hybrid seed production.
- Chemicals causing male castration.
- Effects on female organs.
- Effects on seed setting and seed quality.
- Environment Sterility and its exploitation in hybrid seed production induce. A Chinese experience.
- Role of environment in sex expression potenshedders.
- Maintenance of parental lines – female sterility factors.



- Pollination Techniques.

### **Hybrid Seed Production in Different Crops:**

- Floral biology, seed production planning, land and isolating requirements, wild pollinators, special agronomic practices, maintenance of varieties purity, field inspection, harvesting and threshing in the following crops : -
  - Maize.
  - Pearl Millet.
  - Sorghum.
  - Sunflower.
  - Pigeonpea.
  - Cotton.
  - Hybrid Rice.
  - Hybrid Mustard.
  - Safflower.
- Economics of hybrid seed production.
- Seed Planning.

## **UNIT III**

### **History and Objectives of Vegetable Breeding:**

#### **History of Vegetable Breeding – Reproduction, Pollination Control Mechanisms**

- (a). A Sexual Reproduction:
- Vegetable Propagation
  - Apomixes.
  - Artificial Seeds.

(b). Sexual Reproduction:

- Male Gamete Formation.
- Female Gamete Formation.
- Fertilization.

(c). Pollination Control Mechanism:

- Flowering Habits – Cucurbits, Asparagus, Spinach.
- Self Incompatibility – Gametophytic in *Lycopersicon* spp., and *Solanum* spp., Sporophytic: Heteromorphic, Homomorphic Incompatibility system in cauliflower and cabbage. Methods for breaking incompatibility. Irradiation of pollen, application of NAA, IAA.
- Male Sterility – Genetic male sterility in Tomato, Brinjal and musk melon. Gene – Cytoplasmic male sterility in onion, carrot, radish, cabbage and cauliflower.

**Natural Cross Pollination:**

- Extent of natural cross pollination in vegetable crops.
- Factors determining natural cross pollination.
- Role of natural cross pollination in seed production of vegetable crops.
- Natural cross pollination and pollination vectors in vegetable crops.

**UNIT IV**

**Hybridization Techniques in Vegetables:**

- Raising of crop.
- Equipments required
- Emasculation and use of gametocide.

- Pollination methods – hand pollination, rubbing and hooking – use of electric bee.
- Role of introduction and their utilization :
  - Collection
  - Maintenance
  - Evaluation
  - Storage
- Selection :
  - Pure line Selection – Definition, Methods and Achievements.
  - Single Plant Selection – Procedure, Achievements.
  - Clone Selections – Collections of Clones, Testing of Clones and Achievements.

### **Hybridization with Reference to Vegetables Crops:**

- Crosses between parents.
- Singles cross, double cross, three way cross, back cross, triple cross, hybrid.
- Selection procedure in segregating progenies.
- Pedigree selection.
- Bulk method
- Pure line family method (PLF)
- Single seed descent method
- Population improvement
- Mass selection
- Line breeding
- Selfing and massing

## UNIT V

### Vegetables Seed Production:

- (a) Introduction, Importance and Present status and future prospectus.
  - (b) Classification of vegetable crops – root crops, bulbous crops, leafy crops, flowering and fruits crops.
  - (c) Requirements of Seed Production.
  - (d) Effect of environment on seed setting and production.
  - (e) Methods of seed production of the under mentioned crops dealing with the aspects of – Land requirement, Seedling / Root production, Nursery management, Planting, Cultural Practice, Breeding Methods Used, Plant Protection, Seed Harvesting, Vegetable cum Seed Production. Drying Grading, Seed Extraction method, Wet Dry Methods.
- Tropical Crops – Solanaceous: Brinjal, Potato, Chilly, Tomato, Root Crops (Radish, Carrot, Colocacca). Leaf Vegetables (Palak, Maithi, etc.). Bulb Crops (Onion, etc.), Okra.
  - Temperature Vegetables – Cauliflower, Cabbage and Capsicum.
  - Hybrid Seed Production in Vegetables – Use of male sterile lines.
  - Methods of production of maintainers, pollen parents, planting ratio of 'A': C Lines.
  - Insect pollination (Honey Bees, Blow Flies).

# **B.Sc. (SEED TECHNOLOGY)**

## **SECOND YEAR DETAILED SYALLBUS**

### **PAPER – 203**

#### **Seed Technology & Seed Quality Control**

##### **UNIT I**

###### **Introduction, History & Development:**

- Introduction, history and development.
- National and International organization and seed testing linkages.
- Seed testing laboratory layout and furnishing.
- Seed testing equipments and their maintenance.
- Seed testing laboratory management and functioning.
- Seed sampling, dividing.
- Heterogenic test.
- Handling and testing of the sample.
- Physical purity analysis.
- Determination of other distinguishable varieties.
- Other determination.

##### **UNIT II**

###### **Moisture Festing:**

- Germination test, requirements, seeding evaluation.
- Rapid tests for seed quality determination.
- Seed vigour testing.

- Cultivator purity testing.
- Testing of polluted seeds.
- Uniformity in seed testing results and use of tolerances.
- Record keeping and reporting of results.
- Storage of guard samples.
- Seed testing in relation to seed act and marketing.

### **UNIT III**

#### **Seed Quality Control:**

##### **General Introduction -**

- Seed quality, its concept – Physical purity, germination, health and genetic purity.
- Concept of variety variation – Heritable and Non-Heritable characters.

##### **Seed Legislation -**

- Seed legislation, seed certification.
- Objective – Indian Seeds Act, Seed Rules and Seed Order.
- Seed Inspector – Qualifications duties and responsibilities.

### **UNIT IV**

#### **Seed Certification:**

##### **Concept & History -**

- Classes of seed and phases of seed certification.
- Seed certification agency – its organization.
- Seed certification standards.
- Land requirements and isolation distance.

- Principles of field inspection.
- Techniques of field inspection of seeds production plots of varieties and hybrids of cereals, pulses, oilseeds, forage and fibre crops, potato and vegetables.
- Inspection at harvesting, threshing, processing.
- Sampling for seed quality evaluation.
- Issue of certificates and tags, sealing.
- Testing of genetic purity of seed in grow out test, particularly of cotton.
- Revalidation of seed lots.
- Interstate seed certification.
- New seed policy (1998), Provisional Seed certification.
- Seed quality control organization in India.
- Composition and function of Central Seed Committee, Central Sub-Committee on crop standards, Notification and release, Central Seed Certification Board, State Seed Committee.
- Management of Seed Certification Programme.

## **UNIT V**

### **Seed Certification Internationally:**

- Organization of Economic Co-operation and Development Seed Certification Schemes.
- Future trends in Seed Certification.
- Plant variety protection – plant breeder's rights.

# **B.Sc. (SEED TECHNOLOGY)**

## **SECOND YEAR DETAILED SYALLBUS**

### **PAPER – 203**

#### **PRACTICAL**

- Preparation of agro-climatic maps of India for soil, crops and climate conditions.
- Study of inflorescence, flower structure, seeds of important crops and vegetables. Study of the prolophynous, protandrous nature of flowers (cotton, castor pigeonpea, sunflower, maze, etc)
- Emasculation of various crops e.g. Maze, Cotton and Wheat.
- Study of pollen grains, morphology, and fertility and in vitro and in vitro germination, pollination, fertilization.
- Seeds productions practice of cereals, pulses, oilseeds and fiber crops.
- Visit of nucleus, seed plots and study of maintenance of varieties, visit of foundation and certified seed plots and techniques of seed production should be based on the mapping as well as laboratory work on the rock samples collected during the fieldwork.



# **B.Sc. (SEED TECHNOLOGY)**

## **THIRD YEAR DETAILED SYALLBUS**

### **PAPER – 301**

#### **Seed Pathology & Entomology**

##### **UNIT I**

###### **Seed Pathology & Entomology:**

- History of Seed Pathology.
- Economic significance of seed borne disease.
- Seed borne fungi, bacteria, viruses and namatods.
- Storage fungi and its impact on animal and human health.
- Mechanisms of seed transmission.
- Entry point of weed infection.
- Influence of environmental factors on seed borne disease.
- Seed crop management.
- Management of seed storage.
- Seed treatment, procedures and equipment.
- Qualitative tests for seed.

##### **UNIT II**

###### **Objective of Seed Health Testing:**

- Procedures of sampling for seed health testing.
- Methods of seed health testing.
- Inspection of plants beyond the seedling stage.

- Inoculum density of seed borne pathogens and its relationship with disease security, yield losses.
- Seed certification and tolerance limits of seed borne pathogens.
- Seed act in relation to seed borne diseases.
- Ecological relationship of seed borne micro organisms.
- National and International co-operation in seed pathology.

### **UNIT III**

#### **Seed Entomology:**

- Introduction :
  - Role of insects in seed production.
  - General organization of insects.
- Classification :
  - Methods of insect classification.
  - Orders of insects of economic importance.
- Insect Body and Appendages :
  - External Morphology
  - Types of Appendages
- Life – Cycle : EPF of Insect :
  - Stages of insect development
  - Complete and incomplete metamorphosis
- Insect – Ecology :
  - Definition and its importance
  - Ecological factors governing.
  - Insect development and population build up.
- Economic Entomology :

- Important insect – pest of seed crops, their nature of damage and management.
  1. Cereal – Paddy, Maize and Sorghum.
  2. Pulses – Kharif Pulses – Pigeonpea, Mung, Cowpea, Urd.
  3. Pulses - Rabi Pulses – Chickpea, Filedpeas, Linseed.
  4. Oilseed – mustard, castor, linseed, groundnut, sealine.
  5. Vegetables and dry fruits.
- Beneficial Insects :
  - Type of beneficial insects and their role on seed production.
  - Types of insect’s pollinators, their usage in crop pollination.
  - Honey bees, their social structure and management (Bee Keeping).

## **UNIT IV**

### **Insect Control:**

- Definition and methods of insect control via.
- Monitoring insect pests and miles in storage.
- Nature of damage and losses caused and factors influencing them.
- Sources and development of infestation.
- Detection of infestation.
- Fumigants and methods of fumigation.
- Seed Protestants and their impact on seed viability etc.
- IMP strategies for important pests.

## **UNIT V**

### **Plant Protection Equipments:**

- Types of equipments and their principles.
- Safe handling, maintenance and use machines.
- Rodents and their control in field and seed godowns.

# **B.Sc. (SEED TECHNOLOGY)**

## **THIRD YEAR DETAILED SYALLBUS**

### **PAPER – 302**

#### **Seed Processing & Storage**

##### **UNIT I**

Place and importance of seed processing path way of seed improvement. Concept and objectives of seed processing, physical characteristics used to separate seeds, basic flow pattern in seed processing.

*Preparing Seed for Processing:* The scalper, the debearder, the scarifer maize, sheller licensing of machines.

*Seed Drying:* importance and advantages of seed drainage, moisture content recalcitromit / orthodox and methods of seed moisture measurement theory of seed moisture measurement, theory of seed drying, methods of seed drying (wet dry seeds), and advantage of mechanical drying over sun drying equipment, dehumidification and drying of heat sensitive seeds, relative humidity and equilibrium moisture contents of seeds.

##### **UNIT II**

The air screen cleaner cum grader, vibrating action on a seed separating screen, penetration and retention of seeds on a screen, selection of screen for seed separation, adjustment of air screen cleaners for improved efficiency, cleaning of air seed cleaning machines.

Indented disc and indented cylinder separator, construction and operation of intended disc separator, construction and operation of indented cylinder separators, adjustments of indented disc and indented cylinder separators.

Specific gravity separation: Parts of the machine, stratification and separation of seeds on the separating deck, adjustments of specific gravity separators, starting and operating acquiesces, separation problems and their rectification, recleaning the middling product. The stoner, aspirators and pneumatic separators.

### **UNIT III**

#### **Surface texture separation:**

The roll mill, parts of the machine, separating action and the adjustments, cleaning roll mills.

Affinity for liquid separation, the magnetic separators, the separating action.

Shapes of roundness separations, the spiral separator separating action and operation of spiral separator, the draper best separator, electrostatic separators, cleaning the spiral separators.

Electronic cocowi sortex – working principal.

Quality control and measurement of machine performance in seed processing plants, indicate of machine performance, sampling of product of reject from seed handling machines, seed blending.

### **UNIT IV**

#### **Seed Treatment:**

Seed treatment equipment, shury seed treater, mist-o-matic seed treater, parts of the machines, construction and operation. Labeling of treated seeds and related precautions, storage of treated seeds, machine operators and seed users safety.

Site selection for seed processing plant on a seed production farm, layout of machines in a seed processing plant for equipment product and not movements mechanical injury to seeds in post harvest phase, conservation of energy and

production in seed processing, maintenance and repair of seed processing equipments.

Seed conveyors and elevators, bucket elevators, belt conveyors, screen conveyors oscillation conveyors, pneumatic conveyors, difference between a specific gravity separators and oscillating conveyors installation of bucket elevators, computing the required height of bucket elevators, capacity determination of bucket elevators.

## **UNIT V**

Packaging and marketing seeds, bagger, weigher, bag closing, portable and conveyor type bag closers, leveling and maintaining lot identity, lot numbers, seed pellets, handling and stacking, maintenance of seed processing records.

Seed storage structure: Construction, operation and maintenance, insulation, storage aeration, air conditioning, dehumidification and stacking, moisture and heat roofing of seed storage structures, seed storage management.

# **B.Sc. (SEED TECHNOLOGY)**

## **THIRD YEAR DETAILED SYALLBUS**

### **PAPER – 303**

#### **Seed Farm Management & Marketing**

##### **UNIT I**

###### **Introduction:**

Field of farm management, scope, basic principles in farm management, decision making operation and control.

###### **Decision Making Approach:**

Decision making based on production, cost and conical investment, cost analysis, law of diminishing return, opportunity cost, cost profitable combination of inputs and outputs.

##### **UNIT II**

###### **Planning & Management of Crops, Building and Machinery:**

Important crops of India, concepts pertaining to various crops production operations viz village, irrigation, sowing, plant protection, harvesting and threshing, maintenance of soil fertility, weeds and their control, mixed cropping, multiple cropping and dry land farming.

Machinery selection and their management, determination of field's capacity and field efficiency, machinery adjustments.

Consideration in farm buildings, implement shed, storage, structure.



### **UNIT III**

#### **Farm Business Analysis:**

Field size, factors affecting profit and economic size of farm.

Budget and record keeping.

Farm budgeting, procedures and uses.

Farm efficiency measures, farm records and their use.

### **UNIT IV**

Acquisition and management of land, labour and capital, farm surveys – data collecting and analysis.

### **UNIT V**

#### **Marketing:**

Basic concept, supply and demand, price equilibrium, seed transportation and storage –cost and returns, cost of processing and packaging, marketing organization for seed marketing, seed market in India, structure and working. Seed market survey, projections of supply and demand for different kinds of seeds in India – seed pricing Breeder / Foundation / Certified Seeds.

# **B.Sc. (SEED TECHNOLOGY)**

## **THIRD YEAR DETAILED SYALLBUS**

### **PAPER – 304**

### **PRACTICAL**

1. Identification of farm machines and their use.
2. Determination of field capacity and field efficiency.
3. Soil sampling for fertility and moisture content.
4. Calibration and adjustment of various farm machines.
5. Cost analysis.
6. Farm Planning and Budgeting.
7. Record Keeping.

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