



**SENIOR SCHOOL**  
**CURRICULUM**  
**2016-17**  
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**VOLUME-IV**  
**(PART-5)**

**Agro, Production and  
Marketing Based Courses**

**CENTRAL BOARD OF SECONDARY EDUCATION**

**“SHIKSHA KENDRA”, 2, COMMUNITY CENTRE, PREET VIHAR, DELHI – 110 301”**

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# AGRO PRODUCTION AND MARKETING BASED COURSES

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1. POULTRY FARMING
  2. HORTICULTURE
  3. DIARY HUSBANDRY AND DIARY TECHNOLOGY
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# POULTRY FARMING

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## Introduction

The course aims to develop human resource in the area of Poultry Farming. The knowledge imparted shall facilitate better management of poultry in scientific lines which in turn will improve their productivity.

Poultry Farming has been one of the most important subsidiary occupations of the farming community in India. Poultry Farming is a remunerative business, both in rural and urban areas due to the requirement of small space, low capital investment and quick return throughout the year. It has a significant role in the eradication of malnutrition and poverty as well as eliminating unemployment and under-employment among the rural masses. However, due to lack of modern and updated methods of farming, farmers are practicing their own way, which has been found to be unproductive and not commercially viable.

## Objectives

The main objective of the course is to.

- Ñ Develop and strengthen Human Resource by infusing/imparting knowledge and skill in Poultry Farming.
- Ñ Create awareness about the opportunities of employment and livelihood in poultry sector.
- Ñ Impart basic knowledge and technical proficiency in poultry breeding, housing, management and nutrition.

## CLASS–XI ELECTIVE POULTRY PRODUCTION AND BREEDING (716) THEORY

*Time: 2 Hours*

*Marks: 40*

1. Indian poultry industry with reference to agricultural farming important indigenous and exotic breeds- egg-type, meat-type, dual purpose, Ducks, Turkeys and Quail, etc. External anatomy (Points of a bird) and identification. Franchise hatcheries, Organised poultry research and development farms.
2. Laws of inheritance, Autosomal and sex chromosomes. Inheritance of morphological traits – comb pattern, plumage colour, disease resistance, sex linked genes. Sexing methods, feather colour and vent sexing. Major genes and their utility in production.
3. Components of egg production – egg number, persistency, intensity, sexual maturity, egg weight, body weight, broodiness, viability, feed efficiency. Methods of mating flock mating, shift mating, pen mating. Systems of breeding-inbreeding, cross-breeding, strain-crossing and hybridization.
4. Factors affecting fertility and hatchability. Pedigree hatching and commercial hatching.
5. Modern breeding methods for the production of commercial layers and broiler chicks. Quail, Duck and Turkey, etc.
6. Selection and culling of birds. Measures of egg production- hen housed and hen-day production. Efficiency of egg-production and factors affecting egg production. Production under summer stress-feed consumption, egg weight and egg quality.
7. Importance of artificial insemination in fowl methods of semen collection and insemination of hen. Precautions in semen collection and insemination. Time of insemination, concentration of sperms per insemination, frequency of insemination and their influence on fertility rate. Effect of season on semen production and fertility – Semen evaluation, Formation of egg-yolk, albumen and shell.

**Note:** Number in Parenthesis indicates suggestive teaching hours for the section.

## **PRACTICAL**

*Time: 3 Hours*

*Marks: 60*

1. Study of external anatomy- parts of body.
2. Study of characters of egg type breeds of fowl.
3. Study of characters of meat type breeds of fowl.
4. Study of breeds of ducks, turkey and quail.
5. Study of commercial poultry stocks.
6. Sketching of important poultry pockets in India (showing breeding farms, hatcheries, etc. in the map of India).
7. Exercise on the inheritance of morphological traits.
8. Identification of sex, feather sexing and colour sexing method.
9. Vent sexing.
10. Identification of birds-wing bands (sketch of wing band), application of wing bands, wing badges and leg bands.
11. Drawing of egg production curves based on data.
12. Record keeping of egg weight at various ages.
13. Calculation of feed efficiency per Kg. in terms of eggs and feed requirements per dozen eggs.
14. Drawing of a sketch of various types of cross breeding and strain crossing.
15. Marking eggs for pedigree hatching and hatching of pedigree chicks.
16. Calculation of hatchability of fertile and total eggs set basis.
17. Culling non-layers.
18. Calculation of hen-housed and hen-day egg production.
19. Judging bird for egg production- comb size and colour, bones, distance body conformation and body capacity.
20. Filling pedigree records – sire family and dam family for hatching, egg production, body weight and egg weight.
21. Study and sketching of various types of trap nests.
22. Trap nesting and study of defects in trap nests.
23. Identification of pedigree in cage birds.
24. Study of male and female reproductive organs.
25. Artificial insemination in fowl.
26. Preparation of male for semen collection – collecting funnels – training of males, preparation pfr A.I. Kit, semen evaluation.

### **CLASS–XI ELECTIVE**

## **POULTRY HOUSING AND MANAGEMENT (717)**

### **THEORY**

*Time: 2 Hours*

*Marks: 40*

1. Importance and principles of poultry housing. Materials and method for poultry housing environment and poultry housing management. Housing for chicks, growers, layers and broilers.

2. Factors affecting heat loss and heat production in fowl. Methods of heat loss. Housing considerations in summer, winter, and rainy season.
3. Methods of housing – housing of chicks on floor and cages. Housing of growers in cages and floor. Housing of layers on floor and cages. Slatted floor.
4. Floor space requirements for chicks, grower, layers, and broilers, feeder and waterer space requirements for chicks, growers, layers, and broilers.
5. Equipment – brooder house equipment – floor brooders, battery brooder, chick guards, chick feeders, chick waterers.
6. Grower house equipment – grower feeders, grower waterers, grower cages.
7. Layer house equipment – layer feeders, layer waterer, nest box and grit box. Types of layer feeders, laying cages.
8. Other equipment – debeakers, balances, egg boxes and filler flats, catching crates, catching hooks, litter racker, pedigree boxes.
9. Management of chicks- chick feeding, chick watering, and debeaking. Temperature maintenance – infra red brooding, environmental problem in a poultry farm and its control, prophylactic vaccination.
10. Management of growers –grower feeding, watering and debeaking.
11. Layer management –layer feeding, watering on floor and in cages, medication, egg collection and lighting schedule.
12. Broiler management – separating sexes, lighting schedule, feeding, watering, prophylactic vaccination and medication of broilers.
13. Litter management – material, special emphasis on adverse weather conditions, racking, mixing of lime, built up litter and disposal of litter.
14. Moulting – age of moulting, process of moulting, forced moulting. Methods and precautions in forced moulting.
15. Stress management – identification of various agents causing stress.
16. Management problems –density of bird, watering and feeding space, rodent control, difficulties in poultry management.
17. Introduction to management of ducks, quails and turkeys – hatchery operations care during fumigation. Candling, setting and transferring of hatching eggs, cleaning of hatching eggs. Requirements of temperature, humidity and turning. Gaseous environment of incubator and corrective measures.

**Note:** Number in parenthesis indicates suggestive teaching hours for the section.

## **PRACTICAL**

***Time: 3 Hours***

***Marks: 60***

1. Identification of poultry housing materials.
2. Designing and sketching of poultry house for chicks.
3. Designing and sketching of grower house on floor and in wire mesh cages.
4. Designing and sketching of layer house on floor and in cages.
5. Visit to a poultry farm.
6. Preparation of tables for space, feeder and waterer requirement of birds of various ages.
7. Drawing sketches of floor brooder, battery brooder, chick feeder, chick waterer and brooder guards.
8. Arranging waterers, feeders and chick guards in a brooder house.
9. Identification of equipment for infra-red brooding.
10. Recording of temperature.
11. Drawing sketch and handling of a grower feeder, waterer and wire floor battery cages.

12. Drawing a sketch and handling automatic water arrangement in cages.
13. Drawing a diagram and handling of nest box and grit box.
14. Debeaking of birds.
15. Drawing a diagram of debeaked chick and debeaked adult bird.
16. Drawing a sketch and handling of catching crate, catching hooks, litter racker and pedigree boxes.
17. Identification of filler flats – paper pulp, plastic.
18. Drawing of egg boxes.
19. Drawing of chick box.
20. Drawing and handling of bamboo, wooden and metal transport crates.
21. Cooling poultry house in summer, through water spraying, side curtains, straw thatching, etc.
22. Identification of feather of fowl-primary, secondary and body feather. Sketching sequence of falling of feather in moulting.
23. Preparation of birds for show purposes and visit to poultry exhibition.
24. Hatchery showing location of hatching equipment.
25. Cleaning and fumigation of hatching eggs, setting, candling and transferring of eggs.
26. Distinguishing between fertile and infertile eggs.
27. Recording of temperature, humidity and turning in hatchery.
28. Drawing a chart for common defects in operation of hatcher and setter and their remedial measures.
29. Drawing a sketch of wing feather showing slow and rapid feathering.
30. Drawing a sketch of cloacal opening to differentiate between male and female protuberance.
31. Setting a chick sexing room, bulbs, reflector, chick boxes, etc.

**CLASS–XI**  
**OPTIONAL**  
**POULTRY EXTENSION, MARKETING AND ECONOMICS (718)**  
**THEORY**

*Time: 2 Hours*

*Marks: 40*

1. Extension Education –Principles of extension technique. Poultry extension – objectives and its role in poultry development programmes. Qualities of extension worker different poultry development programmes, their impact and future strategy.
2. Extension methodology and techniques. Handling audio-visual aisa and their importance in poultry education programmes. Methods of effective communication.
3. Rural sociology- its impact, social institutions and their role in poultry development concept of socio-economic cultural change.
4. Nature and importance of marketing. Marketing process, communication media, methodology of survey and their assessment. Adoption process and factors influencing adoption.
5. Marketing channels for poultry and poultry products. Marketing societies and farmers co-operatives.
6. Formation of poultry co-operative societies – their objectives and impact on social structure.
7. Salesmanship, qualities of a salesman. Advertising agencies and their role in acceptability of poultry products.
8. Pricing, demand and supply and its relationship with pricing. Effect of season.
9. Economics of egg production. Economic of broiler production. Factors affecting economic returns.`

10. Economics of poultry production and its relationship with national economy. Benefits and limitation of poultry farming.
  11. The role of poultry products sale points in efficient marketing.
  12. Poultry farm records, inventory receipt and expenditure.
  13. Specific forms for maintaining feed, flock, strength, mortality, incubation, performance and health records.
  14. Accountancy financial statement of profit and loss. Model scheme for setting up of a layer/broiler farm of various sizes.
  15. Importance of poultry insurance. Financial institutions involved in support of poultry programme.
- Note:** Number in parenthesis indicates suggestive teaching hours for the section.

## **PRACTICAL**

***Time: 3 Hours***

***Marks: 60***

1. Preparations of communication materials such as posters, charts, bulleting, boards and films.
2. Handling of audio-visual aids.
3. Organization of poultry exhibition in rural and urban areas.
4. Conducting group discussions, meetings to educate village farmers and arranging demonstrations.
5. Familiarizing with local marketing channels of poultry and poultry products.
6. Preparation of a flow diagram showing steps required for formation of co-operative societies.
7. Calculation of economics of broiler production.
8. Calculation of economic of cockerel production.
9. Calculation of cost of preparation of egg and meat products.
10. Study of registers and accounts.
11. Preparations of insurance schedule.

## **CLASS–XII ELECTIVE**

### **POULTRY NUTRITION AND PHYSIOLOGY (716)**

#### **THEORY**

***Time: 2 Hours***

***Marks: 40***

1. Biology of fowl, digestive physiology - digestion, absorption & utilization of feed nutrients carbohydrates, proteins, fat vitamins and trace elements. Factors affecting digestibility and feed efficiency. **13**  
Importance of nutrition in poultry production-classification of food stuffs and their categorization in to energy feeds, protein feeds, minerals and vitamins. Feed additives. Agre - industrial by- products and non-conventional feeds.
2. Nutrient requirements of different types of poultry-chick grower, layer and broiler, ducks, turkeys and quails. Assessing their requirements. Selection of feed, and BIS feeding standards for poultry. **9**
3. Preparation of poultry rations. Proximate analysis of various categories of poultry feed. Advantages and disadvantages of mash and pelleting feed. Feeding methods of poultry. Feeding schedules for various types of poultry. Common nutritional deficiencies in poultry rations. Common toxic principles in poultry feeds and method of detoxification. **10**

4. Use of non-conventional poultry feed ingredients. Principles of storage of feeds and maintenance of stores. Nutritional factors affecting fertility. Role of hormones and effects of light on growth and reproduction. Stress physiology and remedial measures. **8**

**Note:** Number in parenthesis indicates suggestive teaching hours for the section.

## **PRACTICAL**

**Time: 3 Hours**

**Marks: 60**

1. Identification of various poultry ingredients and their classification.
2. Familiarization with feed additives, agro- industrial by –products and micro nutrients.
3. Identification of common feed adulterants.
4. Sampling and labelling of poultry feeds.
5. Acquaintance with various laboratory equipment and apparatus.
6. Preparation of various laboratory reagents and standard solutions used in feed analysis.
7. Determination of moisture/ dry matter.
8. Determination of proteins.
9. Determination of crude fibre.
10. Determination of ash.
11. Preparation of analytical report.
12. Mixing of chick starter, grower, layer and broiler ration.
13. Use of feed concentrates for preparation of various mashes.
14. Calculation of feed requirements of chicks, growers, layers and broilers according to age.
15. Calculation of feed efficiency for meat production.
16. Calculation of feed efficiency for meat production.
17. Calculation of feed requirements for production of one kg. egg mass and dozens of eggs.
18. Preparation of mineral mixture.
19. Physical evaluation of grains and other feed components.
20. Identification and application of insecticides, fumigants and rodenticides in feed go down.
21. Sketching of digestive tract of fowl.
22. Sketching of endocrine organs.
23. Sketching respiratory organs.
24. Sketching of circulatory system.
25. Sketching of renal organs.
26. Sketching of nervous system.

## **CLASS–XII ELECTIVE POULTRY PRODUCTS AND TECHNOLOGY (717) THEORY**

**Time: 2 Hours**

**Marks: 40**

1. Present status of poultry products technology in India and its scope for expansion and future development. Structure, chemistry, per capita consumption of poultry and egg in India and abroad including changing consumer attitude towards these items. Egg and poultry meat as a source of quality animal protein. Sources of contamination of egg. and its products and its prevention. **5**
2. Egg quality and its maintenance. Importance of egg quality studies and techniques available to evaluate the same Factors responsible for deterioration of egg quality. Microbial spoilage of eggs. Methods of preservation of shell eggs. **5**
3. Handling, collection, grading, packaging and storage of eggs. Organisations and operation of cold stores for holding shell eggs and its products. **10**  
Functional properties of eggs. Pasteurization, freezing and dehydration of egg products, including their packaging and storage. Principles and techniques of manufacture of egg powder, albumen flakes, yolk granules and other edible egg products. Industrial use of egg and egg products. National and international standards for egg and egg products, Microbial spoilage of eggs.
4. Principles of dressing poultry including chilling, packing and labelling. Meat yield, meat cutting and factors influencing meat yield- comparative evaluation of various types of avian species used in India for purposes of meat. Different methods of preservation of poultry meat- chilling, freezing, curing, smoking, dehydration and canning. Microbial spoilage of poultry meat and its prevention. **12**
5. Inspection, grading and standardization of dressed poultry. Fundamentals and principles of further processed poultry products. Specifications and regulations relating to poultry products offered for sale Sanitation in poultry processing plant and egg breaking unit. Selection of types of detergents and sanitizers. Sampling technique and quality control of egg and poultry products. Packaging transportation and marketing of egg and poultry products. **8**

**Note:** Number in parenthesis indicates suggestive teaching hours for the section.

## **PRACTICAL**

**Time: 3 Hours**

**Marks: 60**

1. Structural details and internal parts of an egg.
2. Composition and nutritive value of different types of avian eggs.
3. Measurement of external and internal physical quality of eggs.
4. Identification of quality defects in eggs.
5. Candling and grading of eggs.
6. Washing of eggs.
7. Coating of eggs.
8. Spraying of eggs for preservation.
9. Preservation of eggs by different techniques.
10. Preparation of cold store and its operation during storage and removal for disposal.
11. Packing of shell eggs for short and long term transport.
12. Preparation of various edible egg products.
13. Ante- mortem examination of birds.
14. Dressing of chicken and ducks.
15. Evaluation of dressing yield, meat yield and dressing loss of chicken and ducks.
16. Preparation of cut up parts of chicken and ducks.
17. Chilling, packing and storage of dressed chicken.
18. Grading of dressed chicken.
19. Preparation of tandoori chicken.

20. Preparation of chicken pickle.
21. Preparation of smoked chicken.
22. Preparation of chicken sausage.
23. Preparation of chicken curry.
24. Preparation of chicken patties.
25. Sampling of meat and egg. Products.
26. Organoleptic evaluation of chicken and egg products.
27. Sanitary practices in a poultry and egg breaking plant.
28. Visit to poultry processing plants to get familiar with their organisation, layout and operation.
29. Marketing methods for disposal of egg and poultry products- by visiting different marketing units.

**CLASS–XII**  
**OPTIONAL**  
**POULTRY DISEASE AND THEIR CONTROL (718)**  
**THEORY**

*Time: 2 Hours*

*Marks: 40*

1. Definition of health and disease – signs of health in flock. Principles of hygiene- use of detergents in spraying and cleaning of sheds. Importance of sanitation in hatchery building, hatchers and setters. Role of intermediate hosts in spread of diseases. Pre- disposing factors for sickness- faulty feeding practices, poor ventilation, lack of cleanliness, overcrowding, attendant, precautions to avoid infection. **5**
2. Common diseases of poultry and their causative agents. Symptoms and treatment. **15**
  - Ñ **Viral Diseases:** Ranikhet diseases, fowl pox, EDS -76 (egg drop syndrome), infectious bursal diseases (Gumboro diseases) infectious bronchitis, infectious Laryngo Tranchitis, inclusion body hepatitis, avian encephalomyelitis, Reoviral arthritis, marek’s disease, avian lymphoid leukosis.
  - Ñ **Bacterial Diseases:** coli bacillosis, infectious coryza, salmonellosis, pasteurel lososs pirochetosis, mycoplasmosis, tuberculosis.
  - Ñ **Fungal Diseases:** Aspergillosis and aflatocicosis.
  - Ñ **Parasitic Diseases:** Ectiparasistes – line, mites, ticks and fieas: Endoparasities – rounf worm tape worm and protozoan diseases – coccidiosis.
3. Miscellaneous diseases: Staphyococccosis, cannibalism, pilling of birfs, egg bound condition, proapa of the uterus, cage layer fatigue. Sofuum chloride poisoning. Stunting syndrome, tumors. Diseases of duck, quinea fowl, turkeys and quail Nutritional deficiencies –polyneuritis, curried toe paralysis, encephalomalacia, rickets, perosiisnad other nutritional diseases. **12**
4. Principle of immunity, immunization and control of infectious diseases such as Ranikhet disease, marek’s disease, fowl pox, infectious bronchitis. Immunity periods after vaccination. Precautions at vaccination time. Preparation and storage of vaccines Deworming and control of parasitic diseases and routine treatment methods. **8**

**Note:** Number in parenthesis indicates suggestive teaching hours for the section.

**PRACTICAL**

*Time: 3 Hours*

*Marks: 60*

1. Identification of healthy and sick birds.
2. Recording of temperature.
3. Visual appraisal of comb, buccalcavity, gait and behaviour.

4. Demonstration of terms: bacteria, virus, protozoa, fungus, sulphonamides, antibiotics, Antibodies, antigens, active immunity, passive immunity, acute and chronic diseases, pathogens, vaccines, virulence, morbidity, mortality.
5. Visit to poultry farm showing equipment, position of foot bath. Sterilization and sterilization methods.
6. Preparation of chart for common viral diseases, showing the causative agents, symptoms, prophylactic vaccinations and treatment.
7. Preparation of chart for common bacterial and fungal diseases, showing their causative agents. Symptoms, vaccination and treatment.
8. Preparation of figure of life cycle of coccidial agents. Symptoms and treatment.
9. Control of Ecto – parasites – dipping methods, spraying with insecticides
10. Identification of common insecticides used in poultry and their use.
11. Deforming of poultry birds.
12. Preparation of table common nutritional diseases- their causes, symptoms and treatment.
13. Preparation of vaccines and their preservation.
14. Vaccination poultry birds.
15. Study of internal organs of the body of the fowl.
16. Collection of blood, separation of serum an plasma and preservation.
17. Preparation of blood smear and tissue impression smear and staining.
18. Post- mortem examination for important poultry diseases.
19. Collection of infected material, preservation, packing and despatching to diagnostic laboratory
20. Fumigation of hatchery and eggs.
21. Visit to a disease diagnostic laboratory.



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# HORTICULTURE

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## Introduction

Horticulture is associated with the cultivation of vegetables, fruits, flowers, crops, tuber crops and medicinal, aromatic and ornamental plants where one can attain knowledge about crop production, plant propagation, plant breeding, genetic engineering, preparation of soil and plant physiology and biochemistry and simultaneously can work in various fields including floral design, garden centers, teaching, fruit and vegetable production, arboriculture, landscape construction, etc.

The Course Curriculum of Horticulture is focused to create interest among the students to identify and grow a wide range of different plants of commercial and medicinal use. It will enable the students to learn, how to interpret and understand a range of different habitats from woodlands and grassland to coastlines, to carry out wildlife surveys, undertake a range of countryside skills such as dry-stone walling and hedge-laying and to supervise a team carrying out a habitat regeneration project. The course on Horticulture is effectively designed to build the skills and knowledge of the students so as to equip them to work in the Conservation and Environment sectors. Further, it is intended to lay a foundation for a long-term career in horticulture by developing the ability of the students to identify a large range of plants, your knowledge of essential horticultural principles and practices, your practical skills in plant propagation, growth and care, and your ability to adapt to changing situations.

## CLASS–XI ELECTIVE BASIC HORTICULTURE (762) THEORY

*Time: 3 Hours*

*Marks: 60*

1. Importance of Horticultural crops.
2. Principles of Horticulture crop production technology.
3. Principles of plant propagation, methods of propagation for horticultural crops.
4. Essential of plant nutrients, their deficiency symptoms and toxicities in Horticultural crops.
5. Organic and inorganic manures and their methods of application in Horticultural crops.
6. Principles of weed control, crop rotation, cropping system, methods of irrigation and drainage.
7. Major pest and diseases management in horticultural crops.
8. Harvesting, handling, storage.
9. Traits and quality standards of horticultural products.

## PRACTICAL

*Time: 2 Hours*

*Marks: 40*

1. Visit to a Garden/orchard/vegetable farm .
2. Identification of major fruit crops of our country.
3. Identification of major vegetable crops (*Kharif / Rabi / Zaid*) of our country.
4. Identification of major flower crops of our country.
5. Identification of ornamental/avenue/lawn (grasses, hedge, edge) plants of our country.
6. Identification of indoor and outdoor foliage ornamentals (succulent, bulbous etc.).
7. Propagation through seeds .
8. Propagation through cutting- Sucker, Layering (air & ground), Runners and grafting
9. Preparation of pot for planting- Cleaning, Media Preparation, Filling.
10. Identification of different Fertilizers- NPK.
11. Identification of organic Manures- FYM, vermin compost, Cakes, Bone meal.
12. Preparation of model of a low cost storage structure for horticultural produce.

## CLASS–XI OPTIONAL-I OLERICULTURE (763) THEORY

*Time: 3 Hours*

*Marks: 60*

- |   |   |
|---|---|
| 1. Important vegetable crops - present status and future prospects.                         | 4 |
| 2. Selection of site and soil for growing vegetables.                                       | 5 |
| 3. Role of environment and soil factors in vegetable production.                            | 5 |
| 4. Essential plant nutrients and their deficiency symptoms.                                 | 4 |
| 5. Vegetable crops management.  | 5 |
| 6. Classification of vegetable crops.   | 4 |
| 7. Production technology of solanaceous and cucurbitaceous vegetable crops.                 | 8 |
| 8. Training and pruning in tomato and cucurbits under open field conditions.                | 4 |
| 9. Vegetative and reproductive propagation methods in vegetable crops.                      | 4 |
| 10. Role of growth regulators in vegetable crops.   | 4 |
| 11. Management of important insect-pests and diseases of vegetable crops.                   | 4 |
| 12. Application of biotechnology in vegetable production.                                   | 4 |
| 13. Maturity traits, quality standards of fresh vegetables and their post-harvest handling. | 5 |

## PRACTICAL

*Time: 2 Hours*

*Marks: 40*

1. Visiting vegetable gardens, identification of vegetable crops with reference to stage of crop growth, flowering and marketable stage of the vegetables. 3

2.	Land preparation and sowing of vegetable crops.	2
3.	Preparation of nursery beds for raising vegetable seedlings.	2
4.	Visit to local vegetable nursery and acquaintance with different nursery management practices.	2
5.	Identification of important vegetable crops at different growth stages on the basis of different morphological traits. <b>2</b>	
6.	Identification of seeds of vegetable crops.	2
7.	Calculation of seed requirement for important vegetable crops.	2
8.	Protecting plants from sub-optimal temperature conditions to cultivate off-season vegetables.	2
9.	Methods of irrigation and drainage for the cultivation of vegetable crops.	2
10.	Identification of organic manures and chemical fertilizers.	2
11.	Calculation of the doses of fertilizers as per the recommendation for a particular vegetable crop.	2
12.	Identification of deficiency symptoms of nutrients in vegetable crops.	2
13.	Identification of common weeds in vegetable gardens and preparation of herbarium.	2
14.	Controlling weeds in gardens through manual and chemical methods.	2
15.	Identification of different types of mulches and their application in vegetable crops.	2
16.	Methods of training and pruning of tomato and cucumber crop.	2
17.	Preparation of stecklings of root vegetables and their planting for seed production.	2
18.	Seed production technology of cucurbits.	2
19.	Visit to local market for identification of vegetable crops.	2
20.	Identification of common tools and equipments used for the cultivation of vegetable crops.	1

**CLASS–XI**  
**OPTIONAL–II**  
**POMOLOGY (764)**  
**THEORY**

*Time: 3 Hours*

*Marks: 60*

1.	Major fruit crops, their importance present status and future prospects.	5
2.	Selection of site and soil for planting fruit orchards including fencing and wind break etc. Field preparation and layout of the orchard, planting time, selection of fruit variety, packing, transportation and marketing of propagation material and Fencing and wind break etc.	10
3.	Management of orchard such as protection of young plant, manuring and fertilizer application, irrigation and its various methods including micro irrigation techniques, intercultural operation and green manuring etc.	12
4.	Factors affecting fruitlessness/fruitfulness.	5
5.	Growth and bearing habits of major fruit crops such as banana, papaya, mango, apple, citrus, pineapple, grapes, strawberry, walnut etc.	6
6.	Manipulation of growth & development of fruit plants by training and pruning of fruit plants, (special horticultural practices such as ringing, bending, notching, thinning, root pruning etc.) and use of growth regulators in fruit crops for flowering and fruit set.	12
7.	Climate change and fruit crops, climatic fruit zones of India, effects of climatic factors such as soil, temperature, rain, relative humidity, sunshine etc. on growth, development and fruiting and effect of adverse climatic conditions such as frost, cyclone, flood, heavy rainfall, drought and protection against them.	5
8.	Application of biotechnology in fruit production.	5

## **PRACTICAL**

*Time: 2 Hours*

*Marks: 40*

- |   |   |
|---|---|
| 1. Visiting orchards identification of fruit plants with reference to stage of crop growth, flowering and fruit bearing habit.                    | 2 |
| 2. Getting acquaintance with live and non-live fencing and studying their methods of establishment.   | 2 |
| 3. Identification of plants for wind breaks in orchards.  | 1 |
| 4. Preparation of field /soil and layout of orchards, digging pits and filling.   | 2 |
| 5. Visiting nursery and observing selection of a plant material, lifting, packing and transportation.   | 3 |
| 6. Pre-planting care of planting materials after removal from nursery with special reference to healing removal of wilted damaged and dead parts. | 3 |
| 7. Studying different planting techniques.  | 2 |
| 8. Protecting plants from low temperature, smudging or creating smoke and providing shade during winter.  | 3 |
| 9. Draining out excess water from orchard and observing effect of water stagnation on fruit crops.  | 2 |
| 10. Irrigation of orchard.  | 1 |
| 11. Identification of manures (organic, bio-fertilizers and inorganic).   | 1 |
| 12. Identification of deficiency symptoms of nutrients in fruit crops.  | 2 |
| 13. Intercultural operations in orchards.   | 2 |
| 14. Controlling weeds in orchard through manual and chemical methods.   | 2 |
| 15. Preparation of herbarium of weeds of orchard.   | 2 |
| 16. Identification and applying different kinds of mulches in orchard.  | 2 |
| 17. Methods of training and pruning of fruit crops.   | 2 |
| 18. Identification and locating water suckers/sprouts/shoots in citrus and banana.  | 1 |
| 19. Bending, notching, thinning, and ringing in fruit crops wherever applicable.  | 2 |
| 20. Identifying and analyzing the unfruitful fruit trees and its causes.  | 2 |
| 21. Identification of common tools and equipment's for fruit crops.   | 1 |

## **CLASS–XI OPTIONAL–III FLORICULTURE (765) THEORY**

*Time: 3 Hours*

*Marks: 60*

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|---|---|
| 1. Importance and scope of Floriculture and Landscaping: Present status and future prospects. | 3 |
| 2. History of gardening in India.   | 3 |
| 3. Types and styles of gardens.   | 2 |
| 4. Principle and elements of landscaping.   | 5 |
| 5. Important annual and perennial flower crops.   | 5 |
| 6. Principles and methods of propagation of ornamental crops.                                 | 5 |
| 7. Commercial seed production in Flower Crops.  | 5 |

- |     |  |   |
|-----|--|---|
| 8.  | Essential plant nutrients, their deficiency symptoms, toxicities, organic and inorganic manures and fertilizers for floricultural crops. | 5 |
| 9.  | Application of biotechnology in flower crops.  | 5 |
| 10. | Protected cultivation of commercial flower crops.  | 5 |
| 11. | Concept of xeriscaping, water scaping, interior scaping, roof gardening, terrace gardening and vertical gardens.                         | 5 |
| 12. | Pest and disease management in flower crops.   | 2 |
| 13. | Post Harvest management of Flower crops.   | 5 |
| 14. | Value addition in flowers crops.   | 5 |

## **PRACTICAL**

*Time: 2 Hours*

*Marks: 40*

1. Identification of ornamental trees, shrubs, climbers and bulbous plants.
2. Preparation of herbarium of different ornamentals.
3. Laying out nursery for different seasonal flower crops.
4. Land preparation for flower crops directly raised through seeds.
5. Preparation of nursery beds and field preparation for planting flower seedlings.
6. Identification of propagules like seeds, bulbs, tubers, rhizomes, etc.
7. Preparation of different type of cuttings for the propagation of carnation, chrysanthemum, bougainvillea etc.
8. Identification of manures and fertilizers and calculation of these as per recommended dose for the flower crops to be planted.
9. Identification of deficiency symptoms of nutrients in flower crops.
10. Identification of common tools and equipment used for cultivating flower crops.
11. Use of different irrigation methods in flower crops.
12. Controlling weeds in gardens through manual and chemical methods.
13. Identification and applying different kinds of mulches in the gardens.
14. Seed production of flower crops like marigold, pansy, petunia, antirrhinum etc.
15. Visit to local flower market.
16. Identification of important insect, mites, nematodes and other diseases (viral, bacterial and fungal).
17. Preparation of pesticide solution and their safe application.

## **CLASS–XI**

### **GENERAL FOUNDATION COURSE (501)**

*Time: 3 Hours*

*Marks: 100*

#### **Part–I: (Compulsory to all Vocational Courses)**

*Marks: 50*

- |           |  |           |
|-----------|--|-----------|
| <b>A.</b> | <b>Business Management and Entrepreneurship</b>  | <b>30</b> |
| (a)       | <b>Entrepreneurship Orientation</b><br>Importance and relevance in real life: Emphasis on self employment.     | <b>5</b>  |
| (b)       | <b>Entrepreneurship Values and Attitudes</b><br>Innovativeness, Independence, Risk Taking, Analytical ability. | <b>5</b>  |

- (c) **Entrepreneurial Motivation** 5  
Achievement Planning, personal efficacy, entrepreneurial goal setting.
- (d) **Launching of a Business Venture** 15  
Identification of project, steps in setting up a business, information about various institutions providing assistance, project formulation.
- B. Computational Skills** 10
- (a) Percentage, ratio & proportion, profit & loss, discount, simple and compound interest, population growth and depreciation of value of articles using logarithm. 6
- (b) Area and volume: rectangle, parallelogram, circle, cube, cone, cylinder & sphere. 4
- C. Environmental Education** 5
- (a) Environment and the society.
- (b) Environment properties risks in different economic enterprises, in use of raw materials, in processing / manufacturing and designing.
- (c) Poverty and environment.
- D. Rural Development** 5
- (a) Agriculture, the back bone of Indian Economy.
- (b) Rural development projects in India including Integrated rural development programme.
- (c) Agro based rural industries.
- (d) Community approach to rural development.

### **Part-II**

**Marks: 50**

1. Branches, scope and importance of horticulture. 6
2. Principles of establishing orchard, soil texture, soil structure, soil fertility & soil productivity tillage and tillage operations. 10
3. Essential plant nutrients major and minor-their deficiencies & toxicities, organic and inorganic manures and fertilizers. 10
4. Principles of weed control, crop rotations, multiple and intercropping and drainage. 7
5. Principles of propagation, seed production, integrated pest & disease management. 7
6. handling, storage and quality of horticultural products. 6
7. Importance or rural forestry. 4

## **CLASS–XII ELECTIVE BASIC HORTICULTURE (762) THEORY**

**Time: 3 Hours**

**Marks: 60**

1. Business opportunities in horticulture. 6
2. Principles of preservation and value addition of Horticultural Produce (Fruits, Vegetables and flowers). 15
3. Types of syrup, brines and food colour used in preservation of fruits, vegetables and flowers. 4
4. Urban Horticulture. 8
5. Weeds of horticultural crops and their management. 5

- |    |   |    |
|----|---|----|
| 6. | Methods of propagation of horticultural crop. | 15 |
| 7. | Planting material for horticultural crops.    | 7  |

## PRACTICAL

**Time: 2 Hours**

**Marks: 40**

- |     |   |   |
|-----|---|---|
| 1.  | Visit to a processing plant.  | 3 |
| 2.  | Visit to a fruit, vegetable and a flower market.  | 3 |
| 3.  | Harvesting, safe plucking & storage of fruits.  | 6 |
| 4.  | Identification of food colours.   | 2 |
| 5.  | Primary Processing (including Cleaning and Sorting/Grading) and preservation of fruits (Including drying and addition of preservatives).                | 4 |
| 6.  | Identification of different preservatives and preparation of syrups and brines.   | 5 |
| 7.  | Identification and taste of different value added products of fruits and vegetables such as Jams, Jellies, Squash, Pickles, candies, canned item packs. | 4 |
| 8.  | Identification of common weeds of orchards and vegetable farms.   | 3 |
| 9.  | Visit to a tissue culture laboratory.   | 5 |
| 10. | Harvesting and Primary processing of flowers.   |   |
| 11. | Identification of flood arrangements such as Bouquets, Rangoli, Garland, Ikebana etc.   | 5 |

## CLASS–XII OPTIONAL–I OLERICULTURE (763) THEORY

**Time: 3 Hours**

**Marks: 60**

- |    |   |    |
|----|---|----|
| 1. | Different production system and modern methods of vegetable cultivation.                    | 10 |
| 2. | Industrial importance of vegetable and setting up of industry based on the vegetable crops. | 5  |
| 3. | Cropping system with vegetable crops.   | 10 |
| 4. | Production technology of important vegetable crops.   | 15 |
| 5. | Fertigation in vegetable crops.   | 5  |
| 6. | Role of chemicals and growth regulators in vegetable production.                            | 5  |
| 7. | Seed production techniques of vegetable crops.  | 5  |
| 8. | Hybrid seed production of vegetable crops, An entrepreneurship opportunity.                 | 5  |

## PRACTICAL

**Time: 2 Hours**

**Marks: 40**

- |    |   |   |
|----|---|---|
| 1. | Visit to vegetable field to study methods of vegetable cultivation.               | 4 |
| 2. | Identification of vegetable seeds and vegetable crops at different growth stages. | 4 |
| 3. | Determining the germination percentage of vegetable seed.                         | 2 |
| 4. | To study vegetable treatment with fungicide and bacterial culture.                | 2 |
| 5. | Studying vegetables classification according to economic parts used.              | 1 |

6.	Preparing vegetable nursery beds.	2
7.	Raising vegetable seedling in nursery bed and protrays.	2
8.	Identification of major diseases and insect-pests of vegetables.	2
9.	Preparation for sowing/transplanting of vegetable crops.	2
10.	Sowing/transplanting of vegetables in main field.	2
11.	Fertilizer application for vegetable growing.	2
12.	Preparation of pesticide solutions and its spray in vegetable crops.	2
13.	Preparation of processed products from vegetables.	2
14.	Breaking dormancy to induce germination in potato.	2
15.	Hybrid production technology of tomato.	2
16.	Use of protected structures for vegetable cultivation.	2
17.	Harvesting indices, grading and packaging of vegetables.	2
18.	Calculating cost of production of important vegetable crops.	1
19.	Visit to vegetable based industry.	2

**CLASS–XII**  
**OPTIONAL–II**  
**POMOLOGY (764)**  
**THEORY**

*Time: 3 Hours*

*Marks: 60*

1. Importance of fruit culture (economic preposition, health benefits etc.) Setting up of industry based on the fruits present position and scope of fruit processing and equipments required for setting up a processing unit. **6**
2. Cultivation of temperate of fruits (apple, pear, plum, peach, apricot, walnut, almond). **5**
3. Cultivation of tropical fruits (mango, banana, papaya, sapota, pineapple etc.). **5**
4. Cultivation of sub–tropical fruits (pomeranate, litchi, citrus, grapes, ber, aonpla etc.) their Cultivation of temperature fruits (apple, pear, plum, Alume, Peach, apricot, walnut, almond) cultivation practices with special reference to origin, varieties (cultivars, climate, soil, land preparation, planting, manuring, irrigation, harvesting, ripening of fruits, grading, packaging, marketing) control of insect pest and diseases. **4**
5. Root stocks of different fruit crops, their propagation, nursery management. **4**
6. Management of rootstocks and mother stocks. **3**
7. Fertigation in fruit crops. **4**
8. Maturity standards, harvesting, ripening, grading of fruits etc. **6**
9. Mechanized harvesting of fruits. **6**
10. Role of biotechnology and micro–propagation of importance fruits crops. **5**
11. Pesticide use, safety of operators and consumers, concept of minimum residue limit in fruits crops. **5**
12. Orchard rejuvenation, head back and high density planting in fruits. **3**
13. Packing, storage and value addition and value added products from fruits. **4**

**PRACTICAL**

*Time: 2 Hours*

*Marks: 40*

1. Visit to high density orchard, identification of fruit trees and varieties.
2. Studying fruit setting and fruit dropping in important fruits crops.
3. Laying out different systems of irrigation for young and adult fruit trees in orchard.
4. Planting of fruit trees such as papaya, citrus, mango etc.
5. Mulching in fruit orchard (plastic and biological).
6. Performing intercultural operation in orchard.
7. Selecting at least two fruit species and maintaining them from flowering till fruiting.
8. Training and pruning of available trees.
9. Training in grapes on head and bower system, if available.
10. Training in mango and pomegranate.
11. Notching and pruning in fig/gular.
12. Foliar application of nitrogenous fertilizer in fruit crops.
13. Manuring with farm yard manure and chemical fertilizer in fruit crops.
14. Observing declines in the orchards and study their causes.
15. Studying morphological characteristics of available varieties of fruit crops available in your locality.

16. Identification of important insects and other pests and diseases of fruit crops.
17. Preparation of pesticide solutions and their safe spraying in orchard.
18. Evaluating the taste of fruit cultivars.
  - Ñ Identification of fruit trees & varieties.
  - Ñ Identification of important diseases of fruit crops.
19. Calculating the cost of production of important local fruit crops.
20. Visit to local fruit market and Studying marketing of fruit and finding out scope of different fruit in the local market.
21. Studying the use of Gibberellin Acid and other growth promoting hormones in orchards.
22. Orchard rejuvenation – making rings, application of fertilizers, root pruning etc.

**CLASS–XII**  
**OPTIONAL–III**  
**FLORICULTURE (765)**  
**THEORY**

*Time: 3 Hours*

*Marks: 60*

- |  |   |  |
|--|---|--|
| 1. Present scenario and scope of floriculture in global market.  | 8 |  |
| 2. Employment avenues in floriculture sector.  | 9 |  |
| 3. Study of outdoor room concept: public area, private area and service area.  | 9 |  |
| 4. Different features of gardens like gate, walls, arches, pergolas, paths, roads, edges, hedges, stepping stones, sun dial, bird bath, statues, water fountain, lawns, herbaceous borders, bonsai, topiary etc. | 9 |  |
| 5. Concept of CAD (Computer aided designs) for landscape designs.  | 4 |  |
| 6. Methods of establishing lawns and their management including irrigation, fertilization, mowing, insect-pest and diseases and their control.   | 3 |  |
| 7. Production of indoor plants and their maintenance.  | 2 |  |
| 8. Commercial cultivation of rose, chrysanthemum, gladiolus, marigold, tuberose, jasmine and crossandra.   | 2 |  |
| 9. Protected cultivation of commercial flower crops like rose, carnation, chrysanthemum, gerbera, orchids, antirrhinum etc).   | 2 |  |
| 10. Flower arrangements: types and styles.   | 5 |  |
| 11. Methods of dry flower making like air drying, embedded drying, water drying, press drying, glycerin drying, freeze drying etc. and other value added products.   | 4 |  |
| 12. Post-harvest handling of commercial flower crops including harvesting, pre cooling, pulsing, holding, dry and wet storage, packing, packaging and transportation.  | 3 |  |

**PRACTICAL**

*Time: 2 Hours*

*Marks: 40*

1. Visit to flower market during different seasons.
2. Performing intercultural operations like training, pruning in roses.
3. Performing staking, pinching, de-shooting and disbudding in carnation and chrysanthemum flower crops.
4. Maintenance of mother plants of chrysanthemum.
5. Embedded drying of important flower crops using different embedding media.

6. Studying morphological characteristics of available varieties of flower crops available in your locality.
7. Identification of important pests and diseases of lawn and avenue plants.
8. Preparation of pesticide solutions and their spraying for control of insect, pests and diseases.
9. Preparation of dry flower products like greeting cards, book marks, wall hangings and dry flower baskets.
10. Preparation of landscape designs for school and college using CAD technology.
11. Preparation of landscape designs for home gardens.
12. Preparation of landscape designs for public parks.
13. Preparation of different flower arrangements like Ikebana, garland, bouquets etc.
14. Calculating the cost of production of important flower crops.
15. Packing and packaging of commercial flower crops.

## CLASS–XII

### GENERAL FOUNDATION COURSE (501)

*Time: 3 Hours*

*Marks: 100*

#### Part–I: (Compulsory to all Vocational Courses)

*Marks: 50*

#### **A. Business Management and Entrepreneurship 30**

##### **Management of Business**

Elementary treatment/exposure to basic conceptual frame work of the topic listed below:

- |                            |   |
|----------------------------|---|
| (a) Basic Function.        | 6 |
| (b) Marketing Management.  | 6 |
| (c) Financial Management.  | 6 |
| (d) Production Management. | 6 |
| (e) Personnel Management.  | 6 |

#### **B. Computational Skills 10**

- |   |   |
|---|---|
| 1. (a) Solution of linear equations and their application to problem of commercial mathematics.   | 5 |
| (b) System of linear equations and in equation in two variables. Applications in formation of simple linear programming problems.   |   |
| 2. Statistics: Raw data, bar charts and Histogram; Frequency Tables; Frequency Polygon; Ogive; Mean, Median and Mode of ungrouped and grouped data; Standard Deviation; Introduction to Mortality tables; Price Index etc. Introduction to Computers. | 5 |

#### **C. Environmental Education & Rural Development 10**

- |   |   |
|---|---|
| 1. <b>Environmental Education</b>   | 5 |
| (a) Modernisation of agriculture and environment, irrigation, water logging, use of fertilisers, pesticides, soil erosion, land degradation (desertification and deforestation), silting and drying of water resources. |   |
| (b) Rational utilisation, conservation and regeneration of environmental resources (soil, air, water, plant, energy, minerals).   |   |
| 2. <b>Rural Development</b>   | 5 |
| Principles and goals of rural development, major problems/constraints in rural development in India.  |   |

#### Part-II

*Marks: 50*

1. Principles of vegetable cultivation, soil and site selection in vegetable cultivation. 10
2. Importance of ornamental gardening principles of garden making. Weed control in vegetable and flower gardens. Seed production of seasonal flowers. 15
3. Principles of post harvest technology. Principles of processing and preservation of fruits, vegetables and flowers. 10
4. Types of syrups, brines, preservatives used in preservation process. Use of food colours. 10
5. Importance of Horticultural products in human diet. 5

### **LIST OF RECOMMENDED BOOKS**

1. Pomology–I, Student Handbook for Class–XI, Published by CBSE.
2. Pomology–II, Student Handbook for Class–XII, Published by CBSE.
3. Basic Horticulture–I, Student Handbook for Class–XI, Published by CBSE.
4. Basic Horticulture–II, Student Handbook for Class–XII, Published by CBSE.
5. Floriculture–I, Student Handbook for Class–XI, Published by CBSE.
6. Floriculture–II, Student Handbook for Class–XII, Published by CBSE.
7. Basic Horticulture–I, Student Handbook for Class–XI, Published by CBSE.
8. Pomology–I, Practical Manual for Class–XI, Published by CBSE.
9. Pomology–II, Practical Manual for Class–XII, Published by CBSE.
10. Basic Horticulture–II, Practical Manual for Class–XII, Published by CBSE.
11. Olericulture–I, Student Handbook for Class–XI, Published by CBSE.
12. Olericulture–II, Student Handbook for Class–XII, Published by CBSE.
13. Olericulture–I, Practical Manual for Class–XI, Published by CBSE.
14. Olericulture–II, Practical Manual for Class–XII, Published by CBSE.
15. Floriculture–II, Practical Manual for Class–XII, Published by CBSE.
16. A Handbook of Floriculture, S. Prasad & U. Kumar.
17. Objective Horticulture Knowledge, Salaria.
18. Fundamentals of Garden Designing, Roy, Rup Kumar.
19. Horticulture at a Glance - III Floriculture, Landscape Gardening, Medicinal & Aromatic Plants, Dr. Ajeet Singh Salaria & Dr. Babita Singh Salaria.
20. A Handbook of Soil, Fertilizer and Manure, Prof. P.K.Gupta.
21. Advances in Horticulture-Strategies, Production, Plant Protection, Value Addition, Dr. V.K. Sharma.
22. Advances & Challenges In Agricultural Extension & Rural Development, Dr. T. Rathakrishnan, Dr. M. Israel Thomas & Dr. L. Nirmala.
23. Postharvest Technologies for Commercial Floriculture, Verma, Anil.
24. Breeding, Biotechnology and Seed Production of Field Crops, Bidhan, Asit K. Basu & Asit B. Mandal.
25. Adoption of New Technology - Production, Efficiency and Agrarian Relations, Bhagaban Swain.

### **SUGGESTED LIST OF EQUIPMENTS, APPARATUS AND IMPLEMENTS**

(For a Group of 20-25 students)

S. No.	Name	Qty. No.	S. No.	Name	Qty. No.
1.	Khurpi	20	39.	Measuring jugs (500 ml)	5

S. No.	Name	Qty. No.	S. No.	Name	Qty. No.
2.	Sickle	20	40.	Hindaliumpateelas (big) with lid.	5
3.	Ironpeg	20	41.	Hindaliumpateelas (medium) with lid.	5
4.	Spade	20	42.	Wooden spoons	5
5.	Handrake	20	43.	Steelpateelas (with lids)	5
6.	Handhoe	20	44.	Craters	5
7.	Digging fork	10	45.	Knives	10
8.	Secateur	20	46.	Peelers	20
9.	Cutting knife	20	47.	Lemon squeezes	20
10.	Budding knife	20	48.	Stainless steel strainers	5
11.	Grafting knife	20	49.	Soup strainers	5
12.	Budding and grafting knife (Combined)	10	50.	Steel thali	5
13.	Pruning knife	5	51.	Pressure cooker	5
14.	Watering can with hose	10	52.	Wooden paltas/kadchies	5
16.	Grasss hear	5	53.	Funnels	20
17.	Tasla	10	54.	Class jars	20
18.	Trenching trowel	5	55.	Glass bottles	20
19.	Balti (Bucket)	10	56.	Jam bottles	20
20.	Trenching hoe	5	57.	Wax	5 kg
21.	Grass cuttings word	5	58.	Bottles with crown caps	250
22.	Transplanting trowel	20	59.	Ordinary cork	200
23.	Pruning saw	5	60.	Sealing machine	2
24.	Treepruner	2	61.	Brushes for cleaning bottles	10
25.	Marking rope	5	62.	Glass tumblers	2
26.	Measuring tape	5	63.	Quarter plates	20
27.	Axe	2	64.	Teaspoons	20
28.	Glass containers	10	65.	Tablespoons	10
29.	Hosepipe for irrigation	200 m	66.	Serving spoons	10
30.	Lawn mower	1	67.	Gas lighter	2
31.	Sprayer	1	68.	Enamelled plates (big)	10

S. No.	Name	Qty. No.	S. No.	Name	Qty. No.
32.	Duster	1	69.	Enamelled bowls	10
33.	Wheel barrow	2	70.	Frying pans	5
34.	Cooking tables	3	71.	Tawas	2
35.	Juicer	2	72.	Poni	5
36.	Weighing machine Dial type)	5	73.	Karchi	5
37.	Spring balance	2	74.	Steel jugs	5
38.	Measuring jugs (1000 ml)	5	75.	Sieves	17



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## **DAIRY HUSBANDRY AND DAIRY TECHNOLOGY**

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### **Introduction**

Dairy Technology intends to educate about the methods of handling milk from production and consumption to processing, packaging, storage, transport and physical distribution to the students. The prime objective here is to create interest among the aspiring students about the prevention of spoilage, improvement of milk- quality, increasing the shelf-life of milk and making milk palatable and safe for further human consumption.

With the spectacular growth of the dairy industry in the last two decades, the demands for indigenous production of dairy equipment, increased quality standards and production of varieties of milk products has gained momentum simultaneously. The present course curriculum is concerned to develop trained man power in dairying technology at the grass root level so as to meet the challenges at national and international requirement. The focus of dairy technology course ranges from the role of dairy farming in Indian economy to developing the present technology as an aid in giving employment opportunities to youth. The present course curriculum will give insight knowledge in to the students about animal breeding and artificial insemination, common terms used in animal husbandry and dairying, dentition and age determination, important Indian an dexotic breeds of dairy cattle and buffaloes including cross breeds and their identification, production, planning and management of dairy farms.

### **DAIRY HUSBANDRY (CLASS–XI) SCHEME OF STUDIES**

#### **Subjects**

Language
Biology
Physics
Chemistry
Milk Production
Animal Nutrition and Reproduction

### **CLASS–XI ELECTIVE MILK PRODUCTION (758) (DAIRY HUSBANDRY) THEORY**

*Time: 3 Hours*

*Marks : 60*

1. Dairy Development in India: Dairying - Present status, Future prospectus, its role in Indian Economy, livelihood security; Important Government initiatives/schemes (Operation flood, ICDP). Features of Operation Flood programme and the impact of operation Flood and other schemes on dairy Development, New policies/schemes and initiatives/incentives (National Dairy Plan), important dairy development organizations/Institutions (NDDB,

NDRI, IVRI, NABARD. AMUL, International dairy Federation, etc.) and their role in dairy development, Concept of socio economic and cultural change, Different livestock farming systems.

2. Dairy Cooperatives: Co-operative movement, Definition, principle and advantages of cooperatives, Cooperative structure for dairy sector (Functions, Structure, ANAND Pattern) and National Milk Grid, Organization of milk co-operatives, functions structure and functions of primary co-operative society, district unions, co-operative federations. Functions of milk co-operative secretary. Maintenance of registers and records, New Generation Cooperatives (NGC).
3. Milk Production: Important Dairy Breeds (Cattle, Buffalo, Goat), Body parts of dairy animals, Breeding systems (Crossbreeding, Grading Up), Artificial Insemination, Common terminologies (economic/production, species-wise terminologies), judging and selection of dairy animals, factors affecting milk production.
4. Clean Milk Production: Udder Structure, milk secretion and let down, Milking methods/management, Clean milk production -Concept, Definition, Significance, Constraints, Factors affecting quality of Milk, Measures to be taken for clean milk production.
5. Milk Procurement: Surveys for milk potential area for surplus. Different milk procurement systems. Pricing policy of milk and milk products. Importance of dairy animal insurance. Collection, preservation and transport of milk to chilling point. Different methods of chilling and storage of milk. Financial institutions involved in support of dairy programmes.
6. Extension methods and techniques. Handling of Audio visual aids, and their importance in dairy extension work. Criteria for selection of methods, and their use for effective teaching e.g. in AI etc. Nature and importance of communication, communication process, problems in communication.

## **PRACTICAL**

***Time: 2 Hours***

***Marks: 40***

1. Recognition of different breeds of cows, buffaloes and goats.
2. External anatomy of cow, buffalo and goat.
3. Identification of the animals.
4. Visit to an Animal Farm.
5. Visit to Procurement Centers and other milk shed areas.
6. Maintenance of registers and accounts.
7. Calculation of milk payment based on fat and two axis pricing policy of Dairy Cooperative Society (DCS).
8. Designing milk routes based on data.
9. Preparation of ledger, trial-balance and balance-sheet of DCS.
10. Milking of dairy Animals.
11. Reception, weighment and sampling of milk.
12. Sampling of milk and milk products for microbiological and chemical analysis.
13. Preservation of milk samples for chemical analysis.
14. Sensory evaluation of milk.
15. Gerber fat test for milk.
16. Determination of specific gravity of milk by lactometer.
17. Determination of titra table acidity in milk.
18. Case study of a milk co-operative society and dairy entrepreneur.
19. Study of transport and chilling and storage of milk at farm level.
20. Visit a nearby milk union/dairy and prepare a checklist of problems in procurement and milk distribution.

21. Preparation of extension teaching materials such as posters, charts, bulletins, boards and others.
22. Organization of an exhibition and cattle show with emphasis on Dairy and Animal Husbandry.
23. Conducting group discussions: meetings in the villages, demonstration in the villages.

**CLASS–XI  
ELECTIVE  
ANIMAL NUTRITION AND REPRODUCTION (759)  
(DAIRY HUSBANDRY)**

**THEORY**

*Time: 3 Hours*

*Marks: 60*

1. Classification of nutrients - water, carbohydrates, proteins, lipids, minerals, and Vitamins; Role of different nutrients in animal's growth, production, reproduction and health.
2. Anatomy of digestive system of dairy animals; Digestion, absorption and utilization of different nutrients.
3. Common feeds and fodder used in dairy animals; Classification of feeds and fodders - Concentrates (energy and protein), Roughages (Dry and succulent), unconventional feeds, feed additives, feed supplements, Composition of commonly used feeds and fodders with respect to energy and protein contents.
4. Packages of practices for production of different fodders soils type, land preparation, crop selection, cultivation practices, crop rotation, irrigation and harvesting; Agro forestry, silvipasture.
5. Feed processing and fodder conservation - Importance of processing of feed, compounding of feed - milling, grinding, mixing, pelleting etc.; Conservation of fodder - hay, silage, straw, stover; Methods of making Hay and silage.
6. Feed Formulation - Nutrient requirement for different category of dairy animals, Balanced/complete ration, Methods of feed formulation.
7. Feeding of dairy animals - Principles of feeding in dairy animal, Feeding of different categories of dairy animals viz. new-born calf, growing calves, heifers/bull-calves, pregnant, lactating, dry cows and bulls; feeding during extreme weather conditions and feed/fodder scarcity, requirements of water for different category of dairy animals.
8. Metabolic disorders & deficiency diseases in dairy animals - Bloat, mineral and vitamin deficiency diseases.
9. Anatomy of male and female reproductive system.
10. Basic concepts of animal reproduction - Puberty, sexual maturity, oestrus cycle, oestrus length, Gametogenesis (production of male and female gametes), ovulation, Fertilization, embryogenesis, gestation and parturition.
11. Importance and role of hormones involved in animal reproduction - FSH, LH, estrogen, progesterone, testosterone, oxytocin, prostaglandin etc.
12. Distress/Heat Detection.
13. Artificial Insemination.
14. Breeding Calendar, Gestation, length in different Dairy Animals, Pregnancy Diagnosis & Record Keeping.
15. Common Reproductive Disorders in Dairy Animals..

**PRACTICAL**

*Time: 2 Hours*

*Marks: 40*

1. Collection and identification of common feeds and fodders.
2. Proximate analysis of feed: dry matter, nitrogen, crude fibre, ether extract and total ash.

3. Grinding and mixing of feed ingredients.
4. Hay and Silage making.
5. Preparation of calf starter.
6. Preparation of concentrate mixtures using Pearson square method.
7. Preparation of mineral mixture.
8. Computation of ration for different categories of farm animals.
9. Calculation of feed and fodder requirements using Thumb rule method for various categories of dairy animals viz., growing, heifers/bull calves, bulls, pregnant, lactating and dry cows.
10. Feeding and watering of calves, heifers, pregnant and lactating cows and bulls.
11. Visits to feed laboratory and cattle feed manufacturing plant.
12. Drawing and labeling of male and female reproductive organs of dairy animals.
13. Demonstration of semen collection and evaluation.
14. Detection of estrous/heat through visual examination.
15. Visit to veterinary hospital/AI centre for demonstration of Artificial Insemination.
16. Different equipments used in Artificial Insemination.
17. Care, sterilization, storage and upkeep of AI equipments.
18. Preparation of AI Gun.
19. Thawing of semen straw and loading in insemination gun.
20. Preparation of heat expectancy chart and expected calving calendar.
21. Maintenance of AI records.

**CLASS–XI**  
**ELECTIVE**  
**MILK PRODUCTION (760)**  
**(DAIRY TECHNOLOGY)**  
**THEORY**

***Time: 3 Hours***

***Marks: 60***

1. Dairy Development in India: Dairying - Present status, Future prospectus, its role in Indian Economy, livelihood security, Important Government initiatives/schemes (Operation flood, ICDP). Features of Operation Flood programme and the impact of operation Flood and other schemes on dairy Development, New policies/schemes and initiatives/incentives (National Dairy Plan), important dairy development organizations/Institutions (NDDB, NDRI, IVRI, NABARD. AMUL, International dairy Federation, etc.) and their role in dairy development, Concept of socio economic and cultural change, Different livestock farming systems.
2. Dairy Cooperatives: Co-operative movement, Definition, principle and advantages of cooperatives, Cooperative structure for dairy sector (Functions, Structure, ANAND Pattern) and National Milk Grid, Organization of milk co-operatives, functions structure and functions of primary co-operative society, district unions, co-operative federations. Functions of milk co-operative secretary. Maintenance of registers and records, New Generation Cooperatives (NGC).
3. Milk Production: Important Dairy Breeds (Cattle, Buffalo, Goat), Body parts of dairy animals, Breeding systems (Crossbreeding, Grading Up), Artificial Insemination, Common terminologies (economic/production, species-wise terminologies), judging and selection of dairy animals, factors affecting milk production.

4. Clean Milk Production: Udder Structure, milk secretion and let down, Milking methods/ management, Clean milk production – Concept, Definition, Significance, Constraints, Factors affecting quality of Milk, Measures to be taken for clean milk production.
5. Milk Procurement: Surveys for milk potential area for surplus. Different milk procurement systems. Pricing policy of milk and milk products. Importance of dairy animal insurance. Collection, preservation and transport of milk to chilling point, Different methods of chilling and storage of milk. Financial institutions involved in support of dairy programmes.
6. Extension methods and techniques. Handling of Audio visual aids, and their importance in dairy extension work. Criteria for selection of methods, and their use for effective teaching e.g. in AI etc. Nature and importance of communication, communication process, problems in communication.

## **PRACTICAL**

***Time: 2 Hours***

***Marks: 40***

1. Recognition of different breeds of cows, buffaloes and goats.
2. External anatomy of cow, buffalo and goat.
3. Identification of the animals.
4. Visit to an Animal Farm.
5. Visit to Procurement Centers and other milk shed areas.
6. Maintenance of registers and accounts.
7. Calculation of milk payment based on fat and two axis pricing policy of Dairy Cooperative Society (DCS).
8. Designing milk routes based on data.
9. Preparation of ledger, trial-balance and balance-sheet of DCS.
10. Milking of dairy Animals.
11. Reception, weighment and sampling of milk.
12. Sampling of milk and milk products for microbiological and chemical analysis.
13. Preservation of milk samples for chemical analysis.
14. Sensory evaluation of milk.
15. Gerber fat test for milk.
16. Determination of specific gravity of milk by lactometer.
17. Determination of titratable acidity in milk.
18. Case study of a milk co-operative society and dairy entrepreneur.
19. Study of transport and chilling and storage of milk at farm level.
20. Visit a nearby milk union/dairy and prepare a checklist of problems in procurement and milk distribution.
21. Preparation of extension teaching materials such as posters, charts, bulletins, boards and others.
22. Organization of an exhibition and cattle show with emphasis on Dairy and Animal Husbandry.
23. Conducting group discussions: meetings in the villages, demonstration in the villages.

## **CLASS–XI ELECTIVE**

### **FLUID MILK PROCESSING (761) (DAIRY TECHNOLOGY)**

## **THEORY**

**Time: 3 Hours**

**Marks: 60**

1. Milk: Composition, Milk constituents, Composition of milk from different species, colostrum, physico-chemical properties, factors affecting composition and physico-chemical properties, nutritive value.
2. Quality of milk: Grading, dye detection test, platform test, sensory evaluation, milk and public health, common milk-borne diseases, spoilage, causes and prevention, adulterants and their detection.
3. Reception of milk at milk dock: Sampling and testing (chemical, microbiological) at dairy plant, milk chilling and storage.
4. Market Milk: TM, DTM, SPM, RRM, Flavoured Milk and Fortified Milk, Fluid Milk Varieties & Special Milks.
5. Cream separation: objective, principle, method, equipments and efficiency testing.
6. Clarification: objective, principle, method, equipments and efficiency testing.
7. Pasteurization: objective, principle, method, equipments and efficiency testing.
8. Homogenization: objective, principle, method, equipments and efficiency testing.
9. Sterilization: objective, principle, method, equipments and efficiency testing.
10. Cleaning and sanitization of dairy equipment, CIP.
11. Effluent treatment and dairy plant waste disposal.
12. Dairy utilities: steam, water, ice, refrigeration/freezing, electricity.
13. Packaging: Packaging materials and specifications, machines, systems, operational aspects.
14. Dispensing fluid milk through bulk vending, bottles, carton and pouches.

## **PRACTICAL**

**Time: 2 Hours**

**Marks: 40**

1. Reception of milk at Dairy Cooperative Society, Dairy Plant, Chilling centre.
2. Platform Tests for milk.
3. Straining, filtration & clarification of milk.
4. Chilling & storage of milk.
5. Study of cream separator.
6. Study of can washer.
7. Standardization of Milk.
8. Study of Batch Pasteurizer and High Temperature Short Time (HTST) Pasteurizer.
9. Pasteurization of milk.
10. Determination of efficiency of Pasteurization.
11. Study of Homogenizer, Homogenization of Milk and Determination of Homogenization Efficiency.
12. Study of Milk Sterilizer, Sterilization of Milk and Determination of Homogenizer Efficiency.
13. Sterilization study of Packaging system of milk.
14. Preparation of flavored milk, reconstituted milk, TM and DTM.
15. Cleaning and sanitization of equipment.
16. Design and Layout of a dairy plant.

**CLASS–XI**

**GENERAL FOUNDATION COURSE (501)**

*Time: 3 Hours*

*Marks: 100*

**Part-I: (Compulsory to all Vocational Courses)**

*Marks: 50*

- A. Business Management and Entrepreneurship** **30**
- (a) **Entrepreneurship Orientation** **5**  
Importance and relevance in real life: Emphasis on self employment.
  - (b) **Entrepreneurship Values and Attitudes** **5**  
Innovativeness, Independence, Risk Taking, Analytical ability.
  - (c) **Entrepreneurial Motivation** **5**  
Achievement Planning, personal efficacy, entrepreneurial goal setting.
  - (d) **Launching of a Business Venture** **15**  
Identification of project, steps in setting up a business, information about various institutions providing assistance, project formulation.
- B. Computational Skills** **10**
- (a) Percentage, ratio & proportion, profit & loss, discount, simple and compound interest, population growth and depreciation of value of articles using logarithm. **6**
  - (b) Area and volume: rectangle, parallelogram, circle, cube, cone, cylinder & sphere. **4**
- C. Environmental Education** **5**
- (a) Environment and the society.
  - (b) Environment properties risks in different economic enterprises, in use of raw materials, in processing / manufacturing and designing.
  - (c) Poverty and environment.
- D. Rural Development** **5**
- (a) Agriculture, the back bone of Indian Economy.
  - (b) Rural development projects in India including Integrated rural development programme.
  - (c) Agro based rural industries.
  - (d) Community approach to rural development.

**Part-II**

*Marks: 50*

1. History and scope of Dairying in India. **6**
2. Role of dairy farming in Indian economy and mixed farming practices in India - their advantages and limitations. **7**
3. Dairying as an aid in giving employment opportunities to youth. **7**
4. Layout of dairy farm/plant. Factors involved in profitable dairying. **7**
5. Points of animal body and external anatomy. Common terms used in animal husbandry and dairying, dentition and age determination. **8**
6. Identification marks on animals: tattooing, branding, tagging and notching. **7**
7. Important Indian and exotic breeds of dairy cattle and buffaloes including cross breeds and their identification. **8**

**CLASS-XII**  
**ELECTIVE**  
**MANAGEMENT OF DAIRY ANIMALS (758)**  
**(DAIRY HUSBANDRY)**

## **THEORY**

**Time: 3 Hours**

**Marks: 60**

1. Care and management of different dairy animals - newborn, young/heifers, growing, dry, milch, pregnant animals, bull/bullock and sick animals. **3**
2. Routine management. **3**
3. Record keeping - different records in a dairy farm and its maintenance. **3**
4. Principles and design of animal housings, location and layout of animal sheds. **3**
5. Housing of dairy animals - Conventional and loose housing, space requirements of different category of animals. **4**
6. Layout and designing of animal house/farm. **3**
7. Protection from extreme environmental conditions - bedding, sprinkling/wallowing etc. **4**
8. Cleaning and sanitation of dairy farm and equipments. **3**
9. Common instruments/equipments used in the dairy farm. **3**
10. Farm waste collection, utilization and disposal. **3**
11. Biogas production and vermicomposting. **3**
12. Signs of health - difference between healthy and sick animals, Normal physiological parameters - temperature, respiration and pulse rate. **4**
13. Common diseases - infectious/contagious, bacterial/viral/fungal/parasitic, Causes, mode of transmission and common signs/symptoms. **4**
14. Prevention and control of diseases - vaccination, deworming, quarantine etc. **3**
15. Culling, quarantine, disposal of dead animals, placenta, animal discharges etc. **4**
16. Biotechnology in dairy health, production and reproduction (I). **4**
17. Application of Biotechnology in health, production and reproduction (II). **3**
18. Development of transgenic dairy animals and dairy animal's genomics. **3**

## **PRACTICAL**

**Time: 2 Hours**

**Marks: 40**

1. Approaching, Handling and restraining of animals.
2. Casting of a dairy animal.
3. Identification of dairy animal by tattooing/branding/tagging.
4. Determination of age by dentition.
5. Determination of body weight by formula method.
6. Care and management of calf.
7. Dehorning/disbudding of calf.
8. Castration in dairy animals.
9. BCS in dairy animals.
10. Grooming and washing of animals.
11. Cleaning and sanitation of farm and milking equipments.
12. Drawing of sketch of floor plan for different animal houses.
13. Designing of biogas plant.
14. Observing signs of health in a dairy animal.

15. Determination of pulse, respiration rate and body temperature.
16. Observing and identifying symptoms of certain specific diseases in animals.
17. Visit to a veterinary hospital for demonstration of identification of common diseases of dairy animals.
18. Routine farm operations.
19. Visit to dairy farm.
20. Annexure I (Basic Information).

**CLASS–XII**  
**ELECTIVE**  
**MILK MARKETING AND ENTREPRENEURSHIP (759)**  
**(DAIRY TECHNOLOGY)**  
**THEORY**

*Time: 3 Hours*

*Marks: 60*

1. Milk Marketing: Marketing - definition, systems, channels, entrepreneur - small scale - selection of site for dairy farm, agencies providing financial assistance/incentives, government schemes. **15**
2. Dairy Farm Management: Milk Losses, Managing Productivity, Human Resource Requirements for a Dairy Farm. **15**
3. Entrepreneurship and Organization Building: Entrepreneurial skills and delegation, Development of business plan Managing and operating a small business, Evaluation of small enterprise. **15**
4. Food Safety and Quality Management: New Food Safety Act and Regulations, rule & regulation governing dairy industry, Evaluation of small enterprise, Protocols to strengthen quality control management system, good manufacturing practices, good hygienic practices and HACCP, Laboratory equipment and instruments. **15**

**PRACTICAL**

*Time: 2 Hours*

*Marks: 40*

1. Familiarization with laboratory equipment and instruments.
2. Listing of quality control agencies at national level and international level.
3. Standards specification (chemical and microbiological) of milk and milk products.
4. Determination of fat in all dairy products.
5. Identification of sources for milk losses during processing of milk and preparation of milk products; Preparation of check list for controlling the losses.
6. Identification of parameters for production efficiency.
7. Identification of entrepreneurial skills.
8. Prepare a project report to set up milk parlour/a small dairy plant.
9. Prepare a questionnaire to assess strength and weakness of any milk or milk product marketing by a nearby milk union or a dairy and also administer it.
10. Preparation of check-list to study problems and constraints in procurement and distribution of milk.

**CLASS–XII**  
**ELECTIVE**  
**DAIRY PRODUCTS TECHNOLOGY (760)**  
**(DAIRY TECHONOLOGY)**  
**THEORY**

*Time: 3 Hours*

*Marks: 60*

1. Composition, standards, Manufacturing - process and equipments and defects during manufacturing and storage of Cream, Butter, Ghee, Khoa, Channa, Paneer. **12**
2. Composition, standards, Manufacturing - process and equipments and defects during manufacturing and storage of Curd/Dahi, youghurt, chakka, shrikhand, Cheese. **12**
3. Composition, standards, Manufacturing - process and equipments and defects during manufacturing and storage of softy, ice-cream, Kulfi. **12**
4. Composition, standards, Manufacturing - process and equipments and defects during manufacturing and storage of dried and condensed milk products (milk powder - skim milk, whole milk, whitener, condensed milk). **12**
5. Composition, standards, Manufacturing - process and equipments and defects during manufacturing and storage of dairy by-products (skim milk, casein, caseinate, whey - concentrate, powder, lactose, ghee residue). **12**

**PRACTICAL**

*Time: 2 Hours*

*Marks: 40*

1. Visit to dairy plant: Ghee refinery, Butter Manufacturing unit, Powder plant, cheese factory, Ice cream unit, casein making unit.
2. Demonstration of manufacture of products in laboratory/ at dairy plant/ through video aids - Cream, Butter, Ghee, Khoa, Channa, Paneer, Curd/Dahi, Yoghurt, Chakka, Shrikhand, Cheese, Ice-cream, Kulfi, Dried and condensed milk products: Milk powder - skim milk, whole milk, whitener, condensed milk and dairy by-products (skim milk, casein, caseinate, whey - concentrate, powder, lactose, ghee residue).
3. Sensory Evaluation of milk products.

**CLASS–XII**  
**ELECTIVE**  
**MILK MARKETING AND ENTREPRENEURSHIP (761)**  
**(DAIRY TECHONOLOGY)**  
**THEORY**

*Time: 3 Hours*

*Marks: 60*

1. Milk Marketing: Marketing - definition, systems, channels; entrepreneur - small scale - selection of site for dairy farm, agencies providing financial assistance/incentives, government schemes. **15**
2. Dairy Farm Management: Milk Losses, Managing Productivity, Human Resource Requirements for a Dairy Farm. **15**
3. Entrepreneurship and Organization Building: Entrepreneurial skills and delegation, Development of business plan Managing and operating a small business, Evaluation of small enterprise. **15**
4. Food Safety and Quality Management: New Food Safety Act and Regulations, Rule & regulation governing dairy industry, Evaluation of small enterprise, Protocols to strengthen Quality control management system, Good manufacturing practices, good hygienic practices and HACCP, Laboratory equipment and instruments. **15**

## PRACTICAL

*Time: 2 Hours*

*Marks: 40*

1. Familiarization with laboratory equipment and instruments.
2. Listing of quality control agencies at national level and international level.
3. Standards specification (chemical and microbiological) of milk and milk products.
4. Determination of fat in all dairy products.
5. Identification of sources for milk losses during processing of milk and preparation of milk products; Preparation of check list for controlling the losses.
6. Identification of parameters for production efficiency.
7. Identification of entrepreneurial skills.
8. Prepare a project report to set up milk parlour/a small dairy plant.
9. Prepare a questionnaire to assess strength and weakness of any milk or milk product marketing by a nearby milk union or a dairy and also administer it.
10. Market information report on different dairy products/Preparation of bankable report.

## CLASS–XII GENERAL FOUNDATION COURSE (501)

*Time: 3 Hours*

*Marks: 100*

### Part–I: (Compulsory to all Vocational Courses)

*Marks: 50*

#### **A. Business Management and Entrepreneurship** **30**

##### **Management of Business**

Elementary treatment/exposure to basic conceptual frame work of the topic listed below:

- |                            |   |
|----------------------------|---|
| (a) Basic Function.        | 6 |
| (b) Marketing Management.  | 6 |
| (c) Financial Management.  | 6 |
| (d) Production Management. | 6 |
| (e) Personnel Management.  | 6 |

#### **B. Computational Skills** **10**

- |   |   |
|---|---|
| 1. (a) Solution of linear equations and their application to problem of commercial mathematics.   | 5 |
| (b) System of linear equations and in equation in two variables. Applications in formation of simple linear programming problems.   |   |
| 2. Statistics: Raw data, bar charts and Histogram; Frequency Tables; Frequency Polygon; Ogive; Menu, Median and Mode of ungrouped and grouped data; Standard Deviation; Introduction to Mortality tables; Price Index etc. Introduction to Computers. | 5 |

#### **C. Environmental Education & Rural Development** **10**

- |   |          |
|---|----------|
| 1. <b>Environmental Education</b>   | <b>5</b> |
| (a) Modernisation of agriculture and environment, irrigation, water logging, use of fertilisers, pesticides, soil erosion, land degradation (desertification and deforestation), silting and drying of water resources. |          |
| (b) Rational utilisation, conservation and regeneration of environmental resources (soil, air, water, plant, energy, minerals).   |          |

2. **Rural Development** 5  
Principles and goals of rural development, major problems/constraints in rural development in India.

**Part-II**

**Marks: 50**

1. General Management, principles of animals housing, layout, design and construction of economical animal houses, milking byre, calf pens and paddocks, etc. Disposal and utilisation of dung, etc. of dairy farm and hygiene/sanitation of dairy animals. 10
2. Preparation of animals for show. 5
3. Judging of dairy cattle and buffaloes using score card. 6
4. Composition of milk of different animals. 5
5. Adulteration of milk, different adulterants commonly used. 5
6. Importance of Extension activities for dairy development. 4
7. Functions of dairy cooperation on the pattern of National Dairy Development Board. 5
8. Practical aspects of "Financing and related to dairy establishment. 5
9. Importance of record keeping and accountancy in dairying. 5

**LIST OF RECOMMENDED BOOKS**

1. Animal Nutrition & Reproduction, (Dairy Husbandry), Student Handbook for Class–XI, Published by CBSE.
2. Animal Nutrition & Reproduction, (Dairy Husbandry), Practical Manual for Class–XI, Published by CBSE.
3. Milk Production, (Dairy Husbandry), Student Handbook for Class–XI, Published by CBSE.
4. Milk Production, (Dairy Husbandry), Practical Manual for Class–XI, Published by CBSE.
5. Milk Production, (Dairy Technology), Student Handbook for Class–XI, Published by CBSE.
6. Milk Production, (Dairy Technology), Practical Manual for Class–XI, Published by CBSE.
7. Milk Marketing & Entrepreneurship (Dairy Husbandry) Student Handbook for Class–XII, Published by CBSE.
8. Milk Marketing & Entrepreneurship (Dairy Husbandry) Practical Manual for Class–XII, Published by CBSE.
9. Milk Marketing & Entrepreneurship (Dairy Technology) Student Handbook for Class–XII, Published by CBSE.
10. Milk Marketing & Entrepreneurship (Dairy Technology) Practical Manual for Class–XII, Published by CBSE.
11. Fluid Milk Processing, (Dairy Technology) Student Handbook for Class–XII, Published by CBSE.
12. Fluid Milk Processing, (Dairy Technology) Practical Manual for Class–XII, Published by CBSE.
13. Dairy Product Technology, (Dairy Technology) Student Handbook for Class–XII, Published by CBSE.
14. Dairy Product Technology, (Dairy Technology) Practical Manual for Class–XII, Published by CBSE.
15. Management of Dairy Animals, (Dairy Husbandry) Student Handbook for Class–XII, Published by CBSE.
16. Management of Dairy Animals, (Dairy Husbandry) Practical Manual for Class–XII, Published by CBSE.
17. A Textbook of Animal Husbandry, G. C. Banerjee, IBH Publication.
18. Livestock and Poultry Production, Harbans Singh and Moore, Prentice Hall.
19. Farm Animal Management and Poultry Production, Shastri Thomas and Singh, Vikas Publishers.
20. Approval Practices in Dairying, Mortenson and Juergans.
21. Definition of the characteristics of cattle and buffalo breeds of India, I.C.A.R., New Delhi, 1973.
22. Indian Breeds of Cattle and Buffaloes, Directorate of Extension, Ministry of Agriculture, Govt. of India, New Delhi, 1976.
23. Hand Book of Animal Husbandry, I.C.A.R., New Delhi, 1978.

24. Nutritive Values of Indian Cattle Feeds and Feeding of Animals, K. C. Sen and S.N. Ray, Bull. No. 25, ICAR, New Delhi, 1971.
25. Forage Crops of India, T.R. Narayanan and P. M. Debadheo, ICAR, New Delhi, 1972.
26. Domestic Animal, Harbans Singh, National Book Trust of India, New Delhi, 1966.
27. Veterinary Medicine, D. C. Blood and J.A. Handerson, 4<sup>th</sup> edn., Williams and Wilkins, Baltimore, 1974.
28. Livestock Breeding in India, D. Sundaresan, Vikas Publishing House Private Ltd., New Delhi, 1976.
29. Animal Nutrition and Feeding Practices in India, S.K. Ranjhan, Vikas Publishing House, New Delhi, 1976.
30. Indian Dairy Products, K. T. Acharya.
31. Dairying in India, Sukumar De.
32. Artificial Insemination in Farm Animals, E.J. Parry.
33. Reproduction in Farm Animals, E.S.H. Hefez.
34. Threogenology and reproduction in Farm Animals, C.R. Saneetal.
35. Pashupalan, Haryana School Education Board, Haryana.
36. Pashupalan, Part-I & II, ICAR, New Delhi.
37. The Fluid Milk Industry, J.S. Handerson, A.V.I. Publishing Company, West Pot, Conn., U.S.A.
38. Milk Hygiene in Milk Production Processing and Distribution, F.A.O. Publication, 1982.
39. Dairy Animal Management (Instructional-cum-Practical Manual) by NCERT, New Delhi.
40. Feeds and Feedings of Dairy Animal (Instructional-cum-Practical Manual) by NCERT, New Delhi.
41. Milk and Milk Products (Instructional-cum-Practical Manual) by NCERT, New Delhi.

## **SUGGESTED LIST OF LABORATORY CHEMICALS**

**Fertilizers, Detergents, Pesticides etc. (For a group of 25 students)**

S. No.	Name of Chemical	Quantity
1.	Sulphuric acid (C. grade)	5litres
2.	Sulphuric acid(L.R.)	5litres
3.	Amyl alcohol	2 × 500 ml
4.	Sodium hydroxide (pellets)	500gms
5.	Litmus paper	Blue and red
6.	Filter paper (Whatman No. 1 & 40)	1packeteach
7.	Petroleum ether (40o-60oC)	5litres
8.	Copper sulphate	500gms
9.	Sodium sulphate	500gms
10.	Potassium dichromate	500gms
11.	Sodium bicarbonate	500gms
12.	Oxalic acid	500 gms
13.	Eosin water soluble	25gms
13.	Eosin water soluble	25gms

S. No.	Name of Chemical	Quantity
14.	Nigrosine water soluble	100gms
15.	Methyl blue	25gms
16.	Resazurin	25 gms
17.	Phenolphthalein	25gms
18.	Petroleumjelly/liquid paraffin	500gms
19.	Spirit	5 litres
20.	Mastaid solution	55ml
21.	Sodium citrate	500 gms
22.	Glucose	500 gms
23.	Sulphanilamide	100 gms
24.	Penicillin G-Sodium	5 × 1 gm
25.	Streptomycin sulphate	5 × 1 gm
26.	Anatto colour	–
27.	Butter salt	500 gms
28.	Sodium alginate	500 gms
29.	(a) Colorforice-cream Strawberry Rose Coffee (b) Flavorforice-cream Vanilla Pineapple Orange Banana	
30.	W.B.C. diluting fluid	
31.	R.B.C. diluting fluid	
32.	Ammonium sulphate	
33.	Urea	
34.	Superphosphate	
35.	Rock phosphate	
36.	Potassium sulphate	
37.	Muriate of potash	
38.	Zinc sulphate	
39.	Citric acid	

S. No.	Name of Chemical	Quantity
	<b>Bact. Fertilizers</b>	
40.	Rhizobium cultures	
41.	Anatobactor cultures	
	<b>Pesticides</b>	
42.	Malathion	
43.	Formaldehyde	
	<b>Detergents</b>	
44.	Tea-pol.	
45.	Liquid soaps	
46.	Vim	
47.	Bleaching powder	
	<b>Vaccines</b>	
48.	Foot and mouth	
49.	Rinderpest	

### SUGGESTED LIST OF EQUIPMENTS AND TOOLS

S. No.	Name of Article	Quantity
1.	Currycomb	10 nos.
2.	Stiff brush	10 nos.
3.	Floor brush	10 nos.
4.	Tattoo ingset	2set
5.	Branding ironset	1set
6.	Ear tagging punch	1set
7.	Ear tags	1-100 nos.
8.	Ear notching punches	1 no.
9.	Burdizzocastrator	1 no.
10.	Baxy Burdizzocastrator	1 no
11.	Bull nose ring (small and big)	6
12.	Bull staff	1
13.	Bull leader	1
14.	Drenching bamboo	3
15.	Drenching bamboo	1

S. No.	Name of Article	Quantity
16.	Syringes 10 ml	3
17.	Trecar and canula	2
18.	Dehorner electric	1
19.	First aid kit	2
20.	Pre-bangtube	2
21.	Forceps	5
22.	Scissors	2
23.	Tongs	2
24.	Irrigator	1
25.	Cattle crush	1
26.	Artificial vagina (complete)	2
27.	Liners for A. V. of bovines	10
28.	Cones for A.V. of bovines	10
29.	Refrigerator	1
30.	Speculm (with light)	1
31.	Insemination gun for frozen semen	1
32.	Liquid Nitrogen container (complete3lit.cap.)	1
33.	Hot air oven	1
34.	Auto-clave	1
35.	Syringe sterilizer	1
36.	Student microscope	2
37.	Haemocytometer	1
38.	Haemoal binometer	1
39.	Haemometer	1
40.	Haematocrit (centrifuge 3000 rpm)	1
41.	Water bath automatic	1
42.	Gerber centrifuge	1
43.	Butyro meter stoppers	50
44.	Butyro meter stopper key	2
45.	Butyro meter stand	2
46.	Milk cans 40 lit capacity	1

<b>S. No.</b>	<b>Name of Article</b>	<b>Quantity</b>
47.	Milk plunger	1
48.	Milking pails	2
49.	Buckets	5
50.	Milk feeding pails with nipple	2
51.	Sediment test equipment	1
52.	Strip cup	2
53.	Herd recorders (spring balance)	1
54.	Chairs for cows	5
55.	Chains for calves	5
56.	Hand chaff cutter	2
57.	Blades for chaff cutter	4
58.	Wheelbarrow	2
59.	Cream separator hand operated (25 lit. capacity)	1
60.	Butter chum	2
61.	Butter worker	2
62.	Butter scoop	2
63.	Westphal balance	2
64.	Ice-cream freezer	2
65.	Ice-cream spoons	2
66.	Bhagona steel (s.s.)1 litre,2 litres	5 each
67.	'Karahi' (Frying S.Steel 2lit.)	2
68.	Bottle capper	1
69.	Shovels	2
70.	Spades	5
71.	Khurpi	10
72.	Rake	5
73.	Sickles	5
74.	Deshi plough	1
75.	Handhoes	3
76.	Sprayer	1
77.	Tagari (Basket)	5

<b>S. No.</b>	<b>Name of Article</b>	<b>Quantity</b>
78.	Hotplates	5
79.	Soxhlet apparatus	2
80.	Micro kjeldahl flask	1
81.	Water distillation	1
82.	Muffliefurnace	1
83.	Enamel trays	2
84.	Moisture boxes	10
85.	Chemical balance	1
86.	Weight box	2
87.	Incubator	1
88.	Milk measures 25ml	1
	50 ml	1
	100 ml	1
89.	Tripod stands	2
90.	Pestle and mortar	2
91.	Grinder (Hand operated)	1
92.	Semen shippers	2
93.	Resazurin colour comparator	1
94.	Strainers	6
95.	Clinical centrifuge	1
96.	pH meter	1

### **SUGGESTED LIST OF GLASSWARE**

<b>S. No.</b>	<b>Name of article</b>	<b>Quantity</b>
1.	Semen collection vials	5
2.	Insemination catheters	10
3.	Syring – 2 ml	5
4.	Clinical thermometer	5
5.	Dry and wet bulb thermometer	1
6.	Gerberbutyrometer	25

### **SUGGESTED LIST OF MISCELLANEOUS ITEMS**

S. No.	Name of article		Quantity
1.	Reagent bottles	250ml	10
		500ml	10
2.	Soxhlet apparatus complete		6 sets
3.	Desiccator		1
4.	Wash bottles 500ml cap		10
5.	Glass rods		1
6.	Glass tubing		1
7.	Spirit lamps		10
8.	Slides and cover slips		100
9.	Indicator bottles		10
10.	Sample bottles		60
11.	Centrifuge tube (10 ml)		12
12.	Slides		2 gross

S. No.	Name of article	Quantity
1.	Kerosene	1 tin
2.	Muslin cloth	10 meter
3.	Ropes plastic	2 kg
4.	Bottle caps	1000
5.	Burette	10
6.	Test tubes	10
7.	Jerry can 20litcap	5
8.	Rubber tubing	10mt.
9.	Measuring tape	2
10.	Tags	1 gross
11.	Gur	1 kg

## APPLICATION FORMAT FOR OFFERING VOCATIONAL SUBJECT / COURSES AT SENIOR SECONDARY LEVEL

1. **Name of the Course(s) applied for:** .....  
(with subject codes) .....
  
2. **Name of the School (Complete address)** .....  
(Also provide Website address if available) .....
  
3. **Affiliation No.** .....
4. **School ID.** .....
5. **Name of the Principal** .....
- J Phone No. ....
- J Mobile No. ....
- J E-mail .....
6. **Infrastructure** .....
- No. of Students .....
- No. of Teachers .....
- Student-Teacher Ratio .....
- No. of Classrooms .....
- Books in Library .....
- Total Computers in Computers Labs .....
- Specification of Computers .....
- Details of Constructed area for .....
- Establishing Laboratories .....
7. **Name of Teachers for Vocational Course** .....
- (Qualifications) .....
  
8. **Details of Draft** (in favour of Secretary, CBSE, Payable at Delhi)
- DD No.:** ..... **Date:** ..... **Amount** (in Digits)
- .....
- Bank Issues:** ..... **Amount** (in Words)
- .....

Signature & Seal of the Principal

Note: The document complete in all respects may be sent to: **The Director (Vocational Education), Central Board of Secondary Education 2, Community Center, Preet Vihar, New Delhi-110092.**

