

**DR. BABASAHEB AMBEDKAR
MARATHWADA UNIVERSITY,
AURANGABAD.**

Revised Syllabus of

**B.Sc. Second Year
[Dairy Science & Technology]
Semester – III & IV**

(With Credit System)

(W.E.F 2010-2011 & onwards)

B.Sc. II year (Semester-III)
Dairy Science & Technology
Paper-IX
Title: Animal Nutrition

Max. Marks-50

Sr. No.	Topics	No. of periods
1.	Introduction to the subject	01
2.	Anatomy of digestive system in ruminants. Study of rumen microbiology.	05
3.	Study of nutrients & their nutritional importance Water: sources requirements in animal body, water loss & functions of water in animal body. Carbohydrates: definition, classification, importance, digestion & metabolism in ruminants. Proteins: definition, classification, importance, digestion in ruminants. Lipids: definition, classification, importance digestion in ruminants. Minerals: definition, types & importance in animal nutrition. Vitamins: definition, classification & importance in animal nutrition. By pass protein, probiotics, antibiotic, hormones & other growth stimulating substances.	23
4.	Classification of feeds & fodder.	03
5.	Agronomical practices for fodder production.	02
6.	Cultivation of important fodder crops. Legume: Lucerne, berseem, cowpea & subabul. Non legumes: jawar, maise, oat. Grasses: hybrid napier, paragrass, Rhodes grass, stylo, guinea grass. Intensive / relay fodder cropping programme.	12

Reference Books:

- 1 Animal Nutrition & Feeding practices in India -S.K.Ranjhan
- 2 A Text book of Animal Husbandry (8th Edn) -G.C. Banerjee
- 3 Handbook of Animal Husbandry - I.C.A.R., New Delhi
- 4 Feeds and feeding -G.B.Morrison
- 5 A Textbook of Animal Nutrition -G.C.Banerjee
- 6 Principles & Practices of Dairy Farm Management -Jagdish Prasad
- 7 Modern Dairy Cattle Management -Davis
- 8 A Textbook of animal Husbandry & Dairy Science -Jagdish Prasad
- 9 Dairy cattle feeding & management - Wiltam N.Etgas
- 10 Live-stock feeding & management - Sing & Moor
- 11 Laboratory Manual for Nutrition Research -S.K.Ranjan & Gopal K
- 12 Analytical techniques in animal nutrition research -N.N. Pathak
D.N.Kansra,
R.C. Jakhmola
- 13 Analytical Techniques in Animal Nutrition - P.C.Gupta V.K.Sharma
-A.B. Maudar
- 14 The feeding of farm animals in India -P.E.Lander
- 15 Applied Nutrition - D.V. Reddy
- 16 Nutritional microbiology of farm animals -D.N. Karma,
N.N.Pathak

B.Sc. II year (Semester-III)
Dairy Science & Technology
Paper-X
Title: Indian Dairy Products

Max. Marks-50

Sr. No.	Topics	No. of periods
1.	Introduction Definition of Indian dairy products Classification of Indian dairy products Comparison with western dairy products.	03
2.	Desiccated milk products: Khoa: - Definition, Classification, types, methods of manufacture, packaging, preservation, factors affecting yield of khoa, physico-chemical changes during manufacture and storage of khoa. Khoa sweets - Peda, Burfi, Gulabjamum and Milk Cake. Rabri: Basundi Kheer Khurchan	13
3.	Heat and acid coagulated milk products: Channa: Definition, methods of manufacture, packaging, yield and defects. Channa based sweets: - Channa Kheer, Rasogolla, Kalakand, Pantoa, Sandesh, Rasmalai, Rasanguri. Rajbhog & channa podu. Panir: - Definition Method of manufacture , Packaging & storage. Physico-chemical changes during storage.	13
4.	Fat rich Indian dairy products: Makhan: - Definition, Method of manufacture, fat losses during manufacture. b) Ghee: History, composition, methods of manufacture, grading, packaging and preservation of Ghee, marketing of Ghee. Market quality, Renovation of Ghee. Defects in Ghee. Agmark grading	16

Reference Books:

- | | |
|---------------------------------------|--|
| 1. Outlines of Dairy technology | by S.K. De |
| 2. Technology of Indian Milk Products | by R.P. Aneja, B.N. Mathur, R.C. Chandan & A.K. Banarjee |
| 3. Milk products in India | by M.R. Shrinivasan & C.P. Anantkrishnan. |
| 4. Indigenous milk products | by I.C.A.R., New Delhi |
| 5. Dairy India (2007) | by P.R. Gupta |

**B Sc. II Year (Semester-III).
Dairy Science & Technology
Paper-XI (Practical)
Title: Animal Nutrition**

Max. Marks-50

Sr. No.	Topics
1	Collection & identification of feeds & fodders.
2	Determination of moisture/ dry matter.
3	Determination of crude fiber
4	Determination of crude protein.
5	Determination of ether extract.
6	Determination of ash.
7	Study of digestive system of ruminants.
8	Computation of ration for milch cattles.
9	Preparation of cropping scheme for fodder crops.
10	Preparation of calender to supply fodder round the year.
11	Visit to animal farms of agricultural college/ veterinary college& established dairy farm.

B Sc. II year (Semester-III).
Dairy Science & Technology
Paper-XII (Practical)
Title: Indian Dairy Products

Max. Marks-50

Sr. No.	Topics
1	Preparation of khoa
2	Preparation of khoa sweets Peda Burfi Gulabjamun
3	Preparation of rabri
4	Preparation of basundi
5	Preparation of Kheer
6	Preparation of Chhana
7	Preparation of Chhana sweets Chhana kheer Rosogolla Kalakand Sandesh Rasanguri Rasmalai
8	Preparation of Paneer
9	Preparation of Makkhan
10	Preparation of Ghee

**B Sc. II year (Semester-IV).
Dairy Science & Technology
Paper-XIII
Title: Feed Processing**

Max. Marks-50

Sr. No.	Topics	No. of periods
1	Conservation of green fodders as Silage and Hay	05
2	Study of roughages: Nutritional characteristics of roughages Processing of inferior quality roughages	05
3	Nutritional characteristics of concentrates	02
4	Study of agro-Industrial by-products & unconventional feeds: Sugar industry by products, mango seed kernel, groundnut husk, neem cake, babool & babool pods, tamarind seeds, urea molasses & feeding UMMB	06
5	Feeding livestock during scarcity	02
6	Measures of energy value and protein value of feeding stuff – GE,04, DE, ME, NE, SE, DCP, TDN, Biological value, PER (Protein Efficiency Ratio), Protein replacement value, EAA (Essential Amino Acid).	05
7	Feeding standards for farm animals.	02
8	Study of compounded feeds, concentrate mixtures, calf starters, milk replacer & mineral mixtures	
9	Study of ration: Definition, types, characteristics of balanced ration	09
10	Factors affecting digestion of feed and digestibility coefficient	03

Reference Books:

- | | | |
|----|---|-----------------------|
| 1 | Animal Nutrition & Feeding practices in India | -S.K.Ranjhan |
| 2 | A Text book of Animal Husbandry (8 th Edn) | -G.C. Banerjee |
| 3 | Handbook of Animal Husbandry | - I.C.A.R., New Delhi |
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| 6 | Principles & Practices of Dairy Farm Management | -Jagdish Prasad |
| 7 | Dairy cattle feeding & management | - Wiltam N.Etgas |
| 8 | Live-stock feeding & management | - Sing & Moor |
| 9 | The feeding of farm animals in India | -P.E.Lander |
| 10 | Applied Nutrition | - D.V. Reddy |

**B Sc. II year (Semester-IV).
Dairy Science & Technology
Paper-XIV
Title: Cheese & Fermented Milk Products**

Max. Marks-50

Sr. No.	Topics	No. of periods
1	Introduction to the Subject	02
2	Study of starter culture: definition, types, factors affecting quality of starters, defects.	07
3	Cheese- History Status & scope in dairy industry Definition & Classification Method of manufacture of variety of cheeses: Cheddar ii) Gouda iii) Mozzarella & pizza. iv) Cottage cheese. v) Processed cheese Role of milk constituents in ripening Role of starter culture in relation to cheese quality Study of rennet and its action during cheese manufacture Packaging and storage Defects in cheese, causes & prevention.	26
4	Fermented milk products Dahi/Curd Chakka, Shrikhand Yoghurt Lassi Cultured butter milk Acidophilus milk Kefir Kummis. Leben Bulgarian milk	10

Reference Books:

- 1) Fundamentals of Cheese Science. P.F. Fox, T.P. Guinee, T.M. Cogan and P.L.H. Mcsweeney.
- 2) Microbiology and Biochemistry of Cheese and Fermented Milk,
Edited by B.A. Law
- 3) Cheese and fermented milk foods By Frank Kosikowski
- 4) Milk and Dairy Product Technology by Edgar Spreer
- 5) Outlines of Dairy Technology by S.K. De
- 6) Technology of Indian Milk Products by R.P. Aneja, B.N.Mathur, R.C. Chandan &
A.K. Banarjee
- 7) Dairy Microbiology by K.C. Mahanta.
- 8) Dairy Bacteriology by Hammer
- 9) Handbook of Dairy Processing by M/s Alfa Laval

**B Sc. II year (Semester-IV).
Dairy Science & Technology
Paper-XV (Practical)
Title: Feed Processing**

Max. Marks-50

Sr. No.	Topics
1	Preparation of feeds & feeder – chaffing, cooking, grinding, soaking, palleting, enriching & alkali treatment.
2	Preparation of concentrate mixtures
3	Preparation of Mineral mixtures
4	Preparation of calf starters
5	Preparation of milk replacers
6	Preparation of Hay
7	Preparation of Silage
8	Preparation of urea molasses of liquid feed
9	Preparation of complete feed blocks
10	Visit to feed factory

B Sc. II year (Semester-IV).
Dairy Science & Technology
Paper-XVI (Practical)
Title: Cheese and Fermented Milk Products

Max. Marks-50

Sr. No.	Topics
1	Study of cheese making equipment
2	Manufacturing of cheese Pizza Cheddar Cottage Processed cheese
3	Preparation of dahi
4	Preparation of Chakka and Shrikhand
5	Preparation of Yoghurt
6	Preparation of Lassi
7	Preparation of Cultured butter milk
8	Preparation of Acidophilus milk
9	Visit to dairy plant

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Revised Syllabus

of

B.Sc. III [Animal Husbandry & Dairy Science]

(Optional)

(w.e.f. 2010-2011 & onwards)

**B Sc. III year
Animal Husbandry Dairy Science**

**Paper-IX
Title: Genetics and Breeding**

Max. Marks-100

Sr. No.	Topics	No. of periods
1	Genetics Terminology used in genetics Cell division-mitosis and meiosis Mendel's laws of inheritance i) Monohybrid and dihybrid crosses ii) Modified dihybrid ratio Cytological and molecular basis of heredity Multiple alleles Gene, their function, additive and non additive gene action, DNA & chromosome aberrations Mutation Variation Sex chromosome ,sex linkage, sex determination, sex linked inheritance, sex influenced inheritance, sex limited inheritance. Genotype environment interaction	 02 02 05 02 01 06 02 02 06 02
2	Animal breeding Fertility, breeding efficiency, factors affecting breeding efficiency Sterility, causes of sterility Selection i) Choosing traits for selection ii) Heritability iii) Selection methods iv) Effect of selection Systems of Animal Breeding i) Principles and progress of animal breeding ii) Inbreeding: definition, methods iii) Out breeding: definition, methods iv) Effects of inbreeding on growth, production and reproduction. v) Adaptability of cross breed in tropics	 03 02 04 06
3	Animal Reproduction i) Anatomy of reproductive system in cattle / buffalo ii) growth puberty, gametogenesis growth: definition, factors affecting growth	 06 04

	<p>puberty: definition, factors affecting puberty gametogenesis: definition, types iii) Oestrus cycle Hormones in reproduction Stages of oestrus cycle iv) Ovulation, fertilization and implantation v) Placentation and gestation Types of placenta Functions of placenta Length of gestation in farm animals Factors affecting gestation vi) Pregnancy diagnosis: methods vii) Parturition: definition, stages of parturition, involution of uterus</p>	<p>04 04 02 03 03</p>
4	<p>Artificial Insemination Artificial insemination: definition, advantages & disadvantages ii) Semen collection, Evaluation, dilution, preservation, handling and storage of semen. iii} Bio-techniques, in animal reproduction. a) A-I – Time, Techniques, Advantages & Disadvantages. b) Super ovulation. c) Oestrus synchronization. d) ETT e) Cloning.</p>	<p>02 12 12</p>

**B Sc. III year
Animal Husbandry Dairy Science**

**Paper-X
Title: Dairy Technology-II**

Max Mark- 100

Sr. No.	Topics	No. of periods
1	Introduction to subject	01
2	Cheese- History Status & scope in dairy industry Definition, types and classification Methods of manufacturing of cheddar, Gouda, Mozzarella and Pizza, Cheddar cheese Role of milk constituent in ripening and storage Study of rennet & action during manufacturing Packaging and storage Defects	20
3	Heat & Acid coagulated milk products Channa: - i) method of manufacturing ii) Packaging and preservation iii) Defects Channa based sweets: - Channa kheer, Rosogolla, Kalakand, Channa podo, Rasanguri, Rasmalai, Sandesh, Rajbhog Paneer: -i) method of manufacture, ii) Packaging and storage iii) Physico- chemical changes during storage iv) Nutritive value of paneer	06
4	Ice cream and frozen desert: a) Ice-cream- History ii) Definition, classification and composition iii) Role of milk constituent in Ice-cream iv) Types of freezer Effect of processing on physico chemical properties of ice- cream vi) Processing and Freezing of ice-cream mix vii) Over-run in ice cream viii) Packaging, hardening and storage ix) Nutritive value of ice cream	20

	<p>Defects</p> <p>b) Indigenous frozen desserts:</p> <p>i) Kulfi</p> <p>ii) Malai ka burf</p> <p>iii) Milk ices</p> <p>iv) Lollies</p> <p>Milk shake</p>	
5	<p>Dried milks:</p> <p>i) History</p> <p>ii) Status in India and abroad</p> <p>iii) Method of manufacturing of SMP and WMP</p> <p>iv) Physical properties of dried milk</p> <p>v) Defects in dried milk during manufacturing and storage</p> <p>vi) Study of infants foods</p> <p>vii) Dairy whitener</p>	12
6	<p>By -product technology</p> <p>Status and utilization of dairy by-product in India</p> <p>ii) Physico- chemical characteristic of whey, buttermilk</p> <p>iii) Casein: Industrial & food grade</p> <p>iv) Whey processing</p> <p>Beverages of whey</p> <p>Dried whey</p> <p>v) Lactose</p> <p>vi) Butter milk processing</p> <p>Condensed buttermilk</p> <p>Dried buttermilk</p>	15
7	<p>Food safety & quantity assurance:</p> <p>Personal hygiene</p> <p>ii) Plant hygiene</p> <p>iii) Water quality</p> <p>iv) Quality system:</p> <p>Total quality management. (TQM)</p> <p>Hazard analysis critical control point (HACCP)</p> <p>ISO</p> <p>v) PFA/BIS standard of milk and milk product</p>	06
8	<p>Dairy effluent treatment & pollution control.</p> <p>i) Types of effluent</p> <p>ii) Degree & treatment of waste</p> <p>iii) Characteristic of waste.- BOD, COD</p>	04

**B Sc. III year
Animal Husbandry Dairy Science**

**Paper-XI (Practical)
Title: Genetics and Animal Breeding**

One practical per week

Max Mark- 100

Sr. No.	Topics
1	Study of reproductive organs of Cattle, Buffaloes, Sheep, Goat on chart/ model/Specimen
2	Study of section slides of Spermatogenesis, Oogenesis, Maturation of sperm and ova
3	Judging of dairy cattle
4	Detection of heat in farm animals
5	Preparation of heat expectancy chart
6	Assembling and preparation of A.V. Collection of semen by A.V. Method
7	Study of A.I. equipment and insemination of cow
8	Estimation of P ^H of semen
9	Microscopic examination of semen
10	Bacteriological examination of semen
11	Preparation of semen extender / Dilutor
12	Pregnancy diagnosis in Cow and Buffaloes
13	Estimation of gene frequency
14	Estimation of genotype frequency
15	Estimation of most probable producing ability in cow
16	Estimation of breeding efficiency of the cow
17	Visit to Cattle and buffalo breeding farm Slaughter house A.I. Center Semen collection center

**B Sc. III year
Animal Husbandry Dairy Science**

Paper-XII (Practical)

Title: Dairy Technology-II

One practical per week

Max Mark- 100

Sr. No.	Topics
1	Manufacturing of Cheddar cheese
2	Manufacturing of Pizza cheese
3	Calculation & standardization of Ice-cream mix
4	Manufacturing of plain & fruit flavored Ice cream
5	Preparation of Kulfi
6	Preparation of Milk shake
7	Preparation of chhana
8	Preparation of Channa kheer
9	Preparation of Rassogolla
10	Preparation of Rasmalai
11	Preparation of Kalakand.
12	Preparation of Sandesh.
13	Preparation of Paneer.
14	Manufacturing of edible Casein.
15	Manufacturing of rennet casein.
16	Manufacturing of dried milk.
17	Determination of BOD & COD of dairy influent/effluent
18	Identification of critical control point (CCP) in dairy plant for food safety
19	Analysis of water quality

Reference Books

1. Outlines of Dairy Technology by S.K. De
2. Milk and Milk Products by Eckles Comb, Mary.
3. Milk and Milk Products by Harbonsing and Moore.
4. Modern Dairy Products by Lampert.
5. Hand Book of Dairy Science by K.C. Mahanta.
6. Dairying in India. by Warner J.
7. Milk products in India by M.R.Shrinivasan & C.P.Anantkrishnan.
8. Indigenous milk products by I.C.A.R. New Delhi
9. Dairying in India by D.N. Khurody.
10. Dairy India yearbook (2007) P.R. Gupta
11. Ice-cream by W.S. Arbuckle
12. Cheese Davis
13. Introduction to Food Safety IGNOU, New Delhi
14. Hazards to Food Safety IGNOU, New Delhi
15. Food Safety & Quality Assurance, IGNOU, New Delhi
16. Biological Treatment of Food Processing wastewater, Design & Operation manual DivyaJyoti Prakashan, Jodhpur
17. Reproduction in farm animals C.N. Sane & others
18. Hand Book of Indian Dairy Farmers Patrick John
19. A Textbook of Genetics Dalela R.C.& S.R. Verma
20. A Textbook of Animal Husbandry (8th Edn) G.C. Banerjee
21. Genetics and Breeding in farm animals Banerjee & Mukharjee
22. Reproduction in farm animals Hafeez
23. Hand book & Physiology of farm animals R.D.Frandson

24	Anatomy & Physiology of farm animals	R.D. Frandson
25	Principles of Dairy Science	G.H.Schmidt, L.D.Vivek N.N.Pathak
26	Genes and Evolution	JHA
27	Cattle Embryo Transfer procedure	Curtis
28	Genetics of Live stock improvement	John f. Lesley
29	An Introduction to Genetics	B.K. Jain
30	Population Genetics in Animal breeding	Franz pitcher.
