Sundaresan School of Animal Husbandry and Dairying

SAM HIGGINBOTTOM INSTITUTE OF AGRICULTURE, TECHNOLOGY & SCIENCES

(Formerly Allahabad Agriculture Institute)

(Deemed to-be-University)

Allahabad – 211007

Course Structure of B.Sc. Animal Husbandry & Dairying [now B.Sc. (H) Dairying]

SEMESTER- I

Course code	Course title	L-T-P	Credits
CSIT 301	Introduction to Computer Application	2-0-2	3
MAS 303	Elementary Mathematics-I	2-0-0	2
LNG 300	English and Basic Technical writing	3-0-0	3
MBFT 349	Introductory Microbiology	2-0-2	3
GPT 301	Moral and Value Education	2-0-0	2
BCBT 303	Elements of Animal Biochemistry	2-0-2	3
AGRN 315	Forage Production	2-0-2	3
DT 301	Dairy Development in India	2-1-0	3
AHD 305	Elements of Animal Husbandry	2-0-2	3
			25

SEMESTER II

Course code	Course title	L-T-P	Credits
MAS 304	Elementary Mathematics-II	2-0-0	2
DM 302	Introductory Dairy Microbiology	2-0-2	3
EXT 301	Dairy Extension Education	2-0-2	3
DT 302	Market Milk	3-0-2	4
DC 302	Chemistry of Milk	2-0-2	3
AHD 412	Fundamentals of Dairy Engineering	2-0-2	3
AHD 306	Dairy Farm General Management	3-0-2	4
AHD 307	Dairy Animal Nutrition	3-0-2	4
			26

SEMESTER III

Course code	Course Title	L-T-P	Credits
MAS 322	Statistics	2-0-0	2
MCE 303	Introductory Biotechnology	2-0-0	2
DT 401	Traditional Indian Dairy Products	2-0-2	3
ME 502	Refrigeration and Air Conditioning	2-0-2	3
FMP 411	Dairy Farm Engineering	2-0-2	3
AHD 403	Ruminant Nutrition	3-0-2	4
AHD 404	Goat Production Management	3-0-2	4
BAM 501	Marketing Management & International Trade	3-0-0	3
AEAB 503	Dairy Accountancy and Auditing	2-1-0	3
			27

SEMESTER IV

Course code	Course Title	L-T-P	Credits
AHD 402	Principles of Animal Genetics & Breeding	3-0-2	4
AHD 407	Non Ruminant Nutrition	3-0-2	4
AHD 408	Sheep Production Management	3-0-2	4
AHD 409	Animal Health and Hygiene	3-0-2	4
AHD 410	Meat Technology	3-0-2	4
AEAB 502	Dairy Economics	2-0-0	2
			22

SEMESTER V

Course code	Course Title	L-T-P	Credits
DT 503	By Products Technology	3-0-2	4
DT 508	Quality Assurance in Dairy Industry	2-0-4	4
AHD 501	Reproduction, Lactation & Artificial Insemination	3-0-2	4
AHD 502	Poultry Production	3-0-2	4
AHD 503	Animal Feed Technology	3-0-2	4
AHD 505	Swine Production	3-0-2	4
ENVS 415	Environmental Studies – I	2-0-0	2
			26

SEMESTER VI

Course code	Course title	L-T-P	Credits
BAM 529	Human Resource Management	4-0-0	4
ENVS 416	Environmental Studies – II	2-0-0	2
AHD 504	Egg Technology	3-0-2	4
AHD 506	Common Ailments of Livestock	3-0-2	4
AHD 507	Breeds and Breeding	3-0-2	4
AHD 508	Animal Physiology	3-1-0	4
AHD 509	Buffalo Production Management	3-0-2	4
			26

SEMESTER VII

Course code	Course title	L-T-P	Credits
AHD-697	Hands-on-training and Experiential Learning	0-0-50	25
			25

SEMESTER VIII

Course code	Course title	L-T-P	Credits
AHD 698	In plant/On Farm training	0-0-40	20
AHD 699	Training Report evaluation	0-0-10	05
			25

SYLLABUS OF B.Sc.(Hons.)DAIRYING

I-SEMESTER

CSIT 301 Introduction to Computer Application 1-0-2=2

Introduction to computes: History, evolution, Memory & Input/ Output/ Storage Devices.
Software: Type of software, System software, Application software, Introduction to MS-Word and MS Excel.
Operating systems: Definition, functions of operating system, Booting process of computer-warm and cold. Introduction to DOS and Windows Operating Systems.
Computer viruses: Types of computer virus, worms, Trojans, Security aspects.
Reference Books: Raja Raman, V. (2004), "Introduction to information technology". P.H.L Jain, V.K., "Information Technology", S.K. Kataria, V.K. Jain and Bhambri, Fundamentals of Information Technology", S.K. Kataria P.K. Sinha and P. Sinha, "Foundation of Computing", BPB.

Practical List:

- DOS- Internal /External commands.
- Format
- DIR
- COPY
- PATH
- VOL
- MD,C
- DEL TREE

* Windows- WNDOWS GUI, Desktop and its elements, Windows explorer Working with files and folder, setting time and date, Title Bar, Scroll Bar, Menu and Tool Bars.

* MS-Word- Text graphics, Text boxes, viewing the documents, Character and paragraph formatting, Page setup, header, footer.

MAS- 303 ELEMENTARY MATHEMATICS- I* 2-0-0=2

Algebra

Theory of quadratic, Binomial- theorem (for +ve index), Use of natural and common logarithms, exponential series, partial- factions, determinants of order 3, theory of Matrices, addition, subtraction, multiplication, transpose, elementary ideas on ad joint & inverse. Solution of linear equations, inequalities, permutation & combination.

Trigonometry

Trigonometrical - function, additions and subtractions formula, double and half angel formula laws of sines & consines, solutions, solutions of triangles, height & distance, real & complex- numbers, hyperbolic trigonometric functions, De-movire's theorem.

Coordinate – Geometry: Distance between two points, Area of triangle, straight- lines

LNG 300 English and Basic Technical writing 2-0-2=3

Language:

a. World Enrichment – Antonyms, Synonyms, One word substitution
b. Sentence – Types, Structure & Parts
c. Inflection – Noun
d. Tenses
e. Parts of Speech
f. Voice
g. Reading:

Comprehension

a. Listening
b. Reading
c. Writing

Composition

a. Précis Writing
b. Essay Writing
c. Letter Writing
d. CV
e. Resume

Books Prescribed:

- Martinet A. V. and Thomson: A Practical English Grammar IV ed. 1986 Oxford University Press, Delhi.
- Wren P. C., Martin H: High School English Grammar, revised ed. S. Chand & company LTD., New Delhi.
- Dickson, Grisalda J. S: Higgins's Technical Writing 2004, Godwin Publication Allahabad.
- Agarwal, Malti: Krishna's Professional Communication, KRISHNA Prakashan Media(P) Ltd. Meerut.

MBMT-349 INTRODUCTORY MICROBIOLOGY 2-0-2=3

General introduction to Dairy Microbiology

Microorganisms associated with milk and milk products: Bacteria, Yeasts, Molds and Viruses; Characteristics (morphological and biochemical) of important groups; Classification based on growth, temperature (psychrotrophs; mesophiles, thermodurics, and thermophiles)

Hygienic milk production: Possible sources of entry of microorganisms at various stages of production and

their control.

Microbiological changes in bulk refrigerated raw milk; role of psychrotrophic organisms and incidence of species; microbiological test for grading of raw milk- SPC and dye reduction tests.

Role of microorganisms in spoilage of milk and milk products: Microbial interactions (synergism, metabiosis, mutualism, commensalism); undesirable fermentations (souring, curdling, bitty cream, proteolysis, lipolysis); abnormal flavour and discoloration.

Mastitic Milk: Types of causative microorganism, somatic cells secreted in milk; their detection and significance from processing and public health point of view; effect on fermented milks.

Milk as a vehicle of pathogens; prevention of milk borne diseases.

Incidence and growth of emerging pathogens such as Listeria, Campylobacter, Yersinia and Vibrio.

Antimicrobial substance in milk: Immunoglobulins, lactoferrins, lysozyme, LP system, etc.

Microbiology of heat treated milk such as thermized, pasteurized, boiled, sterilized – UHT Milk; thermal destruction values.

Heat injury, damage and repair mechanism in bacteria.

Practicals

1. Morphological characteristics of common dairy organism (Shape, arrangement, size, motility, sporulation, etc).

2. Identification of common yeast and mold encountered in dairy products.

3. Enumeration of psychrotrophic, thermoduric and thermophilic microorganisms in milk.

4. Alternative methods for assessing viable counts in milk and milk products.

   a) Microcolony counts. b) Microdroplet method

5. Detection of sources of contamination: Air, water, feed, utensils, dung, equipment and personnel through on line testing.

6. Fermentative changes caused by microorganisms in milk

   (i) gassiness (ii) lipolysis (iii) ropiness (iv) proteolysis and (v) discolouration.

7. Tests for mastitis: pH, SLST, Somatic cell count, Chloride content, Hotis test, CAMP test, etc.

8. Detection of important pathogens using selective media and bio-chemical nests.

   (a) E. coli, (b) Staphylococcus (c) Salmonella (d) B. cereus

9. Detection and estimation of coliform; PCT, rapid coliforms test, MPN, total coliform counts. IMVic Tests

10. Dye reduction tests- MBRT, RRT, Tetrazolium tests

11. Tests for detection of antibiotic residues.

GPT – 301 MORAL AND VALUE EDUCATION 2-0-0=2

Objectives:

To mould the students with a good moral character.

To create awareness of the responsibility towards other creations.

To impart values of humanity and solidarity in the local, national and international levels.

1. **Background of Value education**

What is value education?

Importance of value education

Definition of values, Morals and Ethics.

The aims and objectives of value education

Culture and values and values crisis

Some areas of concern in value education-Education for peace, respect for life, Justice, issues of women, Job-oriented education, faith in god, Democracy, self respect, ecology, the meaning of success, Nobel truths in all religions.

2. **My country and my people**

Truly Indian, Really Modern, Deeply Human,

Nationalism and internationalism

The fundamental rights and duties of a Citizen.

3. **Inter personal relationship:**

Areas of inter personal relationship (the home, among friends etc.)

Issues hindering Inter-personal relationship, Towards improving Inter-personal relationship

4. **Personality Development:**

Definition of personality

Elements and stages of personality development.

5. **Motivations and will power:**

Motivation for study

Motivation and setting goals

Decision making

6. **Choice of Vocation/Career guidance:**

Sociologists and Psychologist's contribution

Implication for counseling

Youth and career (Objectives, components and career planning)

7. **Some issues and concerns in Moral Education:**

Morality and Religion (Traditional morality and religious faith, views and debates on morality and religion),Spiritual nature of man, Marriage, Love and sexuality, Aids, Abortion, War and Terrorism, Corruption as Omnibus, Drug addiction and Alcoholism, Tobacco and its Evils, Women issues (gender inequalities), Ecological crisis, Human right issues, Media and its impact, Value of work and time, Indian Education System, Human Communication.

Recommended Reading:

Jacob, Mani. Ed. Resource Book of Value Education (New Delhi, Institute of Value Education, 2002)

BCBT 303 ELEMENTS OF ANIMAL BIOCHEMISTRY 2-0-1=3

1. Concept of cells, organelles and tissues. Metabolism and its significance.
2. Carbohydrates- Definition, classification, properties, nutritional importance, their digestion and overview of metabolism.
3. Lipids- Definition, classification, properties, nutritional significance, digestion and overview of metabolism.
4. Proteins- Definition, classification, properties, nutritional significance, digestion and overview of metabolism.
5. Introduction to Enzymes and characteristics of enzymes, classification, active site concept, mechanism of enzyme action, enzyme inhibition.
6. Vitamins and Minerals and their roles in health and diseases. Animal Hormones- Origin, classification, functions, commercial uses of hormones in animal husbandry.

Practical:

1. Specific group tests for carbohydrates.
2. Specific group tests for amino acids.
3. Specific group tests for lipids nucleic acid.
4. Determination of haematocrit value of the blood sample.
5. Separation of serum and plasma from blood.
6. Qualitative tests of important constituents of plasma and serum.
7. Determination of bleeding and clotting time of blood.
8. Determination of the blood groups.
9. Qualitative tests for- CHO, proteins, nucleic acid and lipids.

AGRN- 315 FORAGE PRODUCTION 2-0-2=3

Introduction and classification of forage crops – herbs, shrubs, trees, grasses, legumes and others, common crops in each group, plant habits – annuals, 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.

Cultivation of important crops – Botanical name, common name, morphology, origin, package of practices, varieties, utilization, nutritive values, Jowar, Bajra, cowpea, Guar, Rice bean and tetrakalia, Oats, Berseem, Lucerne, Mustards, Japanrape, Chinese Cabbage, Hybrid Napier (Napier X Bajra) Para, Guinea, Dinanath, forage beer, Tapioca, fodder turnip, fodder trees.

Cropping schemes – drawing of modes schemes for supply of fodder all the year round under varied conditions-high medium, low marsyland irrigated non-irrigated and partly irrigated conditions.

Weeds – Definition, economic , harmful weed, common weeds and there use as fodder.

PRACTICALS

General Instruction to a fodder farm, study of hand tools and uses, study of bullock drawn implements, ploughing methods and practices – bullock drwn, operation of a disc harrow, operation of cultivator, rollers and wooden plants, Identification of manures and fertilizers, application of F.Y.M., application of fertilizers, compost making, Identification of forage crops, principal forage crops-non-irrigated and irrigated.

DT- 304 DAIRY DEVELOPMENT IN INDIA 2-1-0=3

Socio-economic and geographical features of Indian dairying.

Traditional systems of cattle keeping, estimates of milk production, utilization and sale; cattle and buffalo population and its distribution; trends in population growth, annual milk production and per capita availability; productivity profile of indigenous dairy stock, industrial by-products of livestock industry.

Five year plans and dairy development; resource inadequacy, post partition pressure; catalytic action of international aid; major aided dairy projects; public sector milk supply schemes; co-operative dairy

organizations, Anand Pattern and perspectives; milk products manufacture in private sector, import substitutions in dairy products

Strategy of cattle improvement; pioneering role of military dairy farms; key village scheme and its limitations, intensive cattle development programme: concept, approach and achievements.Public Sector Dairy Schemes, Economic burden performance analysis, National Dairy Development Board aims and objectives, policy orientation in dairy development.

Operation Flood - I, II, III : programmes and outlay, implementation, success, achievements, integrated infrastructure of milk production, improvement of dairy co-operative organization, Dairy Development Corporations, Co-operative Dairy Federations, Self-reliance in dairy development, income and employment potential.

Conversion of milk into products, utilization pattern: indigenous and western products. Dairy Problems and Policies

AHD – 305 Elements of Animal Husbandry 2 – 0 – 2 = 3

Animal Husbandry: Definition and its Important in Indian agriculture. Livestock statistics in India.

External anatomy of cattle, buffaloes, goat, sheep, pig and poultry.

Classification of feed and fodder used for livestock feeding.

Types of farming – mixed, diversified and specialized.

Signs of ill health in animals.

Preventive measures against diseases in farm animals.

Concept of animals breeding in farm animals.

Dairy farm records – Importance and their maintenance

Practical:

1. Introduction to dairy farm
2. External anatomy of cows, buffaloes, sheep, goat, pig and fowl.
3. Identification of tools used in A.H.
4. Identification of feeds and fodder used in A.H.
5. Signs of ill health
6. Familiarity with various records maintained on a dairy farm.

II Semester

MAS 304 Elementary Mathematics-II 2-0-0= 2

Real numbers coordinate line & planes, straight lines, function. Limits, properties, derivatives, differentiation of sine & cosine, continuity, properties of continues functions, differentiation of algebraic, trigonometric, logarithmic & exponential functions, product of functions, function of a function. Derivative as a rate change, maxima & minima of a single variable. Integral of a real function, integration by substitution, integral of trigonometric & transcendental function. Vector in a plane, vector function, sum & difference of vectors of vectors, dot & cross-product.

MBMT- 302 INTRODUCTORY DAIRY MICROBIOLOGY 2- 0-2=3

General Microbiology

Development of cell doctrine as a unit of life cell theory, abiotic and Probiotics origin of nucleotides, nucleic acid etc. Origin of life v/s origin of cells, gene hypotheses.

Introduction to microbiology, its history and development (microbiology and its sub-divisions, scope of microbiology, contributions of Leeuwenhoek, Pasteur, Koch, etc).

Microscope as a tool for the study of cell structures: principles of microscopy; simple and compound microscope, dark field microscope, ultra violet microscope, fluorescent microscope, electron microscope; uses of microscope; use of wet and stained preparations; difference between stains and dyes.

Structure and function of: prokaryotic cells and their organelles: eucaryotic cells and their organelles.

Principles of nomenclature & taxonomy: Adansonian's classification of micro- organism. Classification according to Bergey's manual of systematic bacteriology.

Physiology, growth and multiplication: definition of bacterial physiology and metabolism of bacteria, fungi and virus. Nutritional requirements of bacteria, fungi and virus. Bacterial growth curve, chemo stat, diauxy growth.

Physical and chemical factors affecting growth of microorganisms viz., Temperature, pH. Osmotic pressure, nutrients, bacteriostatic and bactericidal agents; estimation of bacterial growth. Bacterial genetics: structure of DNA. Difference between DNA & RNA.

Genetic recombination methods - transformation, transformation, conjugation, protoplast fusion, electroporation, bacterial mutations-spontaneous and induced mutagens.

Principle of immunology: innate and acquired immunity; differences between active and passive immunity; antigen and antibody reactions neutralization, precipitation and agglutination.

Microbiology of soil: microflora of soil; carbon, nitrogen and sulphur cycles.

Microbiology of water: microflora of water as carrier of pathogens; enumeration of coliform.

Microbiology of air Microflora of air samples: control of aerial contamination.

Practicals

1.General instructions for microbiological laboratory. Optical tools; microscope-simple and compound. Study of general microbiological equipments; autoclave, hot air oven, centrifuge, colorimeter, laminar air flow chamber, Seitz filter, membrane filter.

2. Simple staining - methylene blue; crystal violet; negative staining. Differential staining: gram's staining. Spore staining, capsular staining, acid fast staining.

3. Motility of microorganisms.

4. Size of microorganism by micrometry.

5. Microscopic examination of bacteria, yeasts, molds & protozoa.

6. Preparation of media: nutrient medium, simple & differential media.

7. Cultural characteristics of bacteria and fungi in broth and on agar media.

8. Effect of physical, chemical factors on bacterial growth such as temperature, pH, salt, sugar; bacteriostatic & bactericidal agents.

9. Enumeration of microorganisms in air. Enumeration of microorganisms in soil and rhizosphere and their morphological examination.

10.Enumeration of microorganisms in water: total viable count, coliforms (MPN), test for differentiation of *E. coli* and *Ent. aerogenes.*

11. Isolation techniques for microorganisms such as streaking, overlaying

DE- 412 FUNDAMENTALS OF DAIRY ENGINEERING 2-0-2 =3

1. Electrical machines: A.G. motors- principal parts function types, difference between generator and motor, maintenance of motor.

2. 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

3. 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.

4. Dairy machinery: milk cans- constructional features, metals used, types- conventional and insulated maintenance, handling cleaning, storage, Gerber's centrifuge- principles, construction function and maintenance.

5. 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.

(a)Phase induction motor with star delta and their functions, demonstration of operation, calculation of discharge.
(b) Demonstration of operation of dairy plant machinery. Study of the general features of feed grinder and mixture- principal parts and their function
(c)Acquaintance with soldering, gas, and arc welding equipment their functions and operations.

EXT – 301 DAIRY EXTENSION EDUCATION 2-0-2=3

Need, definition, philosophy, principles, approaches and objectives of extension education. Present status of extension programme. Teaching learning process, extension teaching methods, classification and selection of teaching methods. Nature and importance of communication. Key elements of communications. Models of communication, process, feedback and problems in communication. Importance of audio-visual aids in extension education, Classification, planning and selection of A. V. Aids, Photography as visual medium:

a) Introduction to photography b) Camera: types, formats, parts, and their functions.

c) Lenses: types, zoom, perspective control through lens.

d) Lighting: techniques in flash and artificial lighting.

e) Exposure: exposure techniques, exposure meters

f) Slide Preparation: composition, copying, developers, toners, mounting & labeling.

Identification of moral leaders, their characteristics, roles and functions in moral development, training of moral leaders. Definition of groups, natural types, principles of working with groups and their mobilization. Need, principles and steps of programme planning. Evaluation Procedure of extension programme. Diffusion of innovation and categories of farmers.

Practicals

I. Acquiring skill in use of audio-visual aids: Overhead Projector, Slide Projector, Use of VCR and PA system.

2. Preparation and use of visual aids and printed material:

Poster and chart, Flash card and flannel Graph Circular letter, leaflet, pamphlet, folder

3. Camera and camera parts, holding, focusing, and composing etc. Taking of picture.

4. Conducting a method demonstration

5. Slide Making of drawing/written matter, making of negative from photographs.

6. Making of 35 mm slide- processing chemicals, etc. Toning and mounting.

7. Identification of moral problems of nearby village farmers through interview method

DT- 302 MARKET MILK 3-0-2=4

Market milk industry in India and abroad: distinctive features of tropical dairying from those temperature climates.

Collection and transportation of milk. Identification of milkshed areas and planning procurement.

Organization of milk collection routes.

Practices for collection of milk: Options for collection/preservation of milk at farm Cooling, natural inhibitory substances in milk. Lactoperoxidase system, effect of m Transportation methods and organization of raw milk transport.

Reception and preliminary testing of milk at plant.

Processing of market milk:

Practices for reception, chilling, clarification, storage of raw milk. Homogenization of milk: definition, pretreatment of milk for homogenization, homogenization, synchronization of homogenization with HTST plant.

Effect of homogenization on physico-chemical properties of milk.

Bactofugation.

Thermal processing of milk:

Principles of thermal processing, kinetics of microbial destruction, thermal death curve, Arrhen equation.

Terminology used in thermal processing-'D-value', 'Z-value', 'QIO-value', 'Fo-value'.

Process description and definitions: Thermization, pasteurization, sterilization, UHT -processing. Thermization: significance and methods.

Pasteurization methods: LTLT/HTST, uperization, stassanization.

Manufacture of sterilized milk.

Manufacture of special milks: reconstituted recombined milks, flavoured milks, homogenized/ vitaminized

milks, lactose-hydrolysed milk.

UHT -processing of milk: Relevance of UHT -processing.

Description of UHT -plants - direct, indirect, upstream and downstream homogenization, third generation UHT plants.

Aseptic packaging: types of packaging approaches for sterilization of packages, filling systems. Shelf-life behaviour of UHT milk.

Quality assurance and technical control in UHT processing, design features, training of personnel, plant hygiene, tests for UHT milk.

Nutritive value of heat processed fluid milks.

Plant operation efficiencies for market milk.

Product accounting, setting up of norms for operational losses for fat and SNF, monitoring of operational efficiencies, training of personnel, maintaining plant hygiene.

Distribution system for heat processed milk

Practicals

1. Reception of milk at the plant.

2. Pre-treatment of raw milk: chilling, clarification, filtration.

3. Cream separation, standardization of milk.

4. Operation of LTLT, HTST pasteurizer, sterilizer and UHT plants.

5. CIP cleaning of storage tanks, cream separators, clarifiers, HTST plants

6. Preparation of special milks, vitaminized, homogenized milks, flavoured milk, toned, double toned, sterilized, recombined milks, lactose hydrolysed milk.

7. Homogenization efficiency of milk (USPH, curd tension).

8. Visit to market milk plant.

DC-302 CHEMISTRY OF MILK 2-0-2= 3

Constituents and gross composition of milk. Factors affecting composition of milk. Preservatives, neutralizers and adulterants in milk and their detection.

Nomenclature and classification of milk proteins. Casein: isolation, fractionation and chemical composition, physico-chemical properties of casein. Whey proteins: preparation of total whey proteins: (β-lactalbumin, (β -lactoglobulin. Properties of β -lactalbulin and (β -lactoglobulin. / Immunoglobulins and other minor

milk proteins and non-proteins nitrogen constituents of milk. Hydrolysis and denaturation of milk proteins under different physical and chemical environments. Estimation of milk proteins using different physical and chemical methods. Elementary idea about genetic polymorphism of milk proteins.

Milk enzymes with special references to lipases, xanthine oxidase, phosphatases, proteases and lactoperoxidase.

Milk carbohydrates their status and importance. Physical and chemical properties of lactose. Sugar amine condensation, amadori re-arrangement, production of hydroxy methyl furfural (HMF). Processing related degradation of lactose.

Definition, general composition and classification of milk lipids, nomenclature and general structure of glycerides, factors affecting the fatty acid composition. Milk phospholipids and their role in milk products. Unsaponifiable matter and fat soluble vitamins.

Milk salts: minerals in milk (a) major minerals (b) trace elements. physical equilibria among the milk salts.

Soft and hard water, temporary and permanent hardness of water, softening of hard water.

Milk contact surfaces and metallic contamination.

Practicals

Sampling techniques for chemical examination of milk.

Determination of pH and titratable acidity of milk.

Determination of fat in milk by different methods.

Determination of total solids and solids-not -fat in milk.

Determination of total milk proteins by Kjeldahl method.

Determination of casein. whey proteins and NPN in milk.

Estimation of alkaline phosphatase and lipase in milk.

Determination of lactose in milk.

Determination of ash in milk. .

Determination of phosphorus and calcium in milk

Determination of chloride in milk.

Determination of temporary and permanent hardness of water.

Estimation of available chlorine from bleaching powder.

AHD -306 DAIRY FARM GENERAL MANAGEMENT 3-0-2=4

Definition of Dairying, Present condition and status of Dairying in India, Relative importance of cattle, buffalo and goat in milk production. Milk- nutritive food, market demand, market supply and seasonal nature of milk production.
Economic dairy farming. Housing for dairy animals – objectives, advantages of adequate housing, selection of site and layout of dairy farm, Different systems of housing. Importance and utility of cattle fares, Transport of dairy animals. Care of newly born calf, care and management of heifers, dry stock, pregnant animals, breeding bulls, sanitary milk production, common dairy farm management practices viz.marking, dehorning/ disbudding, age determination, grooming etc.

Practical

1. Grooming of dairy animals
2. Marking of dairy animals
3. Identification of different equipments used on dairy farm.
4. Dehorning/disbudding
5. Estimation of body weight of dairy animals
6. Layout and design of barn
7. Cleaning and disinfection of dairy farm.
8. Judging of dairy animals.

AHD- 307 DAIRY ANIMAL NUTRITION 3-0-2 =4

Nutrients- Definition, classification and role in Animal Nutrition, Feeds and fodders : classification and nutritive value, Evaluation of feeds, Feeding standards, Ration : Balanced, maintenance, production and ideal ration, principles of rationing, desirable characteristics of good ration, formulation of balanced ration for different categories of dairy animals. Supply of green fodders round the year, feeding practices for dairy animals – Soiling system, silage, hay and pasturing. Agro-Industrial by products, new trends in feeding farm animals. Improvement in quality of feeds.

Practicals

1. Identification of feeds
2. Nutritive value of common feeds
3. Improving nutritive value of poor quality feeds
4. Nutritional requirements of dairy animals
5. Preparation of balanced ration for different classes of dairy animals.
6. Cropping scheme for green fodder supply
7. Systems of feeding dairy animals

SEMESTER III

MAS 322 STATISTICS 2-0-2=2

INTRODUCTION: Definition of statistics and its use and limitation; frequency distribution and frequency curves; measure of central tendency; characteristics of ideal average arithmetic mean; median; mode, merit and demerit of arithmetic mean; measure of dispersion; standard deviation, variance and coefficient of variation; probability: definition and concept of probability; normal distribution and its properties; introduction to sampling; random sampling; the concept of standard error; test of significance-type of errors, null hypothesis, level of significance and degree of freedom, steps involved in testing of hypothesis; large sample test SND test for means, single sample and double samples; small sample test for means, students t-test for single sample, two samples and paired t-test. F-test, chi-square test in 2x2 contingency table, Yates correction for continuity ;correlation ; types of correlation and identification through scatter diagram, computation of correlation coefficient ‘r’ and its testing . Linear regression; of Y on X and X on Y. Inter-relation between ‘r’ and regression coefficient. Fitting of regression equation.

Experimental design; basic design complete randomized design (CRD), layout and analysis Latin square design (LSD), layout and design.

Practical: construction of frequency distribution tables and frequency curves; computation of arithmetic mean for un-grouped and grouped data computation of median for un-grouped and grouped data; computation of mode for ungrouped and grouped data ,computation of standard deviation, variance and coefficient of variation for un-grouped and grouped data; and two samples student t-test for single sample; student-test for two samples; paired t-test F-test; chi –square test in2x2 contingency table, Yates correction for continuity; computation of correlation coefficient 'r' and its testing fitting of regression equation-y on x and x on y; analysis of CRD; RBD; and LSD.

MCE-303 INTRODUCTORY BIOTECHNOLOGY 2-0-0=2

Biotechnology

Definition scope and historical development of biotechnology.

Genetic code restriction endonucleases, vectors cloning strategies in bacteria and animals, animal cell culture.

Application of gene manipulation of various characters in dairy starters Protoplast and tissue culture

Application of biotechnology in medicine, agriculture, food and dairy industry environment and pollution control.

Concepts development of single cell protein and uses.

Genetic improvement of dairy starters and uses.

Practicals

1. Isolation of plasmid DNA from bacteria.
2. Restriction analysis of DNA.
3. Preparation of competent cell.

DT 401 TRADITIONAL DAIRY PRODUCTS 2-0-2 =3

Status of traditional milk products in India. Place of milk and milk products in the dietary regime in Indian population.

Khoa: classification of types, methods of manufacture, packaging and preservation. Factors affecting yield of *khoa.* Physico-chemical changes during manufacture and storage of *khoa.* Mechanization in manufacture of *khoa.*

Confections made from *khoa - Burfi, Peda, Lal peda, Milk* cake, *Kalakand, Gulbjamun,* compositional profile, manufacture practices. Nutritive value of *khoa* and *khoa-based* confections. *Rabri, Malai, Khurchan, Basundhi:* Product identification, process description, factors affecting yield. Rheological changes during manufacture

Chhana: product description, methods of manufacture, packaging and preservation.

Chhana-based sweets. Mechanization of manufacturing process.

Paneer: product description, methods of manufacture, packaging and preservation. Prospects for mechanization of paneer manufacturing/packaging process through innovative approaches and integration with newly emerging technologies. Physico-chemical changes during manufacture and storage. Nutritive value of *paneer.*

Shrikhand : *chakka,* product description, method of manufacture, small scale and industrial, packaging and preservation aspects. *Shrikhand-* product description, method of manufacture, small scale and industrial, packaging and preservation aspect. Physico-chemical changes and quality assurance during manufacture and storage. Process/product innovation - spray dried form of *shrikhand.*

Kheer and Pysam : product description, methods of manufacture, innovations in manufacturing/~ packaging processes. Interaction between milk and cereal constituents, rheological changes during manufacture and storage. In-can sterilization of kheer.

Cost of manufacture and storage of traditional milk products

Practicals

1. Preparation of *khoa* from cow, buffalo, concentrated and dried milk.
2. Analysis of *khoa* for total solids, moisture, fat, acidity.
3. Preparation of *kheer.*
4. Preparation of *chhana* from cow and buffalo milk and mixed milk.
5. Preparation of *paneer* from cow and buffalo milk and mixed milk.
6. Proximate analysis of *khoa, chhana* and *paneer.*
7. Preparation of *misti dahi, chhaka* and *shrikhand.*
8. Preparation of *khoa, chhana* based sweets.
9. Field trip.

ME- 502 REFRIGERATION AND AIR CONDITIONING 2-0-2=3

Basic refrigeration cycles and concepts: standard rating refrigerating machines, elementary vapour compression refrigeration cycle with reciprocating, rotary and centrifugal compressors.

Theoretical vapour compression cycle, departure from theoretical vapour compression cycle, representation on T -4> and p-h diagrams, mathelnatical analysis of vapour compression refrigeration system.

Refrigerants: primary and secondary refrigerants, common refrigerants (ammonia, freon), brine, their properties and comparison.

Multiple evaporator and compressor systems: applications, one compressor systems: dual compression, comparison of system, control of multiple evaporator system, working and mathematical analysis of

above systems.

Refrigeration equipments: compressor, condenser, evaporator, cooling tower, spray pond; basic elements of design, construction, operation and maintenance, balancing of different components of the system.

Refrigeration controls: low side and high side float valves, capillary tube, thermostatic expansion valve, automatic expansion valve, solenoid valve, high pressure and low pressure cutouts, thermostat, overload protector, common defects and remedies.

Refrigeration piping: purpose, materials, joint and fittings, water and brine pipe size selection. Absorption refrigeration systems: simple vapour absorption refrigeration systems, practical absorption system, refrigerant absorbent combinations absorption cycle analysis.

Psychometry: definition, properties of air-vapour mixtures, psychometric charts, processes involving air vapor mixtures, dehumidification, humidifiers, humidity measurements, humidity control.

Cooling load calculations: types of loads, design conditions for air cooling, air conditioning loads.

Cold storage: types of cold storage, types of loads in cold storage, construction of cold storage insulating materials and vapour barriers.

Practicals

l. To study tools used in installation of a refrigeration plant including charging and detection of leaks.

2. To study different parts and learn operation of bulk milk cooler.

3. To study different parts and learn the operation of refrigeration plant/ice plant using ammonia refrigerant.

4. To study different parts and learn the operation of a vapour absorption refrigeration plant.

5. To dismantle and assemble an open compressors and a sealed unit.

6. To study different parts and refrigeration controls of the following:

(a) Refrigerator (b) water cooler (c) deep freezer (d) compare their cooling coils and other systems.

7. To find out the rating (cooling rate) at different suction temperatures (temperature differences) and air handling capacity of the air-cooling unit.

8. To plot the practical refrigeration cycle on a pressure enthalpy diagram and to compare it with theoretical refrigeration cycle.

9. Study different parts and operation of a (a) air washer, (b) room cooler, (a) air conditioner, (d) chemical dehumidifiers, and (e) cooling.

10. To plot psychometric process: sensible heating & cooling, dehumidification & cooling and heating & humidification.

11. To study different humidity indicating, recording and controlling devices.

12. Problems on cold storage

13. Visit to cold storage.

FMP 411 DAIRY FARM ENGINEERING 2-0-2 = 3

Farm machinery and power: Conventional country tools & implements type, principal parts & functionsdeshi 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.

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.

1. 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.
2. 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.
3. Feed grinding and mixing machines: Constructional features, maintenance and improvements in trailors and animal drawn vehicles, functions, types, milk van tanker-types, constructional features and maintenance.
4. Meteorology: Introduction to agricultural meteorology, importance, study of meteorological instruments in an Agr met observatory.
5. 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)Acquaintance with carpentry tools- their functions and operations.

(f) Acquaintance with soldering, gas, and arc welding equipment their functions and operations.

(g) 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

AHD -403 RUMINANT NUTRITION 3-0-2 =4

Digestive system and digestion in ruminants, Rumen microbes – types and their role in utilization of feeds, Digestibility, digestibility co-efficient, digestibility trial- measurement of digestibility, factors affecting nutritive value and digestibility of feeds. Computation of economical ration for different categories of cattle and buffaloes, improving nutritive value of low grade roughages. Fodder preservation techniques: Silage – methods of preparation, ensiling, chemical changes, Hay – types, quality, curing, losses of nutrients during hay making,

Feeding of sheep and goats – principles of feeding, nutritional requirements, formulation of ration and methods of feeding.

Practical

- Familiarity with different equipments used in proximate analysis of feeds
- Study of feeds and fodders for ruminants
- Formulation of least cost ration for different classes of dairy animals
- Urea treatment of wheat straw
- Alkali treatment of paddy straw
- Feeding practices in sheep and goats
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AHD- 404 GOAT PRODUCTION MANAGEMENT 3-0-2 =4

Importance of goat farming in India, Annual production statistics of goat and goat products.

Breeds of goat- Indian and exotic breeds, Breeding management of goats. Feeding strategies for Goats, Grazing management of goats, Management of goats: Housing, Tethering, Determination of age, disbudding, castration, exercise, hoof trimming, Clean milk production, Care of doe at and after kidding , Care of newly born kids, Health care for Goats: preventive measures of common diseases, Health management. Economics of goat farming.

Practical

1. Body parts of goat
2. Identification of common tools used in Goat husbandry
3. Determination of age in goats
4. Disbudding in kids
5. Cleaning and disinfection of houses
6. Hoof trimming in goats
7. Economics of goat farming

BAM- 501 MARKETING MANAGEMENT & INTERNATIONAL TRADE 3-0-0=3

Concept of marketing: functions of marketing; concepts of marketing management; scope of marketing management; marketing management process: concept of marketing-mix, elements of marketing-mix.

Market structure and consumers buying behavior: concept of market structure, marketing environment-micro and macro environments; consumers buying behavior, consumerism.

Marketing opportunities analysis: marketing research and marketing information systems.

Market measurement-present and future demand; market forecasting; market segmentation, targeting and positioning. Allocation of marketing resources. Marketing planning process.

Product policy and planning: product mix; product line; product life cycle, new product development process, product brand, packaging, service decisions, marketing channel decisions. Retailing, whole selling and distribution.

Pricing decisions: price determination and pricing policy of milk products in organized and unorganized sectors of dairy industry.

Promotion mix decisions.

Advertising: how advertising works, deciding advertising objectives, deciding advertising budget, deciding advertising message, media planning.

Personal selling. Publicity. Sales promotion.

Food and dairy products marketing.

International marketing. and international trade, salient features of international marketing. Composition & direction of Indian exports.

International marketing environment.

Deciding which & how to enter international market.

Exports - direct exports, indirect exports, licensing, joint ventures, direct investment & internationalization process.

Deciding marketing programme: product, promotion, price, distribution channels. Deciding the market organization. World trade organization (WTO).

AEAB- 503 DAIRY ACCOUNTANCY AND AUDITING 2-1-0 =3

Concept of financial accounting; its subject matter, basic principles involve in accounting, classification and importance. Concept of Accounting procedure; Journal, Definition; Role of debates Concept of Double Entry System; meaning, advantages of Double Entry System Ledger: Its concept, necessity, types ruling, difference between Journal and Ledger Cash book; Meaning, types of cash, advantages, difference and similarities with ledger. 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. Format of sales return book

8. Format of sales book
9. Format preparation of Inventory
10. Preparation of Purchase register
11. Preparation of Sales register
12. Depreciation

SEMESTER IV

AHD- 402 PRINCIPLES OF ANIMAL GENETICS & BREEDING 3-0-2 =4

Introduction to Genetics, history of Genetics.
Cell mechanism: Cell division- Mitosis and Meiosis.
Mendel's laws of inheritance – Law of dominance, law of segregation, law of Independent assortment.
Linkage and Crossing over – Types, Significance and mechanism
Mutation: types and cause of mutation.
Variation: hereditary and non-hereditary.
Selection: Choosing traits for selection, selection objectives, principles of selection,
methods of selection: family selection, pedigree selection etc.

Practical

1. Familiarity with common Genetic terms
2. Study of animal cell
3. Problems on Mendelian laws of inheritance: monohybrid, dihybrid ratio etc.
4. Problems of on gene and genotypic frequencies.

AHD- 407 NON RUMINANT NUTRITION 3-0-2 =4

Digestive system of non-ruminants, importance of poultry nutrition, principles of feeding poultry, poultry feeds- classification and composition , nutritional requirement of different class of poultry – layer starter, layer grower, layers, broiler starter and broiler finisher, Methods of feeding poultry. Nutritional disorders in poultry.

Feeding of pigs-characteristic features of swine nutrition, parameters affected by quality of ration. Feeds for hogs, ration for different class of pigs viz.- weaners, growers ,finishers, pregnant sows and boar, Feeding strategies for pigs. Nutritional disorders in pigs.

Non-nutrient feed additives.

PRACTICAL

- Familiarity with feeding tools used in pigs and poultry
- Formulation of balanced ration for different class of poultry
- Preparation of ration for pigs
- Composition of poultry feeds and maximum level of inclusion of different feed ingredients in poultry ration.

AHD- 408 SHEEP PODUCTION MANAGEMENT 3-0-2 =4

Contribution of sheep industry in India and its statistics. Indian and exotic breeds of sheep, Artificial insemination in sheep, Grazing management of sheep, Feeding strategies of sheep, Care of ewe at and after lambing, care and management of newly born lamb, docking, marking in sheep. Sheep products: Sheep production statistics, Wool: Parameters for judging of wool quality, grading systems of wool. Economics of sheep farming

Practical:

1. Body parts of sheep
2. Marking of sheep
3. Shearing of wool, Grading of wool
4. Hoof trimming
5. Docking of lamb
6. Economics of sheep farming
7. Cleaning and disinfection of sheep farm

AHD -409 ANIMAL HEALTH & HYGIENE 3-0-2 =4

Observation on sick vs. healthy animals, sanitation.
Immunity – Types, modes and significance.
Immunization and vaccination of dairy cattle.
General preventive measures against infectious and contagious diseases.
Important diseases of dairy cattle their etiology, symptoms, diagnosis, prevention and control (H.S, B.Q, F.M.D, Anthrax, R.P, Brucellosis, Vibriosis, Trichomoniosis, Tick fever, Surra, and Mastits).
Animal quarantine.
Euthanasia of animals.

PRACTICAL

- Identification of veterinary tools and drugs.
- Estimation of pulse, respiration rate and body temperature.
- Lifting of legs, casting and securing of animals.
- Cleaning and disinfection of dairy farm.
- Diagnosis and treatment of sick animals.
- Faecal examination.
- Vaccination of dairy cattle.
- Collection of blood samples.
- Methods of administration of drugs.
- Prescription writing, common prescription in veterinary practices.

AHD -410 MEAT TECHNOLOGY 3-0-2 =4

Composition and nutritive value of meat tissues.
Abattoir Management and structure
Ante and post mortem examination
Factors affecting meat quality
Microbial and other deteriorative changes in meat and their identification.
Methods of slaughtering, Role of meat and products in Human nutrition.
Meat cutting, Packaging and transportation.

Preservation of meat, curing of pork Meat and meat products: Ham, sausages, nuggets, tikka kabab, kofta, pickles.

Practical

1. Familiarity with the tools and equipments used in slaughtering of animals and birds.
2. Pre- slaughtering, handling, killing, dressing and estimation of dressing percentage of birds.
3. Judging of meat and meat products of various animals.
4. Cut-up parts of carcass- display.
5. Evaluation of various meats (fresh and frozen).
6. Utilization of meat industry by products.

AEAB- 502 DAIRY ECONOMICS 2-0-0=2

Basic concepts-wants goods, wealthy, utility,

Consumption; demand and supply;

Consumer behaviour, Law of diminishing marginal utility

Law of equimarginal utility, concepts of cardinal and ordinal utility.

Theory of Demand – Law of Demand, Demand Schedule, Demand function.

Determination of demand, individual consumer demand and market demand, demand forecasting. Elasticity of demand, Income elasticity and cross elasticity.

Consumer's surplus Theory of Production-concepts of firm and industry.

Basic factors of production and their roles, production function for a single product, nature of production. Laws of Returns. Concepts of costs, fixed and variable costs, short-run and long-run costs, average and marginal costs. Economics & Dis-economies of scale.

Pricing and output under different market situations, market price and normal price, Price determination under perfect competition.

Monopoly, Oligopoly and Monopolistic competition.

Product pricing policies, pricing Decisions and pricing practices.

Normal Income, GDP, GNP, NNP, Disposable personal Income, Per Capita Income, Inflation.

SEMESTER V

DT- 503 BY-PRODUCTS TECHNOLOGY 2-0-2=3

Status, availability and utilization of dairy by-products in India and abroad. Associated economic and pollution problems. Physico-chemical characteristics of whey, buttermilk and ghee residue.

By-products from skim milk: Casein: Types of commercial casein, their specifications, manufacturing processes with basic principles involved, Industrial and food uses of casein.

Manufacture of sodium and calcium caseinates, their physico-chemical and functional properties and food applications. Manufacture of casein hydrolysate and its industrial application..

Co-precipitates: Types, their specifications, manufacturing processes with basic principles involved, functional properties and food applications.

Whey processing: Fermented products from whey, Beverages from whey, Deproteinized and dematerialized whey, condensed whey, Dried whey, types and their specifications, manufacturing techniques.

Utilization of whey products: Whey protein concentrates: methods of isolation with basic principles involved, physico-chemical

properties. Functional properties and food applications.

Lactose: methods for industrial production, refining, uses and hydrolysis of lactose.

Butter milk processing: condensed butter milk, dried butter milk.

Utilization of butter milk products.

Membrane technology for effective utilization of byproducts.

Ghee residue: composition, processing and utilization.

Techno-economic aspects of by-products utilization.

Management aspects of manufacture and newer applications to enhance profitability. Nutritional characteristics of by-products.

Practicals

1. Manufacture of edible casein from cow and buffalo milk.

2. Manufacture of rennet casein.

3. Manufacture of sodium caseinate.

4. Manufacture of calcium caseinate.

5. Manufacture of co-precipitates.

6. Isolation of whey proteins by cold precipitation technique.

7. Manufacture of whey protein concentrate by ultrafiltration.

8. Manufacture of whey drinks.

9. Manufacture of dried whey.

10. Manufacture of lactose.

11. Membrane concentration of skim milk, whey , etc.

12. Incorporation of whey protein concentrate in processed cheese foods.

13. Field trip.

DT-508 QUALITY ASSURANCE IN DAIRY INDUSTRY 2- 0- 4= 4

Dairy Chemistry

Importance of chemical quality control in dairy industry; setting up quality control laboratories and testing facilities; mobile testing laboratories.

Sampling procedures; labelling of samples for analysis; choice of analytical tests for milk and milk products for chemical analysis; instrumental methods of analysis.

Calibration of dairy glassware including butyrometers. pipettes, burettes. hydrometers. Lactometers and freezing point thermometer.

Preparation and standardization of reagents required in the analysis of milk and milk products.

Legislation on production, transport, processing and marketing of milk and milk products; application of

PFA, Agmark. BIS. IDF, ISO, IPO and international sanitary regulations related to dairy products to the quality control of milk and milk products.

Dairy effluents and their recycling.

Prediction of shelf-life behaviour and quality assurance in milk and milk products.

Dairy Microbiology

Selection of tests for microbiological analysis of milk and milk products and "their interpretations

Rapid methods of milk testing; non culture methods.

Organizational aspects of microbiological quality of dairy products.

Role of various agencies in the formulation of standards and controlling quality of dairy products. Various microbiological standards of BIS. PFA, ISO, CCFS for dairy products.

Quality of dairy water supplies and purification procedure and waste disposal. Treatment and disposal and waste water and effluent.

Dairy products borne infections and intoxications and of public health significance: Microbial toxins in dairy products and their significance in public health.

Detection and control measures.

Indicator organisms and their significance in dairy products: faecal and non-faecal coliform including faecal streptococci, total gram negative bacteria including salmonella and shigella group.

Predictions of shelf life behaviour and quality assurance in UHT processed/sterilized milk and milk products.

Application of HACCP in dairy industry.

Practicals

Dairy Chemistry

1. Calibration of dairy glassware such as pipette, burette, volumetric flasks, hydrometer, butyrometers.

2. Preparation and standardization of dairy reagents such as acids alkalies Na2Sp3' AgN03, Fehling's, EDTA solutions etc.

3. Detection of adulterants, preservatives and neutralizers in milk and milk products.

4. Chemical analysis of permissible additives used in milk and dairy products.

5. Chemical analysis of detergents and sanitizers.

6. Preparation and testing of Gerber H2SO4 used in fat determination.

7. Testing the amyl alcohol used for fat determination.

Dairy Microbiology

1. Evaluation of common sanitizing agents used in dairy plants by

(a) suspension

(b) capacity test.

2. Bacteriological quality analysis of dairy water (a) total viable counts - SPC

(b) total coliform counts - "MPN method

3. Determination of BOD in dairy waste

4. Microbiological tests for dairy effluent

5. Detection and enumeration of *Staphylococcus aureus* in dairy products

6. Detection of staphylococcal toxin in dairy products.

7. Detection of faecal and non faecal coliform and faecal streptococci in dairy products.

8. Detection of total gram negative bacteria, salmonella and shigella ? groups in dairy products.

9. Quality evaluation by HACCP in the preparation of dairy products.

AHD-501 REPRODUCTION, LACTATION & ARTIFICIAL INSEMINATION 3-0-2 =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. Lactogenenis and galactopoiesis, let down of milk.

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

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

AHD 502 POULTRY PRODUCTION 3-0-2 =4

Poultry keeping in India:-history, importance, status of poultry in India-various improvement programmes

Breeds: Breeds of Ducks, geese, Fowl, Quail, feeding management of poultry

Breeding: Reproductive systems of fowl, breeding management

Health care & Management: Hygiene and sanitation, common poultry diseases prevalent in India, vaccination programme for broilers and layers. Poultry housing & equipments, Management of layer and broiler.

Poultry products: Egg- structure & formation, composition, grading & preservation. Slaughter of poultry for meat. Defeathering, removal of waste, processing and preservation of meat.

Economics of poultry farming: Eggs and Broiler production.

Practical

1. Body parts of fowl
2. Visceral organ of domestic fowl
3. Slaughtering of poultry, evisceration, removing & cleaning of giblets, dressing percentages
4. Defeathering of Poultry
5. Determination of Egg quality - Candling and grading of eggs
6. Preservation of eggs
7. Sexing of chicks
8. Feeding, watering and space requirement of poultry under different housing systems.
9. Care of day old chicks
10. Post mortem of birds

AHD -503 ANIMAL FEED TECHNOLOGY 3-0-2=4

Feed Technology- Definition, significance. Feed industry- development in India, present condition and constraints faced by feed manufactures in India, feed manufacturing-feasibility of feed plants, Present status of feed resources, utilization of agro-industrial by products, processing of feeds- necessity, methods, advantages and their effect on nutritive value of feeds, feed mills, anti-nutritional factors. Storage of feeds and feed ingredients- factors affecting food value and deterioration during storage, Quality control of feeds.

PRACTICAL

- Design of feed plant,
- Maintenance of feed plant
- Preparing economical ration,
- Visit to feed manufacturing plant,
- Preparation of mineral mixture for farm animals.
- Processing of feeds

AHD - 505 SWINE PRODUCTION 3-0-2=4

Scope and importance of swine farming, statistics of swine industry

Important breeds of pigs in India, Guidelines for selection of sow and boar, Guidelines for normal reproduction in pigs, detection of heat in sows

Feeding management of pigs

Management practices for hogs, Housing of hogs, castration, management of sow before and after farrowing, Pig fenders, care and management of piglets at and after birth, Pig wallows, management at breeding (flushing), Needle teeth, preventive measures against common diseases of pigs.

Pork: Types and composition, Economics of pig farming.

Practical

- Body parts of pig
- Marking of pigs
- Removal of needle teeth
- Slaughtering of pigs
- Economics of pig farming
- Cleaning and disinfection of pig houses

ENVS- 415 ENVIRONMENTAL STUDIES- I 2+0+0= 2

1: Multidisciplinary nature of environmental studies

Definition, scope and importance, need for public awareness.

1. Ecosystems

• Concept of an ecosystem.
• Structure and function of an ecosystem.
• Producers, consumers and decomposers.
• Energy flow in the ecosystem.
• Ecological succession.
• Food chains, food webs and ecological pyramids.
• Introduction, types, characteristic features, structure and function of the following ecosystems :- a) Forest ecosystem, b) Grassland ecosystem ,c) Desert ecosystem, d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

3. Social Issues and the Environment

• From Unsustainable to Sustainable development
• Urban problems related to energy
• Water conservation, rain water harvesting, watershed management
• Resettlement and rehabilitation of people; its problems and concerns. Case Studies
• Environmental ethics : Issues and possible solutions.
• Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.
• Wasteland reclamation.
• Consumerism and waste products.
• Environment Protection Act.
• Air (Prevention and Control of Pollution) Act.
• Water (Prevention and control of Pollution) Act
• Wildlife Protection Act
• Forest Conservation Act
• Issues involved in enforcement of environmental legislation.
• Public awareness.

SEMESTER VI

BAM- 529 HUMAN RESOURCE MANAGEMENT 4-0-0=4

Management as a discipline: manager, managerial skills, management thoughts.

Managerial functions: planning, organizing, staffing, budgeting, coordinating, directing and controlling.

Responsibility, authority, power, decentralization of authority.

Human & organizational behavior: theory x & theory.

Value system of Indian managers.

Human resource management :concepts & principles. difference between HRM & personnel management.

Human resource policy: procurement, recruitment and selection. transfer & promotions.

Job enrichment & job enhancement.

Performance appraisal, job evaluation.

Grievances handling system, moral & productivity.

Motivation - meaning, characteristics, content theories.

Leadership - traits, styles, grid, leadership effectiveness.

AHD 506 COMMON AILMENTS OF LIVESTOCK 2-0-2=3

THEORY

- General observations of animal suffering from Ailments.
- Managemental practices to check the incidences of common ailments.
- **Ailments of digestive organs:** chocking, Impaction of rumen, Constipation, Diarrhoea, Dysentry, Stomatitis, and Tympanitis their causes, symptoms, control and treatment measures.
- **Other Ailments:** Pneumonia and Bronchitis, Epistaxis, Absces, Sore eye, Sore feet /foot rot, Coccidiosis, Food poisoning, Scalds and Burns.
- **Ailments associated with reproductive organs:** Abortion, Retention of Placenta, Prolapes of Vagina and Uterus, Brucellosis vibriosis, Trichomoniosis, Vagenitis, Metritis and Dystokia.
- **Ailments associated with mammary system:** Dermetitis, Chopped teat, Teat wounds, Teat closure, Hard milker, Leaky teats, Teat fistula and Milk fever.
- **Ailments of calves:** Calf scour, Calf Pneumonia, Milk Tateny, Sore mouth, Naval ill and Paratyphoied.

PRACTICALS

- Common symptoms and diagnosis of ailments under field condition.
- Securing and treatment of a sick animals.
- Treatment of animal suffering from food poisoning.
- Handling a case of retention of Placenta.
- Handling a case of Dystokia.
- Naval treatment.

- Agglutination test to Diagnose Brucellosis in breeding animals.
- Collection of Vulval discharge or perpetual wash to diagnose diseases of reproductive system.
- Preparation of common Prescriptions used in the treatment of simple ailments of animals. (Ointments, Liniments, Lotions, Powders, Oral mixture etc.)
- Handling a case of foot rot, shoeing, trimming of hooves etc.

AHD 507 BREEDS AND BREEDING 2-0-2=3

General introduction, Important breeds of dairy animals:- Their origin, characteristics and utility, systems and methods of breeding of different dairy farm animals- Cows, Buffaloes, Sheep, Goat, Pigs and Poultry. Culling of layers in poultry. Construction of sire indices. Inbreeding coefficient and its application, limitations etc.

Practicals

- Familiarity of common terms used in breeds and breeding.
- Study of various economic traits in Zebu, Crossbreds and buffalo breeds.
- Study of records maintained in a cattle breeding Farm.
- Preparation of history and pedigree sheets.
- Selection of animals based on history and pedigree records.
- Preparation of sire indices and calculations.
- Study of Inbreeding coefficient.

AHD 508 ANIMAL PHYSIOLOGY 2-0-2=3

cell and their function physiology Animal cell-different organelle of of system of ruminant and non-ruminant endocrine system-Role of hormones in lactation and reproduction,physiology of reproductive system of farm animals adaptation of farm animals,factors affecting productive and reproductive efficiency of animals.

AHD 509 BUFFALO PRODUCTION MANAGEMENT 2-0-2=3

General introduction: Importance and significance of buffalo rearing – in India and related statistics.

Breeds and breeding of buffaloes:

Important breeds of buffalo in India, Breeding management of buffaloes, Management of buffaloes to mitigate heat stress.

Feed and feeding of buffaloes: Nutrients and their functions, classification of feeds and fodder, Nutrients requirement in buffaloes

Management of buffaloes: Rearing and management of Calves' management and care of milking herd, watering and wallowing Routine management practices viz: making disbudding castration etc. in buffaloes. Prevention of common diseases in buffaloes. Common buffalo's calf aliments. Nutritional diseases in buffaloes

Practical

1. Identification of various tools used – in Buffaloes management
2. Clearing and disinflation of barn
3. Wallowing and bathing buffaloes
4. Identification of feeds and fodder
5. Computation of ration
6. Feed distribution to buffaloes
7. Identification of buffaloes
8. Handling and leading of buff

SEMESTER VII

ENVS- 416 ENVIRONMENTAL STUDIES- II 2+0+0=2

1. Natural Resources :

Renewable and non-renewable resources :

Natural resources and associated problems.

a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber

extraction, mining, dams and their effects on forest and tribal people.

b) Water resources : Use and over-utilization of surface and ground water, floods,

drought, conflicts over water, dams-benefits and problems.

c) Mineral resources : Use and exploitation, environmental effects of extracting and using

mineral resources, case studies.

d) Food resources : World food problems, changes caused by agriculture and over-grazing,

effects of modern agriculture, fertilizer-pesticide problems, water logging,

salinity, case studies.

e) Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.

f) Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

• Role of an individual in conservation of natural resources.

• Equitable use of resources for sustainable lifestyles.

2. **Biodiversity and its conservation**

• Introduction – Definition : genetic, species and ecosystem diversity.

• Biogeographical classification of India

• Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values

• Biodiversity at global, National and local levels.

• Inida as a mega-diversity nation

• Hot-sports of biodiversity.

• Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.

• Endangered and endemic species of India

• Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity

3. **Environmental Pollution** (8 lectures)

Definition: Cause, effects and control measures of:-

a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution

e. Noise pollution f. Thermal pollution g. Nuclear hazards

• Solid waste Management: Causes, effects and control measures of urban and Industrial wastes.

• Role of an individual in prevention of pollution.

• Pollution case studies.

• Disaster management: floods, earthquake, cyclone and landslides.

AHD -504 EGG TECNOLOGY 3-0-2=4

Reproductive organs of fowl and formation of egg,
Egg structure, nutritive value of egg, Egg as food.
Collection, handling and storage of fresh eggs.
Evaluation of eggs: Shape, size of eggs and methods of preservation of fresh eggs,
Storage and incubation of eggs.
Examination of quality of raw egg: - External and internal examination.
Packaging and transportation of eggs.

Practicals:

- Collection and handling of fresh eggs.
- Cleanliness of eggs
- Selection of eggs for incubation
- Defects in eggs and their grading
- Study of reproductive organs of fowls.
- Study of Egg parts.
- Preparation of egg products
- Examination of eggs: without breaking and after breaking
- Methods of preservation of eggs.

AHD- 506 COMMON AILMENTS OF LIVESTOCK 3-0-2=4

THEORY

General observations of animal suffering from Ailments.
Managemental practices to check the incidences of common ailments.
Ailments of digestive organs: chocking, Impaction of rumen, Constipation, Diarrhoea, Dysentery, Stomatitis and Tympanitis- their causes, symptoms, control and treatment. Other Ailments: Pneumonia and Bronchitis, Epistaxis, Abscess, Sore eye, Sore feet / foot rot, Coccidiosis, Food poisoning, Scalds and Burns. Ailments associated with reproductive organs: Abortion, Retention of Placenta, Prolaps of Vagina and Uterus, Brucellosis vibriosis, Trichomoniosis, Vaginitis, Metritis and Dystokia. Ailments associated with mammary system: Dermatitis, Chopped teat, Teat wounds, Teat closure, Hard milker, Leaky teats, Teat fistula and Milk fever. Ailments of calves: Calf scour, Calf Pneumonia, Milk Tetany, Sore mouth, Naval ill and Paratyphoid.

PRACTICALS

- Common symptoms and diagnosis of ailments under field condition.
- Treatment of sick animals.
- Handling a case of retention of Placenta,
- Handling a case of Dystokia.
- Navel treatment.
- Agglutination test to Diagnose Brucellosis in breeding animals.
- Collection of Vulval discharge or perpetual wash to diagnose diseases of reproductive system.

- Preparation of common Prescriptions used in the treatment of simple ailments of animals. (Ointments, Liniments, Lotions, `Powders, Oral mixture etc.)

AHD- 507 BREEDS AND BREEDING 3-0-2=4

General introduction, Important breeds of dairy animals: Their origin, characteristics and utility, systems and methods of breeding of different farm animals- Cows, Buffaloes, Sheep, Goat, Pigs and Poultry. Culling of layers in poultry. Construction of sire indices. Inbreeding coefficient and its application, limitations etc.

Practicals

- Familiarity of common terms used in breeds and breeding.
- Study of various economic traits in Zebu, Crossbreds and buffalo breeds.
- Study of various records maintained on a livestock Farm.
- Preparation of history and pedigree sheets.
- Selection of animals based on history and pedigree records.
- Preparation of sire indices and calculations.
- Study of Inbreeding coefficient.

AHD 508 ANIMAL PHYSIOLOGY 3-1-0=4

Animal cell- different organelles and their functions. Digestive of system of ruminant and non-ruminant, endocrine system-Role of hormones in lactation- lactogenesis, galactopoiesis , Let-down of milk and reproduction, physiology of reproductive system of farm animals, adaptation of farm animals, factors affecting productive and reproductive efficiency of animals. Blood- Constituents, composition and properties.

AHD- 509 BUFFALO PRODUCTION MANAGEMENT 3-0-2=4

General introduction: Importance and significance of buffalo rearing in India and related statistics.
Important breeds of buffaloes, Management of buffalo to mitigate the heat stress.
Management of buffaloes: Rearing and management of calves, Feeding management of buffaloes.
Management and care of milking herd, watering and wallowing, routine management practices viz: marking, disbudding, castration etc. in buffaloes. Prevention of common diseases in buffaloes, common buffalo's calf aliments.

Practical

9. Identification of various tools used in Buffalo management
10. Wallowing and bathing in buffaloes
11. Marking in buffaloes
12. Handling and leading of buffalo
13. Disposal of barn waste
14. Design and layout of dairy barn

SEMESTER VII

AHD -697 Hands-on-training and Experiential Learning 0-0-50=25

SEMESTER VIII

AHD-698 In plant/On farm training 0-0-40=20

AHD 699 Training Report evaluation 0-0-10=05