SRI VENKATESWARA UNIVERSITY - TIRUPATI

B.Sc. Honours in Dairy Science-MAJOR

w.e.f. AY 2024-25 onwards

COURSE STRUCTURE

Year	Semester	Course	Title	No. Hrs./ Week	No. of Credits
I	I	1	Introduction to Classical Biology	5	4
		2	Introduction to Applied Biology	5	4
	II	3	Breeds and Breeding of Dairy Cattle and Buffaloes - (T)	3	3
			Breeds and Breeding of Dairy Cattle and Buffaloes - (P)	2	1
		4	Dairy Cattle Nutrition - (T)	3	3
			Dairy Cattle Nutrition - (P)	2	1
II	III	5	Dairy Chemistry (Chemistry of Fluid Milk) - (T)	3	3
			Dairy Chemistry (Chemistry of Fluid Milk) - (P)	2	1
		6	Dairy Microbiology (Microbiology of Market Milk - (T)	3	3
			Dairy Microbiology (Microbiology of Market Milk - (P)	2	1
		7	Dairy Farm Management - (T)	3	3
			Dairy Farm Management - (P)	2	1
		8	Management of Sheep and Goats - (T)	3	3
			Management of Sheep and Goats - (P)	2	1
	IV	9	Processing of Milk - (T)	3	3
			Processing of Milk - (P)	2	1
		10	Technology of Cheese and Fermented Milks - (T)	3	3
			Technologyof Cheese and Fermented Milks - (P)	2	1
		11	Technology of Fat-Rich Dairy Products - (T)	3	3
			Technology of Fat-Rich Dairy Products - (P)	2	1

Semester–1

Course-1: Introduction to Classical Biology

Theory: Credits - 4

Learning objectives

The student will be able to learn the diversity and classification of living organisms and understand their chemical, cytological, evolutionary and genetic principles.

Learning Outcomes

1. Learn the principles of classification and preservation of biodiversity
2. Understand the plant anatomical, physiological and reproductive processes.
3. Knowledge on animal classification, physiology, embryonic development and their economic importance.
4. Outline the cell components, cell processes like cell division, heredity and molecular processes.
5. Comprehend the chemical principles in shaping and driving the macromolecules and life processes.

Unit-1: Introduction to systematics, taxonomy and ecology

1.1. Systematics – Definition and concept, Taxonomy – Definition and hierarchy.
1.2. Nomenclature – ICBN and ICZN, Binomial and trinomial nomenclature.
1.3. Ecology – Concept of ecosystem, Biodiversity and conservation.
1.4. Pollution and climate change.

Unit- 2: Essentials of Botany

2.1. The classification of plant kingdom.
2.2. Plant physiological processes (Photosynthesis, Respiration, Transpiration, phytohormones).
2.3. Structure of flower – Micro and macro sporogenesis, pollination, fertilization and structure of mono and dicot embryos.
2.4. Mushroom cultivation, floriculture and land scaping.

Unit- 3: Essentials of Zoology

3.1. The classification of Kingdom Animalia and Chordata.
3.2 Animal Physiology – Basics of Organ Systems & their functions, Hormones and Disorders
3.3 Developmental Biology – Basic process of development (Gametogenesis, Fertilization, Cleavage and Organogenesis)
3.4 Economic Zoology – Sericulture, Apiculture, Aquaculture

Unit-4: Cell biology, Genetics and Evolution

4.1. Cell theory, Ultrastructure of prokaryotic and eukaryotic cell, cell cycle.
4.2. Chromosomes and heredity – Structure of chromosomes, concept of gene.
4.3. Central Dogma of Molecular Biology.
4.4. Origin of life

Unit -5: Essentials of chemistry

5.1. Definition and scope of chemistry, applications of chemistry in daily life.
5.2. Branches of chemistry
5.3. Chemical bonds – ionic, covalent, non-covalent, Vander Waals, hydrophobic, hydrogen bonds.
5.4. Green chemistry

Reference Books:

1. Sharma, O.P. 1993. Plant taxonomy. 2nd Edition. McGraw Hill publishers.
2. Pandey, B.P. 2001. The text book of botany Angiosperms. 4th Edition. S. Chand publishers, New Delhi, India.
3. Jordan, E.L. and Verma, P.S. 2018. Chordate Zoology. S. Chand publishers, New Delhi, India.
4. Rastogi, S.C. 2019. Essentials of animal physiology. 4th Edition. New Age International Publishers.
5. Verma, P.S. and Agarwal, V.K. 2006. Cell biology, genetics, Molecular Biology, Evolution and Ecology. S. Chand publishers, New Delhi, India.
6. SathyanarayanaU. and Chakrapani, U. 2013. Biochemistry. 4th Edition. Elsevier publishers.
7. Jain, J.L., SunjayJain and Nitin Jain. 2000. Fundamentals of Biochemistry. Scand publishers, New Delhi, India.
8. Karen Timberlake and William Timberlake. 2019. Basic chemistry. 5th Edition. Pearson publishers.
9. Subrata Sen Gupta. 2014. Organic chemistry. 1st Edition. Oxford publishers.

Activities:

1. Make a display chart of life cycle of non-flowering plants.
2. Make a display chart of life cycle of flowering plants.
3. Study of stomata
4. Activity to prove that chlorophyll is essential for photosynthesis
5. Study of pollen grains.
6. Observation of pollen germination.
7. Ikebana.
8. Differentiate between edible and poisonous mushrooms.
9. Visit a nearby mushroom cultivation unit and know the economics of mushroom cultivation.
10. Draw the Ultrastructure of Prokaryotic and Eukaryotic Cell
11. Visit to Zoology Lab and observe different types of preservation of specimens
12. Hands-on experience of various equipment – Microscopes, Centrifuge, pH Meter, Electronic Weighing Balance, Laminar Air Flow
13. Visit to Zoo/Sericulture/Apiculture/Aquaculture unit
14. List out different hormonal, genetic and physiological disorders from the society

Semester–1

Course-2: Introduction to Applied Biology

Theory: Credits-3

Learning objectives

The student will be able to learn the foundations and principles of microbiology, immunology, biochemistry, biotechnology, analytical tools, quantitative methods, and bioinformatics.

Learning Outcomes

1. Learn the history, ultrastructure, diversity and importance of microorganisms.
2. Understand the structure and functions of macromolecules.
3. Knowledge on biotechnology principles and its applications in food and medicine.
4. Outline the techniques, tools and their uses in diagnosis and therapy.
5. Demonstrate the bioinformatics and statistical tools in comprehending the complex biological data.

Unit-1: Essentials of Microbiology and Immunology

1.1. History and Major Milestones of Microbiology; Contributions of Edward Jenner, Louis Pasteur, Robert Koch and Joseph Lister.

1.2. Groups of Microorganisms – Structure and characteristics of Bacteria, Fungi, Archaea and Virus.

1.3. Applications of microorganisms in– Food, Agriculture, Environment and Industry.

1.4. Immune system – Immunity, types of immunity, cells and organs of immune system.

Unit- 2: Essentials of Biochemistry

2.1. Biomolecules - I: Carbohydrates, Lipids.

2.2. Biomolecules - II: Amino acids and Proteins.

2.3. Biomolecules – III: Nucleic acids –DNA and RNA.

2.4. Basics of Metabolism – Anabolism and catabolism.

Unit -3: Essentials of Biotechnology

3.1. History, scope, and significance of biotechnology. Applications of biotechnology in Plant, Animal, Industrial and Pharmaceutical sciences.

3.2. Environmental Biotechnology –Bioremediation and Biofuels, Biofertilizers and Biopesticides.

3.3. Genetic engineering –Gene manipulation using restriction enzymes and cloning vectors; Physical, chemical, and biological methods of gene transfer.

3.4. Transgenic plants–Stress tolerant plants (biotic stress–BT cotton, abiotic stress–salt tolerance). Transgenic animals – Animal and diseasemodels.

Unit-4: Analytical Tools and techniques in biology – Applications

4.1. Applications in forensics – PCR and DNA finger printing

4.2. Immunological techniques – Immunoblotting and ELISA.

4.3. Monoclonal antibodies – Applications in diagnosis and therapy.

4.4. Eugenics and Gene therapy

Unit-5: Biostatistics and Bioinformatics

5.1. Data collection and sampling. Measures of central tendency – Mean, Median, Mode.

5.2. Measures of dispersion – range, standard deviation and variance. Probability and tests of significance.

5.3. Introduction, Genomics, Proteomics, types of biological data, biological data bases- NCBI, EBI, Gen Bank; Protein 3D structures, Sequence alignment

5.4. Accessing Nucleic Acid and Protein databases, NCBI Genome Workbench

Reference Books:

1. Gerard, J., Tortora, BerdellR. Funke, Christine L. Case. .2016. Microbiology: An Introduction. 11th Edition. Pearson publications, London, England.
2. Micale, J. Pelczar Jr. E. C.S.Chan., Noel R. Kraig. 2002. Pelczar Microbiology. 5th Edition. McGraw Education, New York, USA.
3. Sathyanarayana, U and Chakrapani, U. 2013. Biochemistry. 4th Edition. Elsevier publishers.
4. Jain J.L., Sunjay Jain and Nitin Jain. 2000. Fundamentals of Biochemistry. S. Chand publishers, New Delhi, India.
5. R.C. Dubey. 2014. Advanced Biotechnology. S. Chand Publishers, New Delhi, India.
6. Colin Ratledge, Bjorn and Kristiansen, 2008. Basic Biotechnology. 3rd Edition. Cambridge Publishers.
7. U. Sathyanarayana, 2005. Biotechnology. 1st Edition. Books and Allied Publishers pvt. ltd., Kolkata.
8. Upadhyay and Nath. 2016. Biophysical Chemistry - Principles and Techniques. Himalaya Publishing House.
9. Arthur M. Lesk. Introduction to Bioinformatics.5th Edition. Oxford publishers.
10. A P Kulkarni. 2020. Basics of Biostatistics. 2nd Edition. CBS publishers.

Activities:

1. Identification of given organisms - harmful or beneficial.
2. Observation of microorganisms from house dust under microscope.
3. Finding microorganisms from pond water.
4. Visit to a microbiology industry or biotech company.
5. Visit to a waste water treatment plant.
6. Retrieving a DNA or protein sequence of a gene'
7. Performing a BLAST analysis for DNA and protein.
8. Problems on biostatistics.
9. Field trip and awareness programs on environmental pollution by different types of wastes and hazardous materials.
10. Demonstration on basic biotechnology lab equipment.
11. Preparation of 3D models of genetic engineering techniques.
12. Preparation of 3D models of transgenic plants and animals.

[**NOTE**: In the colleges where there is availability of faculty for microbiology and biotechnology, those chapters need to be handled by microbiology and biotechnology faculty. In other colleges, the above topics shall be dealt by Botany and Zoology faculty]

II Semester

Course- 3: Breeds and Breeding of Dairy Cattle and Buffaloes

Theory: Credits-3

Unit-1: Livestock census; Breeds of Dairy cattle, Buffaloes and Goats. Indigenous, Exotic and Crossbred Cattle breeds – Classification of Indian breeds of cattle based on utility - Classification of Indian breeds of buffaloes –Conservation of indigenous local breeds of cattle. (**15Lectures)**

Unit-2: Anatomy of Udder; Development of udder; Lactogenesis and Galactopoiesis; Letdown of milk – Composition of milk and colostrum – Difference between milk of cows, buffaloes and goats. **(10 Lectures)**

Unit-3: Artificial insemination - advantages and disadvantages. Differences between natural service and artificial insemination. Oestrous cycle; Symptoms of heat in cows and buffaloes. Conception, Pregnancy diagnosis in cattle. Multi-ovulation and embryo transfer technique. Cloning. **(15 Lectures)**

Unit-4: Economic traits of Dairy cattle - factors influencing yield and composition of milk. Methods of selection of dairy animals – progeny testing program. **(15 Lectures)**

Unit-5: Systems of Dairy cattle breeding. Inbreeding, Outbreeding, Cross breeding, Grading up. Breeding systems suitable to enhance milk production in India (Cross breeding of cattle and grading up of buffaloes). **(5 Lectures)**

II Semester

Course- 3: Breeds and Breeding of Dairy Cattle and Buffaloes

Practical: Credits-1

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1. Points dairy cow.
2. Identification of different breeds of dairy cattle and buffaloes.
3. Male and female reproductive systems.
4. Symptoms of heat in cow and buffalo.
5. Artificialinsemination.
6. Pregnancy diagnosis in cattle.
7. To study the comparative merits of cows and buffaloes ; zebu and crossbred cows.
8. Differences between swamp and river water buffaloes.
9. Importance of dairy wedges in dairy animals' election.

Reference Books:

1. Text book of Animal Husbandry -GC Banerjee
2. Handbook of Animal Husbandry- ICAR Edition
3. Principles and practices of Dairy Farm –Jagdish Prasad

II Semester

Course-4: Dairy Cattle Nutrition

Theory: Credits-3

Unit-1:

Classification of Feeds and Fodders. Importance of proteins, fats and carbohydrates in livestock feeding – Importance of vitamins and minerals in cattle feeding - (**15 Lectures)**

Unit-2:

Conservation of Fodder–Hay and Silage –Fodder security measures during summer and drought seasons - (**10 Lectures)**

Unit- 3:

Feeding standards; Balanced rations for Dairy cattle; Feeding practices of Dairy cattle (i) Soiling, (ii) Ensiling, (iii) Pasturing, (iv) Hay feeding, (v) General feeding practices with regard to management – Azolla feeding - Hydroponic fodder production - **(20 Lectures)**

Unit-4:

Types of Fodder varieties - legumes and non-legumes, seasonal and perennial fodder crops. Cultivation practices of fodder crops - Para grass, Hybrid Napier, Berseem, Cow pea, Jowar – fodder trees – Silvi pasture system – Horti pasture system - **(10 Lectures)**

Unit-5:

Utilization of agricultural and industrial by-products for livestock feeding. Enrichment of poor-quality roughages – Urea treatment of paddy straw – Total mix ration (TMR) - **(5 Lectures)**

II Semester

Course - 4: Dairy Cattle Nutrition

Credits-1

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1. Identification of feeds and fodders.
2. Computation of rations.
3. Hay making.
4. Silage making.
5. Estimation of dry matter of feed or fodder.
6. Cultivation of fodder crops.
7. Preparation of ration schedules for different categories of animals-calves, young, heifers, pregnant, and lactating animals.

Reference Books:

1. Text Book of Animal Husbandry-GC Banerjee
2. Principles and practices of Dairy Farm –Jagdish Prasad
3. Animal Nutrition and Feeding Practices–Surendra K. Ranjhan
4. Dairy Chemistry and Animal Nutrition – M. M. Rao

III Semester
Course-5: Dairy Chemistry (Chemistry of Fluid Milk)
Theory: Credits-3

Unit-1: Composition of Milk: Definition of milk as per FSSAI, composition of cow milk, differences in the composition of milk from cow, buffalo, goat, sheep, human. Colostrum: Significance, Composition, difference between normal milk and colostrum

Unit-2: Constituents of milk: Minor and major constituents; proteins, casein, whey proteins, NPN compounds, milk fat, triglycerides, phospholipids, sterols, fat globule membrane, enzymes in milk and their significance.

Unit-3: Factors affecting composition and yield of milk –Species, Breed, individuality, Stage of lactation, Age of the animal, Season, Interval between milking, Stage of milking, Feed, Estruses, Exercise, Milker and Drugs.

Unit-4: Physico-chemical properties of milk - Color, Flavor, Density and Specific gravity, Freezing point, Boiling point, Surface tension, Viscosity, Specific heat, Refractive index, Electrical conductivity, pH and acidity, Ionic balance. Physico chemical constants of milk fat – RM value, Polenske value, Saponification value, Iodine number.

Unit-5. Nutritive value of milk. Platform tests; Tests for detection of adulteration of milk; Preservatives and Neutralizers. FSSAI Specifications for milk.

III Semester
Course-5: Dairy Chemistry (Chemistry of Fluid Milk)
Practical: Credits-1

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1. Estimation of specific gravity of milk.
2. Estimation of Fat in milk.
3. Estimation of SNF in milk.
4. Estimation of Protein in milk using Pyne's constant.
5. Estimation of acidity in milk.
6. Estimation of pH in milk.
7. Platform tests.
8. Tests for detection of adulteration of milk.
9. Tests for Preservatives and Neutralizers.
10. Comment on the quality of given milk sample.

Reference Books:

1. Dairy Chemistry and Animal Nutrition- M. M. Roy
2. Text of Practical Dairy Chemistry- N. K. Roy
3. Fundamentals of Dairy Chemistry -Webb Johnson and Alfred
4. Dairy Chemistry and Physics – Pieter Walstra and Robert Jenness.
5. Fundamentals of Dairy Chemistry -Noble, P.W.

III Semester

Course-6: Dairy Microbiology (Microbiology of Market Milk)

Theory: Credits-3

Unit-1: Definition, Microscopy–Simple, Compound-bright-field microscopy. Structure and functions of prokaryotic cells; Taxonomy of Microorganisms - Classification, nomenclature, identification; Differences between cell wall of Gram-positive and Gram-negative bacteria.

Unit-2: Sources of contamination of milk and their control: exterior of the animal, interior of the udder, utensils, water, milkers, flies and insects, soil and manure, milking barn, cattle shed and surroundings. Methods of clean milk production.

Unit-3: Sources and Significance of specific groups of microorganisms in milk i.e. psychrotrophic, mesophilic, thermoduric and thermophilic bacteria – their morphological and biochemical characteristics. Types of Microorganisms in milk such as acid producing, gas producing, protein splitting, fat splitting microbes; Pathogens associated with raw milk and inert organisms.

Unit-4: Chemical changes observed during storage of milk and abnormal fermentations observed in milk: souring, gassy fermentation, proteolysis, lipolysis, ropiness, and flavour fermentations. Factors affecting growth of bacteria, Common nutrient requirements and nutritional types of microorganisms.

Unit-5: Milk borne diseases: bacterial, viral and other diseases. Microbiological examination of milk: direct microscopic count, standard plate count, methylene blue reduction test, resazurin reduction test and coliform test. Microbiological grading and legal standards of raw and processed milk.

III Semester

Course-6: Dairy Microbiology (Microbiology of Market Milk)

Practical: Credits-1

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1. Microbiological equipment; autoclave, hot air oven, incubator, centrifuge, colorimeter, laminar airflow, membrane filter.
2. Staining of Microbes: Simple staining (methylene blue) and Differential staining (Gram).
3. Preparation of commonly used growth media liquid and solid.
4. Grading of raw milk by direct microscopic count.
5. Grading of raw milk by standard plate count.
6. Grading of raw milk by coliform counts.
7. Grading of raw milk by methylene blue reduction time.
8. Grading of raw milk by resazurin reduction test.
9. Enumeration of psychrophilic and thermophilic microorganisms in milk.

Reference Books:

1. Hand Book of Dairy Microbiology –RK Robinson
2. Applied dairy microbiology – Steele and Marth
3. Milk products preparation and quality control- CP Ananthakrishnan
4. Food Microbiology -WC Frazier

III Semester

Course-7: Dairy Farm Management

Theory: Credits-3

Unit-1:

Systems of Housing of Dairy cattle - Loose Housing and Conventional Dairy Barns. Drawing of layouts for dairy cattle dwellings; Criteria for selecting site for establishing Dairy farm buildings; Water requirement of dairy animals; Drainage system in dairy farms; Disposal of dairy farm wastes - Composting and establishment of small scale gobar gas units. **(15 Lectures)**

Unit-2:

Symptoms of ill health of dairy animals. Diseases of dairy animals- Bacterial, Viral, Parasitic and Nutritional diseases and their control – Economically important diseases–mastitis and foot and mouth disease. **(10 Lectures)**

Unit-3:

Management of different classes of Dairy animals – Milk producing animals, Pregnant animals, dry animals, heifers and calves; Management of sick animals - quarantine, sanitation and hygiene; Management during transport, drought and summer season**. (10 Lectures)**

Unit-4:

Management practices for Dairy farm; Identification, Dehorning, Castration, Deworming, Vaccination, Disinfection, and milking management. **(10 Lectures)**

Unit-5:

Maintenance of high level of fertility in the herd. Importance, reasons for low fertility, methods of maintaining high level of fertility in the herd. Methods of determining reproductive efficiency:(i) by no return percentage of cows, (ii) by calving interval period, (iii) by pregnancy days of cows per year - Reducing prolonged calving intervals. **(15 Lectures)**

III Semester

Course-7: Dairy Farm Management

Practical: Credits-3

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1. Dairy farm layout.
2. Methods of identification of cows,
3. Dehorning of calves.
4. Castration of bulls.
5. Deworming of dairy cattle.
6. Preparation of vaccination schedule of dairy cattle.
7. Identification of sick animals.
8. Tests for hardness of water.
9. Determining the strength of detergent solution.

Reference Books:

1. Text book of Animal Husbandry - GC Banerjee
2. Handbook of Animal Husbandry - ICAR Edition

III Semester
Course-8: Management of Sheep and Goats
Theory: Credits-3

Unit-1:
Importance of goat farming. Breeds of Indigenous goats. Important Exotic goat breeds for India. Differencesbetweenandgoatandsheep.

Unit-2:

Advantages of sheep farming. Breeds of sheep—Indian and exotic breeds. Reproduction in sheep. Nutrition of sheep.

Unit-3:

Anatomy of male reproductive system in goat and sheep, Anatomy of female reproductive system in goat and sheep, Reproduction in female animals (symptoms of heat, mating systems etc.). Pregnancy diagnosis in sheep and goat.

Unit-4:

Feeding habits of goat and sheep. Nutrient requirements of goat and sheep. Feeding regimes and practical feeding of sheep and goat.

Unit-5:

Management of goat farms and sheep farms. Routine operations in goat and sheep farms. Essentials of sheep and goat management. Housing, deworming, health care and hygiene in goat and sheep farms.

III Semester
Course-8: Management of Sheep and Goats
Practical: Credits-1

1. Identification of important goat breeds.
2. Identification of important sheep breeds.
3. Symptoms of heat in goat and sheep.
4. Methods of pregnancy diagnosis in goat and sheep.
5. Preparation of feeding regimes or rations for different categories–young, lactating and pregnant goat and sheep.
6. Preparation of project report for 25 and 50 goat farms (economic aspects).
7. Preparation of project report for 25and 50 sheep farms (economic aspects.)
8. Management techniques of sheep and goat farms.

Reference Books:

1. Textbook of Animal Husbandry - GC Banerjee
2. Principles and practices of Dairy Farm - Jagdish Prasad

IV Semester

Course - 9: Processing of Milk (Market Milk)

Theory: Credits -3

UNIT-I

(a) Reception of Milk - Unloading, Grading, Sampling, Testing, Weighing and Recording. b) Storage of Milk. c) Straining, Filtration and Clarification of Milk.

UNIT-II:

Pasteurization of Milk - Definition, Objectives, Principles of Heat exchange, Methods of Pasteurization - (LTLT, HTST, Uperization). UHT and Sterilization of Milk.

UNIT- III:

a) Homogenization of Milk- Factors influencing Homogenization of Milk (Temperature and Pressure), Effect of Homogenization on Milk. (b) Standardization of Milk: Standardization using Pearson square method.

Unit-IV:

a) Market Milk - Toned milk, Double toned milk, Reconstituted milk, Standardized milk, and Full cream milk - Standards and methods of manufacture. (b) Packaging of Milk- Desirable characters and types of packaging materials, Forms of Packaging.

UNIT V:

(a) Cleaning and sanitation of dairy equipment: Types of cleaning and sanitizing agents, mode of action, different types of cleaning methods, (i)Handwashing, (ii)Mechanical washing(iii) Cleaning-in-place (CIP).

(b)Disposal of Dairy effluents: Sources of Dairy wastes, Necessity of treating Dairy wastes, methods of treatment, Low-cost methods, Conventional methods, Activated sludge process and trickling filters.

IV Semester

Course-9: Processing of Milk (Market Milk)

Practical: Credits -1

1. RMRD Testing of Milk (Platform tests).
2. Standardization of Milk.
3. Homogenization of Milk.
4. Pasteurization of Milk.
5. Sterilization of Milk.
6. Preparation of Toned Milk.
7. Preparation of Double Toned Milk.
8. Preparation of Reconstituted Milk.
9. Cream Separation.

Reference Books:

1. Outlines of Dairy Technology – Sukumar De
2. Milk Products Preparation and Quality Control - C. P. Anantha Krishnan
3. The Technology of Milk Processing-C. P. Anantha Krishnan
4. Modern Dairy Products – Lincoln M Lampert

IV Semester

Course - 10: Technology of Cheese and Fermented Milks

Theory: Credits-3

UNIT-I:

Significance and health benefits of fermented milks. Types of fermented milks - Cultured buttermilk, Lassi, Kumiss, Dahi, Yoghurt.

UNIT-II:

Cheese - Definition, FSSAI Standards, Composition, Classification, Method of manufacture of Cheddar Cheese.

UNIT II:

Method of manufacture of Processed Cheese, Method of manufacture of Cottage Cheese, Packaging of Cheese and Storage of Cheese.

UNIT-IV:

Method of manufacture of Mozzarella cheese, Packaging of Mozzarella Cheese and Storage.

UNIT-V:

Maintenance of dairy equipment. Daily and periodical maintenance. Maintenance of industrial and personal hygiene in dairy plants.

IVSemester

Course10: Technology of Cheese and Fermented Milks

Practical: Credits-1

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1. Preparation of yoghurt.
2. Preparation of dahi.
3. Preparation of lassi and buttermilk.
4. Preparation of Kumiss.
5. Preparation of Cheddar Cheese.
6. Preparation of Cottage Cheese.
7. Estimation of acidity in milk and Whey.
8. Preparation of Mozzarella Cheese.
9. Estimation of fat percentage in cheese and whey.
10. Standardization of casein to fat ratio.

Reference Books:

1. Outlines of Dairy Technology – Sukumar De
2. Milk Products Preparation and Quality Control - C. P. Anantha Krishnan
3. The Technology of Milk Processing - C. P. Anantha Krishnan
4. Modern Dairy Products -Lincoln M Lampert

IVSemester
Course-11: Technology of Fat-Rich Dairy Products
Theory: Credits-3

Unit-1:

Cream: Definition and legal standards, efficiency of cream separation and factors responsible for fat loss in buttermilk. Control of fat content in cream. Packaging and storage of cream. Methods of manufacture of cream.

Unit-2:

(a) Neutralization, standardization, pasteurization and cooling of cream. (b) Different types of cream; table cream, sterilized cream, whipped cream, plastic cream and frozen cream. (c) UHT processing of cream. (d) Factors affecting quality of cream; ripening of cream. (e) Defects in cream and their prevention.

Unit-3:

Butter: (a) Introduction to the butter making process; theory of churning, legal standards. (b) Technology of butter manufacture, Batch and continuous methods. Over-run in butter; control of fat loses in buttermilk; packaging and storage; transportation; defects in butter; uses of butter; Preparation of desi butter.

Unit-4:

(a) Ghee: Preparation of ghee from cream and butter. Methods of ghee making-batch and industrial processes, innovations in ghee production, procedure, packaging and preservation of ghee. (b) AG Mark Standards and FSSAI Standards for Ghee.

Unit-5:

Utilization of dairy by-products – skim milk, buttermilk, whey etc. Butteroil: Manufacture of butter oil, packaging and storage.

IV Semester
Course-11: Technology of Fat-Rich Dairy Products
Practical: Credits-1

1. Cream separation.
2. Estimation of fat percentage in cream.
3. Determination of titratable acidity of cream.
4. Estimation of fat percentage in cream.
5. Neutralization of cream.
6. Preparation of White butter and Table butter.
7. Calculation of Overrun in butter.
8. Estimation of fat% in buttermilk.
9. Estimation of fat% in butter.
10. Estimation of free fatty acids content BR reading of ghee

Reference Books:

1. Outlines of Dairy Technology - Sukumar De
2. Milk and Milk Products - Eckles, Combs and Macy
3. Milk, Milk Products and Quality Control - C.P. Anantha Krishnan
4. The Technology of Milk Processing - C.P. Anantha Krishnan