

I.D.D.(DAIRY HUSBANDRY)

SEMESTER I

Course Code	Course Title	L-T-P	Credits
IDD-301	Dairy Technology I (Indian Dairy Industry & Market Milk)	3-0-2	4
IDD-302	Dairy Chemistry I (Chemistry of Milk & Milk constituents)	3-0-2	4
IDD-303	Dairy Microbiology I (Basic Microbiology)	3-0-2	4
LNG-300	English & Basic Technical Writing	3-0-0	3
IDD-306	Dairy Production-I (Forage Production)	3-0-2	4
IDD-307	Dairy Production-II (Cattle Nutrition)	3-0-2	4

SEMESTER II

Course Code	Course Title	L-T-P	Credits
IDD-314	Elementary Statistics	2-1-0	3
IDD-315	Dairy Production III (Genetics & Cattle Breeding)	3-0-2	4
IDD-316	Dairy Production IV (General Mgt. & Care of Dairy Herd)	3-0-2	4
IDD-311	Dairy Microbiology II (Microbiology of Milk)	3-0-2	4
IDD-317	Dairy Technology II (Milk Products)	3-0-2	4
IDD-318	Dairy Farm Engg.	3-0-2	4

SEMESTER III

Course Code	Course Title	L-T-P	Credits
IDD – 325	Dairy Production – V (Animal Physiology and Reproduction)	3-0-2	4
IDD – 326	Dairy Production – VI (Animal Disease & Hygiene)	3-0-2	4
IDD – 327	Poultry Production	3-0-2	4
IDD – 328	Extension Education	3-0-2	4
IDD – 329	Principles of Economics	3-0-0	3
IDD – 330	Financial Accounting in Dairy Business	3-0-0	3

SEMESTER IV

Course Code	Course Title	L-T-P	Credits
IDD – 336	Breeding & Management of Sheep	2-0-2	3
IDD – 337	Breeding & Management of Goats	2-0-2	3
IDD – 338	Breeding & Management of Pigs	2-0-2	3
IDD – 339	Dairy Business Management	3-0-2	4
IDD- 340	Preservation & Processing of Animal Foods	3-0-2	4
COMP- 401	Computer Application	1-0-2	2

SYLLABUS OF I.D.D.(DH)**FIRST SEMESTER****IDD-301****DAIRY TECHNOLOGY- I****4 Credits****INDIAN DAIRY INDUSTRY & MARKET MILK****S.No.****Topic****No. of
Lectures**

1. Market Milk: Market Milk Industry in India and Abroad
2. Clean Milk production, collection of Milk and practices followed at rural milk collection centres, chilling of milk, milk preservation by hydrogen peroxide and LP systems
3. Transportation of milk. Reception of milk. Platform tests
4. Filtration, clarification and separation of milk, Standardization of milk
5. Pasteurization of milk
6. Homogenization of milk
7. Sterilization of milk by conventional method UHT processing of milk sterilization
8. Special milks, recombined milk, toned milk, double toned milk, filled milk, vitaminised milk, flavoured milk
9. Packaging and distribution of milk
10. Metals in dairy equipments manufacture
11. Cleaning and sanitation of dairy equipment
12. Defects in milk, their causes and prevention

Practical

1. Reception of milk and platform tests
2. Fat, SNF and acidity tests of milk
3. Filtration and clarification of milk
4. Preparation of standardized, recombined, toned double toned milks
5. Preparation of flavoured and sterilized milk
6. Can washing and sanitation of dairy equipments.
7. Separation of milk
8. Homogenization of milk and efficiency of homogenization.
9. Pasteurization of milk
10. Filling/ Packing of milk by FFS Machines, common problems

CHEMISTRY OF MILK & MILK CONSTITUENTS

1. Composition of Milk:
Definition of Milk: Gross Composition of milk (Cow, buffalo, goat, sheep, and human).
Factors affecting composition: Colostrum and Abnormal milk. Market Milk: Standard, toned, double toned, skim, sterilized flavoured, recombined and reconstituted milks and UHT Milk.

2. Physical properties of milk:
Colour and flavour, factors responsible, Density and specific gravity: Methods of measurements: Calculation of total solids and solids-not-fat using formula. Factors affecting density and specific gravity of milk. Racknagel effect.

Freezing point and boiling point: effect of dissolved substance on freezing point and boiling point; Use of cryscope in detecting adulteration of milk with water.

Surface tension: Explanation, factors affecting

Viscosity: Factors affecting, importance.

Electrical conductivity: factors responsible, application in detection of mastitis.

Refractive, Index: Explanation, importance.

pH and titratable acidity pH of milk, its importance; milk acidity- natural and developed; constituents responsible: extent of contribution.

Buffer value: Explanation, Buffering agents in milk.

Oxidation:- Reduction potential: Explanation, factors affecting, significance.

3. Neutralisers and preventives in milk;

4. Milk constituents and their chemical properties:
 - i. Milk lipids; Definition and composition of fat glycerides, fatty acids, saponifiable and unsaponifiable matter, sterols, fat soluble vitamin, phospholipids; Properties of milk fat- density, refractive index, iodine value, RM value, polenske value, saponification value, melting point. Relation of milk fat constants to fatty acid composition; importance in quality control.
 - ii. Milk proteins:
Structure, nomenclature, classification, Isolation, fractionation. Determination major milk proteins. Non protein nitrogen constituents. Properties of milk proteins-hydration, solubility, denaturation, isoelectric point, hydrolysis and colour reactions.
 - (iii) Major milk enzymes:
Level in milk and their role in milk processing.
Functions, influence of processing parameters.
 - (iv) Water soluble vitamins in milk:

- Levels in milk, effects of light and heat
- (v) Carbohydrates:
Definition, classification, presence in milk.
Lactose – structures, physical forms. Solubility, reducing property, hydrolysis, status of lactose in milk, estimation of lactose in milk.
- (vi) Minerals in milk:
Major and trace elements: salt balance (Physical equilibrium-colloidal, soluble and ionic) and its importance: Factors affecting physical equilibrium among the salts-temperature, pH and concentration.

Practical

1. Preparation and standardization of sodium hydroxide, hydrochloric acid, sulphuric acid, silver nitrate, potassium permanganate and sodium thisulphate.
2. Sampling of milk for chemical analysis Platform tests of milk.
3. Determination of titratable acidity of milk
4. Preparation of Gerber acid and determination of fat in milk by Gerber and Milk tester methods.
5. Determination of fat by Mojonnier method
6. Determination of lactose in milk by Lane Eynon and polarimetric method.
7. Determination of milk proteins by Kjeldahl and Pyne's methods.
8. Determination of ash, phosphorus, calcium and chloride of milk.
9. Phosphates test
10. Detection of preservatives, neutralizers and adulterants in milk.
11. Detection of adulteration of milk with water by freezing point method.

IDD-303

DAIRY MICROBIOLOGY - I
BASIC MICROBIOLOGY

4 Credits

A. General Microbiology

1. Introduction to Microbiology; Definition, History of Microbiology, Microbiology, Microscope & its uses.
2. Nutrition & Metabolism of Bacteria
3. Bacterial growth
4. Effect of environment of growth of bacteria
5. Destruction of bacteria by physical & chemical modes.
6. Salient features of Moulds
7. Salient features of Actinomycetes, Rickettsiae and virus.

B. Salient features of Applied Microbiology

1. Soil Microbiology
2. Microbiology
3. Water Microbiology
4. Silage Microbiology
5. Industrial Microbiology

Practical

1. Familiarity with common equipment used in microbiological work; use of ovens, steam sterilizers, pressure sterilizers, refrigerators, care of microscope.
2. Common Bacteriological Techniques;
Cleaning & sterilization of glassware, preparation of media, pH adjustment, preparation of dilution blanks, preparation of stains and indicators and their use in microbiology.
Simple staining and differential staining; motility of microorganisms.
- 3 Evaluation of Bacterial population on agar plate and direct cell enumeration.
- 4 Study of important characteristics of microbes; Staphylococci, Streptococci, Micrococci, Enterococci, Aerobic and Anaerobic bacteria, Lactic acid bacteria, coliforms, streptococci, micrococci, ciliates, yeasts and moulds.
- 5 Microbiological examination of Soil, Air, Water and Silage.

LNG-300**English & Basic Technical Writing****3 Credit****1. Language:**

- a. Word Enrichment- Antonyms, Synonyms, One word substitution
- b. Sentence – Types, Structure & Parts
- c. Inflection – Noun
- d. Tenses
- e. Parts of speech
- f. Voice

2. Reading

Comprehension:

- a. Listening
- b. Reading

3. Writing:

Composition

- a. Precis Writing
- b. Essay Writing
- c. Letter Writing (Components, Formats & different types)
- d. CV
- e. Resume

IDD-306

**Dairy Production-I
(Forage Production)**

4 Credits

1. **Soils** – Definition, functions, composition, texture, structure, moisture, K, pH, acid, alkaline and saline soils and reclamation, soil organism, fertility and productivity, important soil types of India, erosion and control.
2. **Tillage**- Definition of Tillage and tillage, objective, implements-primary, secondary sowing, planting-functions. Farm mechanization- advantages, limitations and scope under Indian conditions.
3. **Irrigation**- Definition of irrigation- needs, irrigation water sources quality, devices and methods of irrigation commonly used, measurement of irrigation water factors determining frequency, water requirement of important forage crops.
4. **Drainage**- Definition needs principles of layouts systems and layouts.
5. **Dry farming**- Definition, objectives, practices, crops suited manure- fertilizers-classification of plant nutrient- major, minor micro, N.P.K.- role on plant growth, deficiency symptoms, role and deficiency symptoms of minor and trace elements, classification of manures and fertilizers: FYM, compost, liquid manure, slurry, green manure, concentrated organic manures, composition of commonly used nitrogenous, phosphatic and potassium fertilizers, method and time of application of manures and fertilizers and residual effects.
6. **Weeds**- Definition, economic weed, common weeds and methods of eradication
7. **Forage crop classification**- Herbs, shrubs, trees, grasses, legumes and others, common crops in each group, plant habits-annual, biennials, perennials-common crops in each group, cash crops, companion crops, soiling crops, silage crops hay crops.
Cropping seasons- Zaid (prekharif), Kharif and Rabi- common crops in each group. Important objectives in forage evaluation factors determining selection of forage crops.
8. **Cultivation of important crops**- Botanical name, common name, morphology, origin, package of practices, varieties, utilization, nutritive values, cost of production-per hectare, per unit of green, per unit of D.G.P. & T.D.N. – maize, Jowar, bajra, Cowpea, Guar, Rice bean and tetrakalia, oats, Berseem Lucerne, Mustards, Japanrape, Chinese Cabbage, Hybrid Napier (Napier X Bajra) Para Guinea, Dinanath, forage beet, Tapioca, fodder, turnip, fodder trees.
9. **Cropping schemes**- Rotations- Definition, principles advantages, common rotations with fodder crops. Mixed cropping- definition, advantage, principles, common mixtures of fodder crops, cropping schemes – definition advantages, points to be considered, intensity of cropping, carrying capacity. Drawing of model schemes for supply of fodder all the year round varied conditions- high, medium, low marsyland irrigated non-irrigated and partly irrigated conditions. Comparative economics of forage crops v/s cereal and cash crops.
10. **Pastures** – Different kinds, advantages, scope in India, Characteristics of good pasture species, and name of important pasture crops, establishment & management of pasture rotational grazing, silvi –pastoral concept and practices, social forestry.
11. **Forage seeds** - Importance of good seed, standard, sources, storage, protection.
12. **Conservation of fodder** – Need, forms, advantages and limitations silage making-objective, biochemical changes, types of silos, suitability of types, method of filling and co erring, crops for silage, stages of harvesting, additives and preservatives, silage

quality. Hay making-crops, stage of harvesting, methods, quality under different methods. Losses in silage and hay making-comparison, comparative advantages & disadvantages of silage and hay making under different conditions.

13. **Agro Industrial By Products** – Utilisation, feed values, need under Indian condition.

Practical

1. General Introduction to a fodder farm, study of hand tools and uses, stud of bullock drawn implements, ploughing methods and practices-bullock drawn, operation of a disc harrow, operation of cultivator, rollers and wooden planks, Identification of manures and fertilizers, application of F.Y.M., application of fertilizers, compost making, Demonstration on water lifting devices and methods of irrigation, practice on flood irrigation study to drainage system and practice on surface drainage. Methods of sowing-practices on broadcasting and line sowing. Demonstration of drilling. Identification of forage crops, harvesting of different forage crops and loading on trailers. Testing of seeds for germination and purity. Seed bed preparation for principal forage crops-non-irrigated and irrigated. Silage making practices, hay making practices-barn curing, estimation of quantity of straw in stacks. Cost of cultivation of important forage crops. Layout of a fodder farm. Study different types of farm fence-cost per running metre.

IDD-307

**Dairy Production-II
(Cattle Nutrition)**

4 Credits

1. **General Introduction-** Importance of Science of Animal Nutrition, role of feeds in maintaining life process, Nutrients- definition, essential nutrients in feeds water, proteins, lipids, carbohydrates, minerals vitamins. Harmful substances in feeds names, sources and their effects.
2. **Digestive organs and Processes in cattle-** Introduction, significance of the term "Digestion" digestive system- division and functions (i) Alimentary canal and (ii) Accessory Organs, identification of the parts with the help of diagrams and models.
3. **Digestive Processes-** Mechanical, secretary, chemical, role of enzymes, digestion, absorption and metabolism of carbohydrates, fat and proteins, factors affecting digestibility and measures to improve digestion of feeds in cattle.
4. **Feed quality and Nutritive Value-** Importance and methods, chemical analysis-proximate analysis- tractions of feed components, Digestibility trial-conventional type-estimation of Energy contents- by calculation of TDN from digestion trail, Evaluation of protein quality-DGP estimation by digestion trial, calculations of Digestive co-efficient, Digestive Nutrients, TDN & DGP, different system of expressing feed value. (Elementary ideas only).
5. **Nutritional Requirements-** Ration, maintenance and production ration, requirements of dry matter, energy requirements for maintenance and lactation, feeding standards, formulation of ration-principles and requirements according to different categories of animals.
6. **Classification of feedstuffs for cattle-** Roughages and concentrates, coarse fodder and succulent fodder, straws and their uses in feeding cattle, fortification of paddy saw urea treatment, treatments for oxalates, mineral supplementations

concentrates – energy rich grains, seeds, brans, chuni, roots, oil cakes their feed values and extent of their uses.

Whole Milk, skimmed milk powder, tapioca roots, molasses feed values and extent of their uses, scarcity fooders under adverse conditions-tree leaves, seed kernels, water hyacinth extent of their uses.

Use and minerals and vitamins in cattle feed requirement and limitations, feed additives-their extent of uses.

7. **Computation of Rations for cattle-** Desirable characteristics of a balanced ration, general considerations for computation of ration, computation of ration for cattle at different stages of growth feeding of calf of different ages, milk replacers, calf of different ages, milk replacers, calf starters, pregnant heifers, cows in milk, dry cow, bull in service, working bullock, economics of feed formulation, unit cost calculation. Compounding of feed- selection of feed ingredients, grinding, mixing, bagging, storage and distribution- different methods and limitations of their uses under different conditions, quality control of compounded feeds and chemical processes.

Practicals

Identification of digestive organs of cattle and accessory digestive organs.

Identification of fodders and feeds

Feeding of colostrums and milk to calves, measurement of total milk yield of cow

Computation of ration for different categories of animals, compounding of feed-grinding, mixing, bagging stitching and storage programme.

Identification of glasswares, equipment and apparatus for proximate analysis of feed stuff.

Demonstration on proximate analysis of feeding stuff

Estimation of drymatter in fodder and feeds.

Estimation of water requirements

Quality control of compounded feeds-sampling , physical analysis, chemical analysis

Demonstration on microscopic study of the histological characteristics of digestive organs of cattle.

Demonstration on identification of carbohydrates, lipids and proteins by qualitative tests.

SECOND SEMESTER**IDD-314****ELEMENTARY STATISTICS****3 Credit**

Compilation of Data: Introduction, Scores: Discrete and Continuous, Frequency distributions, graphical Representation of the data (Polygon, histogram & pie- diagram)

Measures of Central Value Arithmetic Mean, Median, Mode

Measures of Dispersion of scores – range, Q, mean deviation, standard deviation, co-efficient of variation.

Normal curve- characteristics, Non- normal curves- skewness and kurtosis.

Causes of non- normality

Significance of the difference between two means by t- test, χ^2 – test (chi- square test)

Significance of the differences among more than two means by F-test

Sampling methods: types, requisites for randomization, use of random numbers.

IDD-315**DAIRY PRODUCTION III
(GENETICS & CATTLE BREEDING)****4 Credits**

1. General Management: Importance of ruminants, classification of breeds of the basis of utility.
2. Important dairy breeds of indigenous and exotic cattle and buffaloes.
3. Calf rearing different methods
4. Management of dairy heifers and bull calves
5. Care of pregnant animals during and after parturition.
6. Management and care of milking stock, dry stock and breeding bulls.
7. Cleaning and sanitation of cattle yard premises.
8. Clean milk production, principles of milking, milk recording. Records essential to good herd management.
9. Milk secretion.
10. Preparation of animals for cattle shows, transport of animals by roads and rail.
11. The principles and practices of breeding dairy stock.
12. Inbreeding, Different systems of breeding
13. Inbreeding, line breeding, cross breeding, grading up, pregnancy testing, culling and selection of animals in the open market.
14. Anatomy of reproductive organs Artificial Insemination.
15. Embryo transfer technology- a general concept and its role in national perspective.
16. Signs of health and ill health.
17. Diagnosis and detection of diseases care and feeding of sick animals
18. Disinfections, isolation and prophylaxis measures during outbreak of contagious diseases of cattle like foot and mouth, Rinder Pest, Brucellosis, T.B. Johanes and mastitis.
19. Diseases of young stock, Navel-III, Pneumonia, scours, Ring worm and Mange.

Practical

1. Layout of a cattleyard, living space for each category of animal from health point of view.
2. Recognition of body parts of dairy animals
3. Physical character of the breeds maintained.
4. Calf feeding, Tatting, Dehorning, Grooming.
5. Estimation of age and body weight
6. Preparation of animals for milking, milk cooling, observations of signs of oestrus and pregnancy.
7. Cleaning and sanitation of milking sheds and milk record room.
8. Judging of milch cows
9. Preparation of animals for show
10. Study of important cattle records
11. Identification of common cattle feeds computation of rations
12. Recording observations on temperature, pulse and respiration.
13. Identification and use of common first aid drugs and pharmaceutical instruments used in the cattle yard.
14. Dressing of wounds and bandaging
15. Diagnosis and treatment of mastitis.
16. Practice in Artificial Insemination
17. Demonstration on Embryo Transfer Technology at the appropriate centre

IDD-316

**DAIRY PRODUCTION IV
(GENERAL MGT. & CARE OF DAIRY HERD)**

4 Credit

General Introduction: Definition of Dairying, Present condition and status of Dairying in Indian, Present condition and status of dairy farmers in India, Seasonal nature of milk production, Mixed farming.

Breeds: Indian and exotic breeds of cattle, Breeds of buffaloes in India.

General Management and Care of Dairy Herd: Rearing and management of calves, Weaning of calves, management and care of milking herd, care of breeding bulls. Different systems of housing for dairy animals, Marking of animals, Dehorning/ disbudding of dairy animals, Castration of male calves, Clean milk production, principles and methods of milking.

Practicals

1. General Introduction to Institute dairy farm.
2. Recognition of body parts of cow.
3. Care of newly born calf.
4. Feeding of milk to calf by pail method.
5. Identification of different equipments used on dairy farm.
6. Estimation of body weight by measurements.
7. Practice on marking, disbudding and milking of dairy animals
8. Cleaning and disinfections of barn.

IDD-311

**DAIRY MICROBIOLOGY- II
(MICROBIOLOGY OF MILK)**

4 Credits

A Microbiology of Milk

- 1) Sources of microbial contamination of milk and their importance
- 2) Milk – borne disease
- 3) Important groups of spoilage of micro organisms and their manifestation in milk.
- 4) Microbial growth in milk during storage and transport
- 5) Taints and abnormal conditions in milk
- 6) Principles of sanitation practices at all stages of production and processing
- 7) Bacteriology of heat-treated milks
- 8) Evaluation of bacteriological features of milks

B Microbiology of Foods

- 1) Classification of foods
- 2) Natural functional systems of food and their interactions on shelf life
- 3) Food processing compulsions and options
- 4) Types of food spoilage and their aetiology
- 5) Methods of limiting microbial proliferation in foods
- 6) Features of food fermentations as a desirable change
- 7) Evaluation of microbiological features of foods

Practical**A Microbiology of milk**

- 1) Sampling of milk for microbiological analysis
- 2) Application of rapid tests for evaluation of milk quality
- 3) Enumeration of bacterial numbers by direct and indirect methods
- 4) Methods used for determining psychrotropic organisms in milk
- 5) Assessment of pasteurized milk based on the following; standard plate count. E coil test. Phosphate test, thermoduric and thermophilic numbers
- 6) Evaluation of utensils and equipments for sanitation

B Microbiology of foods

- 1) Comparative study of raw and processed foods
- 2) Study of food enzymes in relation to their profiles at shelf life
- 3) Effect of storage temperature on shelf life foods
- 4) Microbiology of vegetables, eggs, meat, flour, bread, cereals and spices
- 5) Role of salt, sugar, inorganic acids and alkalies in food preservation

IDD-317**Dairy Technology II
(Milk Products)****4 Credit**

Status of fat rich dairy products in India and abroad.

Introduction to milk lipids - definition and general composition of milk fat.

Cream: efficiency of cream separation and factors affecting it; control of fat concentration in cream. Receiving, grading, sampling and weighing of raw cream; neutralization, pasteurization and cooling of cream. Preparation and properties of different types of cream; table cream, sterilized cream, whipped cream, plastic cream, frozen cream and cultured cream. Preparation of cream for butter making.

Butter: introduction to the butter-making process; theory of churning; batch and continuous methods. Technology of butter manufacture; over-run in butter; control off at losses in ~utter milk; packaging and storage; transportation; defects in butter; rheology of butter; uses of butter. Butter-making equipment: construction, operation, care and maintenance of cream separators, coolers and vacreator, factory butterchurn and continuous butter making machines.

Special butters and related products: manufacture, packaging, storage and properties of whey butter, flavoured butter, whipped butter, renovated butter/fractionated and poly-unsaturated milk, fat products, vegetable oil-blended products and low-fat spreads.

Manufacture, packaging, storage, and characteristics of Margarine of different types.

Ghee and butteroil: Methods of ghee making . batch and industrial processes, innovations in *ghee* production, procedure, packaging and preservation of ghee; utilization of substandard milk and old/stored butter in the manufacture of ghee.

Continuous process for the production of ghee.

Methods of manufacture, packaging, storage, distribution and uses of butter- oil.

Nutritional aspects of cream, butter, butter-milk, ghee and ghee residue.

Health aspects of milk fat.

Technical control in butter industry: Factors affecting plant operations' efficiencies,. Losses of milk solids, methods of improving operational efficiency and product accounting.

INDIGENOUS MILK PRODUCTS

1. Ghee:

- a) Definition of ghee, importance of ghee in India
- b) Methods of manufacturing ghee
- c) Grading of Ghee and factors influencing quality of ghee
- d) Difference of ghee & butter oil
- e) Utilization of ghee and resedue.

2. Khoa

3. Chhana

4. Paneer

5. Dahi

6. Indigenous Cheese

- a) Preparation & Packaging, yield and composition.
- b) Factor affecting quality
- c) Packaging & Preservation
- d) Marketing and grading
- e) Legal standards

MILK BASED SWEETS

1. Place of milk based sweets in India and abroad.
2. Method of manufacture, packaging, storage and transportation of Rasogulla, Gulab jamun, Kalakhand, Rabri, Keer, Khurcho, malai, Rasmalai, Barfi, Peda, Srikhand, Sandesh, Chakka, Milk cake, Pantoa, Payodhi and lassi.

Practicals

1. Standardization, neutralization, pasteurization and cooling of cream
2. Preparation of sterilized cream.
3. Preparation of cooking butter by the hand-operated chum.
4. Preparation of *desi* butter.
5. Manufacture of table butter using the power-driven chum.
6. Preparation of a low-fat spread.
7. Preparation of *ghee* from cream and butter.
8. Plant visit.
9. Preparation of *khoa*
10. Preparation of Ghee from butter and cream.
11. Preparation of *Paneer*.
12. Preparation of *chhana*
13. Preparation of *Dahi*
14. Preparation of Surti Cheese
15. Preparation of milk based sweets

1. Farm machinery and power: Conventional country tools & implements type, principal parts & functions deshi plough, patella, hoe, sickles, Khurpi etc, yokes for desi bullocks, crossbred bullocks.
Internal combustion engine and its principal parts and principles of operations: Agricultural Tractor and its principal parts maintenance and selection, driving the tractor, common troubles and remedies terminology.
2. Associated Implements in mechanized farming: Functions, principal parts and maintenance of board and disc plough, harrows, and cultivators, seed drill chaff cutter, weighing machine and its principal parts types maintenance. Milking machine principal parts, operation and maintenance.
3. Electrical machines: A.G. motors- principal parts, function types, difference between generator and motor, maintenance of motor.
4. Refrigeration: Importance in dairy industry, natural refrigeration, artificial refrigeration by mechanical compression system or absorption system, calculation of quantity of ice or dry ice required for certain amount of cooling , Mechanical refrigeration cycle, refrigerants, bulk milk coolers –construction function and maintenance, cold stores, operation and maintenance of cold stores
5. Water supply :- Principles of water supply, water requirement, sources of water, pumps terminology, general construction of pumps, types-positive pumps, non-positive pumps, calculation of requirements of H.P., sanitary and irrigation pumps, maintenance of total head discharge.
6. Dairy machinery: milk cans- constructional features, metals used, types- conventional and insulated maintenance, handling cleaning, storage, Gerber’s centrifuge- principles, construction function and maintenance.
7. Storage tank: Types functions and constructional features, types and maintenance of clarifiers separators, homogenizers, heat exchangers, pasteurizers, milk sterilizers, can washers bottle washers ghee kettles, butter churns ice cream freezing equipments.
8. Farm building- principles of site selection, layout farm building, factors involved in assembling, lighting and ventilation requirements, importance of ventilation in dairy farm building factors involved in constructive features for temperatures and ventilation control, maintenance of building, feed go downs- constructional features, storage space and space requirement, damp and rodent proofing ventilation, anticorrosive measures, disinfection, fumigation cleaning.
9. Bio –Gas Plant: Need for drainage and sewage in dairy farm, disposal and cattle hardware, biogas plant constructional and operational features, uses of biogas plant, products and by products and utilization.
10. Feed grinding and mixing machines: Constructional features, maintenance and improvements in trailers and animal drawn vehicles, functions, types, milk van tanker-types, constructional features and maintenance.
11. Meteorology: Introduction to agricultural meteorology, importance, study of meteorological instruments in an Agr met observatory.
12. Fencing: uses, types, constructional features, estimation, periodical checks and maintenance.

Practicals:

- (a) Identification of principal parts and practice on starting stopping- petrol engine, diesel engine and tractor.
- (b) Identification of principal parts and hitching to a tractor- mould board and disc ploughs and disc harrow.
- (c) Chaff cutter- principal parts and their functions, operations of chaff cutter- milking machine- principal parts and their functions and operations.
- (d) Phase induction motor with star delta and their functions, demonstration of operation, calculation of discharge.
- (e) Demonstration of operation of dairy plant machinery. Study of the general features of feed grinder and mixture- principal parts and their function

- (f) Acquaintance with carpentry tools- their functions and operations.
- (g) Acquaintance with agricultural meteorological equipment, apparatus and their functions.
- (h) Acquaintance with soldering, gas, and arc welding equipment their functions and operations.
- (i) To Draw a plan of a –
 - (i) Model of milking shed
 - (ii) Model of bull pen
 - (iii) Model of calf pen
 - (iv) Model of calving shed

THIRD SEMESTER**IDD – 325****Dairy Production – V
(Animal Physiology and Reproduction)****4**

General Introduction: Familiarity with the concept of Animal Physiology and reproduction and its significance in Livestock rearing.

Reproduction and Lactation: Hormones- classification and functions, Male and female reproductive organs in dairy cattle, Sexual cycle, Heat and its detection in cows, Ovulation, Fertilization, Implantation, pregnancy diagnosis, parturition, sterility and infertility. Lactogenesis and galactopoiesis, milk let down.

Artificial Insemination: History merits, demerits and limitations, phases of A.I. viz, collection of semen, evaluation of semen, Dilution of semen, Storage of semen and deposition of semen for higher rate of conception.

Practicals

1. Identification of male and female reproductive organs.
2. Identification of different equipments used in animals Physiology and reproduction.
3. Detection of heat in cows.
4. Preparation of artificial vagina and collection of semen.
5. Evaluation of semen- Macroscopic, Microscopic and chemical.
6. Preparation of semen- dilutors
7. Maintenance of records at A.I. sub centre.
8. Study of morphology of udder.

IDD – 326**Dairy Production – VI
(Animal Disease & Hygiene)****4 Credit**

General Introduction: Definition and concept of disease and health. Factors affecting the health of animal, signs of ill health.
Care and feeding of sick animals.

Immunization: Types of immunity, Antigens and antibodies, vaccination.

Communicable Diseases: causes of communicable diseases, FMD, Rinderpes, cowpox, Tuberculosis John's Disease, Haemorrhagic Septicaemia, Anthrax, Black Quarter and their etiology, incubation period, mode of infection, mortality, symptoms, treatment and prophylactic measures.

Common Parasites Disease: Causes, symptoms, treatment and preventive measures of common parasitic diseases.

Diseases of Digestive & reproductive organs: Causes , symptoms, treatment and preventive measures of common diseases of digestive and reproductive tract viz, Bloat, Impaction of rumen, diarrhea, dysentery, vaginitis, Trichomoniasis, vibriosis etc.

Practicals

1. Identification and use of common instruments and drugs.
2. Practice on castrating and castration of animals
3. Signs of ill health.

4. Methods of drug administration.

IDD – 327		POULTRY PRODUCTION	4 Credits
<u>S.No.</u>	<u>Topic</u>	<u>No. of Lectures</u>	
1.	Poultry keeping in India:- History, status of poultry in India, various improvement programmes	3	
2.	Breeds: Breeds of Ducks, geese, Fowl, Quails	8	
3.	Feeds and Feeding: Digestion & Digestive system of fowl, composition, classification of poultry feeds, formulation of Balanced ration for various class of birds.	6	
4.	Breeding: Reproductive systems of fowl, systems and methods breeding	4	
5.	Health care & Management: Hygiene and sanitation, common poultry diseases, prevent in India, vaccination programme for broilers and layers. Poultry housing & equipment, Breeding, Management of layer, management of broiler.	20	
6.	Poultry products: Egg structure, Formation composition grading & preservation. Slaughter of poultry for meat. Defething, removal of waste processing and preservation of meat.	8	
7.	Economics of poultry farming: economics of Eggs production, Economics of Broiler production.	6	
Practical			
1.	Body parts of fowl		
2.	Visceral organ of domestic fowl		
3.	Slaughtering of poultry		
4.	Defething of Poultry		
5.	Evisceration, removing & cleaning of giblets		
6.	Calculation of dressing percentages		
7.	Candling and grading of eggs		
8.	Egg quality and their measurement		
9.	Preservation of eggs		
10.	Sesing of chicks		
11.	Feeding, watering and space requirement for various class of poultry under different housing system.		
12.	Care of day old chicks		
13.	Management of broilers		
14.	Post mortem of birds		
15.	Computation of balance ration for various class of poultry.		

IDD – 328	EXTENSION EDUCATION	4
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1. Dairy Extension- meaning and purpose, extension education- meaning, history, objectives, philosophy and principles, basic elements of effective extension work.
2. Rural sociology- meaning and role in rural development, characteristics of rural life- physical structure of village society- social structure, concepts of culture, society, social change and their relevance to extension work.
3. Extension Education and Dairy Extension- role of extension education in development of Dairying. Training of extension personnel at different levels, extension teaching –

- methods and techniques and teaching aids, basic principles of learning and teaching, visit and training method.
4. Planning an extension programme- objectives, principles and steps, extension evaluation. Planning and execution of extension work in relation to development of animal husbandry and Dairying. Involvement of youth, women and other strategic units in development work.
 5. Dairy Development Project and other Rural Development Projects- contribution to Animal Husbandry and Dairy Development- Operation Flood- I & II, National Extension Service (NES), Community Development Programme, Intensive Agricultural District Programme (I.A.D.P.) Drought Prone Area Programme (D.P.A.P.) Command Area Development (C.A.P.), Intensive Agricultural Area Programme (I.A.A.P.) High Yielding Varieties Programme (H.Y.V.P.), Integrated Tribal Development (I.T.P.), Integrated Dryland Agricultural Development (I.D.A.D), Margin Farmers and Agricultural Labour Programme (M.F.A.L), Small Farmers Development Agency (S.F.D.A.), Integrated Rural Development Programme (I.R.D.P.) Krishi Village Scheme (K.V.S) Intensive Cattle Development Project (I.C.D.P.), Cattle and Dairying Development (C.D.D.), Farmers Training Centre (F.T.C.), Krishi Vighyan Kendra (K.V.K.-ICAR), Trainers Training Centre (T.T.C.) Lab to Land programme and other technology transfer programmes.

Practicals

Observation and study of village extension work carried out at the key village (1.) Artificial Insemination (2) Fodder Development (3) Animal Management (4) Other rural extension activities (5) Visit and observation of village panchayats (6) Block Development Committee, (7) N.E.S. Block Development and District Planning meeting.

Practice in use of extension education methods- such as (8) Group discussion method and result demonstrations (9) Use of audio visual aid in extension teaching, use of puppetry, song, poetry and drama for extension work in the villages, Preparation of extension teaching materials such as (10) posters (11) Charts exhibits etc (12) Organization of vikas melas, vikas Sammelans (13) Cattle shows and rallies with emphasis on dairy and animal husbandry development, (14) Survey of a village for the purpose of planning extension programme for Dairy and Animal husbandry development

IDD – 329

PRINCIPLES OF ECONOMICS

3 Credit

1. Basic concept; Nature of Economics, Meaning, definition, scope of Economics, Utility, Goods value, Wealth.
2. Concept of consumption: Meaning and importance, determination and characteristics, classification of wants, Law of Diminishing utility, Law of Equi-marginal utility.
3. Concept of Production: Meaning and definition, Factors of production, Land, Labour, Capital, organization, Enterprise.
4. Concept of Exchange: Its Meaning, Definition, Advantages and form of Exchange.
5. Concept of Market, Meaning, Definition, Degree of competition in market, Demand and supply.
6. Concept of Distribution: Meaning, Definition, problem of distribution, Rent, Wages, Interest Profit etc.

IDD – 330

FINANCIAL ACCOUNTING IN DAIRY BUSINESS 3 Credits

1. Financial Management; its planning meaning, objective, functions, its role and importance
2. Concept of financial accounting; its subject matter, basic principles involve in accounting, classification and importance.
3. Concept of Accounting procedure; Journal, Definition; Role of debets
4. Concept of Double Entry System; meaning, advantages of Double Entry System
5. Ledger: Its concept, necessasity, types ruling, difference between Journal and Ledger
6. Cash book; Meaning, types of cash, advantages, difference and similarities with ledger.
7. Trial balance; its meaning, definition, objective and characteristics of Trial balance, limitation etc.

Tutorial

1. Preparation of Journal
2. Preparation of Ledger
3. Preparation of cash book
4. Preparation of Trial balance
5. Preparation of Purchase Book
6. Preparation of Purchase return Book
7. Formate of sales return book
8. Formate of sales book
9. Formate preparation of Inventory
10. Preparation of Purchase register
11. Preparation of Sales register
12. Depreciation

FOURTH SEMESTER

IDD – 336

BREEDING & MANAGEMENT OF SHEEP

3 Credit

1. Contribution of sheep industry in India and its statistics.
2. Breeds and breeding of sheep:
 - Indian and exotic breeds of sheeps
 - Mating and A.I. in sheeps
3. Feeds and feeding of sheeps
 - Nutrient contents of daily diets, feeding of lamp and ewe at and after lambing
 - Common diseases of sheep and their control measures
4. Sheep products:
 - Sheep production statistics
 - Wool: Parameters of judging, wool quality, grading system of wool.
 - Economics of sheep farming

Practical

1. Body parts of sheep
2. Feeding, watering and space requirement for different class of sheep under various housing system
3. Marking of sheep
4. Shearing
5. Docking of lamp
6. Castration of lamp
7. Grading of wool
8. Economics of sheep farming
9. Cleaning and disinfection of houses

IDD – 337

BREEDING & MANAGEMENT OF GOATS

3 Credits

1. Importance of goat farming in India
2. Annual production statistics of goat and goat products
3. Breeds and breeding of goat:
 - Indian breeds of goats, Exotic breeds of goats
 - Breeds and breeding management of goats
4. Feeds and feeding of goats:
 - Nutrient requirement for goats
 - Feeding systems and feeding strategies for goats
 - Feeding management of goats
5. Management of goats:
 - Housing Management
 - Tethering, Determination age of goats, disbudding, castration, exercise,

- hoof trimming
- Clean milk production
- Care of doe after kidding
- 6. Health care for Goats:
 - control measures of common diseases
 - Health management
- 7. Economics of goat farming

Practical

1. Body parts of goat
2. Feeding, watering and space requirement for different classes of goats under various housing system
3. Determination of age of goats
4. Disbudding in Kids
5. Castration
6. Cleaning and disinfections of houses
7. Hoof trimming in goats
8. Economics of goat farming

IDD – 338

BREEDING & MANAGEMENT OF PIG

3 Credits

1. Scope and importance of swine farming statics on swine
2. Breeds and breeding of pigs Important feeds of pigs experience in India
 - Guidelines for selection of sow and boar
 - Guidelines for normal reproduction in pigs and detection of heat in sows
3. Feeds and feeding of pigs: Nutritive requirement, creep feeding weaning Recommended rations for different class of pigs
4. Management practices for hogs Housing of hogs castration management at farrowing, Pig fenders, Pig wallows, management at breeding (flushing), Needle teeth Common disease of pigs and their control vaccination
5. Pork:
 - Steps of slaughter of hogs
 - Curing of pork
 - Economics of pig farming

Practical

1. Body parts of pig
2. Feeding watering and space requirement for different class of pigs under various housing system
3. Marking of pig
4. Removal of needle teeth in piglets
5. Feed mixing for pigs
6. Castration of pigs
7. Slaughtering of pigs
8. Economics of pig farming
9. Cleaning and disinfections of houses

IDD – 339**DAIRY BUSINESS MANAGEMENT****4 Credit**

1. Genesis of the Management- Introduction, Dairying as a Business, Selection of Enterprise, Management.
Industrial Management: Principles of Farm Management, Law of substitution, Authority, responsibility.
Organization: Types, methods of organization, line organization, Functional organization.
2. Dairy Development: Historical of Dairy Industry in the country present status of dairying in India, Livestock statistics, Important Magazines and Journals of Dairying.
3. Management Functions: What is good management, function of Management, Leadership, Quality of a Leaders, Quality of a Supervisor, Attitude towards himself, Attitude towards others, Attitude towards his job.
Delegation of authority: responsibility, authority, decision making.
Reviewing management performance: Objectives
4. Personnel management: organization and control of labour, Duties of labour department, control of labour, labour efficiency.
Staff Welfare:
Public relations: What is public relations, public relations and its three purposes, public relations and its application to Dairy Industry, Public relations with reference to consumers, Public relation with reference to local authorities and government.
Labour Legislation in India: factory act 1948 amended in 1954, Definition, Inspection, health and cleanliness, safety.
Employee Morale: Introduction – Meaning.

IDD- 340**PRESERVATION & PROCESSING OF ANIMAL FOODS****4 Credits**

1. Cooling, Pasteurisation and Preservation of milk
2. Indian meat industry
3. Structure, composition and nutritive value of meat tissues
4. Post mortal changes
5. Meat quality parameter
6. Meat cutting and packing
7. Principles of various preservation techniques:-
Chilling, freezing, curing and smoking dehydration and freeze drying
8. Processing of meat and meat products- curing and smoking of Pork, grading, packaging & preservation of eggs as well as dressed chicken, chevon, mutton and pork.
9. Factors affecting meat quality.
10. Meat products:-
 - (ii) Sausage
 - (iii) Salami
 - (iv) Kabab
 - (v) Tanduri chicken
 - (vi) Ham and bacon

Practical

1. Familiarity with various tools and equipments of meat processing
2. Slaughtering of Animals and Birds
 - (a) Halal Method
 - (b) Jharka Method
 - (c) Jewish method
3. Dressing of Birds, packing and sale
4. Judging of meat of different animals
5. Grading, judging and preservation of eggs as well as carcass
6. Cut- up parts of carcass- display
7. Curling of pork
8. Egg parts.

COMP- 401**COMPUTER APPLICATION****2 Credit**

1. Introduction to Computers
2. H/W and S/W Concepts and Terminology
3. Operating System
 - (a) DOS
 - (b) Windows
4. Introduction to commonly used application software
 - (a) MS Word
 - (b) MS Excel
5. Computer Languages & Introduction to 'C' Programming Language
 - (a) Input & Out put statements
 - (b) Declaration of variables
 - (c) Operators
 - (d) Control Statements (Branching and Looping)
6. Introduction to computer Networks
7. Introduction to Internet
8. Application of I.T.

Practical List:

1. Working with operating systems like MS. DOS, Windows
2. Study of Software packages, Like MS Word, MS Excel and MS. PowerPoint
3. Packages related to medical applications
4. How to search data, workable knowledge of Internet
5. Simple programs in C languages
 - (i) To find the largest among three numbers
 - (ii) To check whether the given number is palindrome or not.
 - (iii) To find whether the given number is the prime
 - (iv) To find sum and average of n integer using linear array
 - (v) To generate the Fibonacci series
 - (vi) To find factorial of a given number using functions.