SWAMI RAMANAND TEERTH
MARATHWADA UNIVERSITY NANDED

SYLLABUS

Of

DAIRY SCIENCE

B.Sc. Second Year

Choice Based Credit System

Semester Pattern

Effective from June 2017

Swami Ramanand Teerth Marathwada University, Nanded

Choice Based Credit System (CBCS) Course Structure

Faculty of Science

B. Sc. Second Year Syllabus

Semester Pattern effective from June 2017

Subject: Dairy Science

Semester	Course No.	Name of the Course	Instruction Hrs/ week	Total period	CA	ESE	Total Marks	Credits
III	CCDS III (Section A)	Animal Nutrition (P-VI)	03	45	10	40	50	2
	CCDS III (Section B)	Animal Genetics and Reproduction (P-VII)	03	45	10	40	50	2
	CCDSP II [CCDSIII & IV (Section A)]	Practical's based on P-VI & P-VIII (P-X)	03 03	Practicals 08 08	05 05	20 20	25 25	1 1
	SECDS I	SEC I (Anyone Skill from optional)	02	02	25	25	50	(02)*
IV	CCDS IV (Section A)	Processing Technology of Milk (P-VIII)	03	45	10	40	50	2
	CCDS IV(Section B)	Animal Breeding (PIX)	03	45	10	40	50	2
	CCDSP III [CCDS III & IV (Section B)]	Practical's based on P-VII & P-IX (P-XI)	03 03	Practicals 08 08	05 05	20 20	25 25	1 1
	SECDS II	SEC II (Anyone Skill from optional)	02	02	25	25	50	(02)*
Total credits semester III and IV								**12(04)***

I. ~Note: ESE of CCDSPII, CCDSPIII & SECDS I, SECDS II should be evaluated at annual

Skill Enhancement Course > One skill for each semester from any optional subject.

CCDS = Core Course Dairy Science

CCDSP= Core Course Dairy Science Practical

ESE= End of Semester Examination

CA= Continuous Assessment.

A)Theory Papers (Test / Seminar / Assignment)

B) Practical Paper (Record book & Submission / Excursion Report/ Visit Report

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

B.Sc. Second Year (Semester -III)

Semester Pattern Effective from June-2017

Dairy Science

CCDS III and Semester III)

(CCDS IV and Semester IV)

Theory and Laboratory Course

Objectives :

The course is framed for getting the students acquainted with

- The breeding and nutritional aspects of livestock.
- The anatomy and physiology of digestive system
- Role of various nutrients in animal nutrition
- The nature and quality of ration/diet required to the livestock for maintaining different body system along-with requirement of ration for production.
- The knowledge of reproduction and different breeding systems along-with application of bio-techniques.
- The recent advances in animal nutrition and animal breeding.
- The basic genetic principles applied in breeding of animals to increase their productivity.
- Milk processing
- Dairy plant layout and operations
- Quality standards for milk

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

B.Sc. Second Year (Semester -III)

Semester Pattern Effective from June-2017

Dairy Science

CCDS III Section A

Paper-VI

Title – Animal Nutrition

Credit 2 (Marks – 50) **3 Periods per week/Total Periods-45**

Unit – I	**No. of periods 10**

- Introduction to Animal Nutrition
- Anatomy of Ruminant's digestive system
- Study of Digestive system of Poultry
- Rumen ecosystem & Rumen manipulation

UNIT – II	**10**

- Definition, classification, importance of nutrients in Animal nutrition- water, carbohydrates, proteins, Lipids, Minerals, Vitamins.

UNIT- III	13

- Digestion, absorption, metabolism of carbohydrates, proteins, lipids
- Digestibility – Digestibility of nutrients, Digestion trials, factors affecting digestibility.

UNIT – IV	**12**

- Evaluation of energy value of feed –
  - GE, DE, ME, NE, SE, TDN, HI, NR
- Estimation of energy Value of Feeds by –
  - C N Balance technique
  - Bomb Calorimeter
  - Calculation of TDN by digestion trials
  - Chemical composition
- Estimation of Protein value of feeds by –
  - PER, B.V., Net protein utilization
  - DCP estimation by digestion trials
  - Nitrogen Balance experiments
  - NPN substances as a source of proteins

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

B.Sc. Second Year (Semester -III)

Semester Pattern Effective from June-2017

Dairy Science

CCDS III Section B

Paper-VII

Title – Animal Genetics and Breeding

Credit 2 (Marks – 50)	**3 Periods per week/Total Periods-45**
Unit – I	**No. of periods 07**
❖ Introduction to Animal Genetics ❖ Animal genetic resources, conversation and approach related to regional aspects. ❖ Gene, its function. ❖ Mendel's laws of inheritance	
UNIT – II	**10**
❖ Qualitative and quantitative traits. ❖ Variation and causes of variation. ❖ Sex linked inheritance. ❖ Sex influenced inheritance and sex limited inheritance ❖ Random mating, Hardy Weinberg equilibrium	
UNIT- III	**14**
❖ Anatomy of Reproductive system of cattle. ❖ Study of Gametogenesis, Maturation of Spem and Ovum. ❖ Study of Puberty, oestrus cycle.	
UNIT – IV	**14**
❖ Fertilization, pregnancy, parturition in cow and buffalo. ❖ AI – Time and Technique, Advantages and disadvantages ❖ Semen collection, evaluation, freezing, handling and transport.	

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Choice Based Credit System (CBCS) Course Structure

B.Sc. Second Year (Semester -III)

Semester Pattern Effective from June-2017

Dairy Science

CCDS IV Section A

Paper-VIII

Title – Processing Technology of Milk

Credit 2 (Marks – 50)	**3 Periods per week/Total Periods-45**
Unit – I	**No. of periods 12**
❖ Procurement of milk, Cooling of milk ❖ Milk Processing – a) Straining, Filtration, Clarification b) Pasteurization LTLT, HTST c) Homogenization d) Sterilization	
UNIT – II	**12**
❖ Legal standards – PFA, HACCP, FSSAI ❖ Pricing policy ❖ Standardized milk ❖ Storage and milk packaging ❖ Distribution of milk	
UNIT- III	**13**
❖ Layout of milk processing plant ❖ Flooring, Ventilation, Doors, Windows ❖ Drainage system, washing unit ❖ Rodent control ❖ Maintenance of hygiene	
UNIT – IV	**08**
❖ Metals used in Dairy Industry. ❖ Steam Generation ❖ Refrigeration ❖ Dairy waste disposal	

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Choice Based Credit System (CBCS) Course Structure
B.Sc. Second Year (Semester -III)

Semester Pattern Effective from June-2017

Dairy Science

CCDS IV Section B

Title – Animal Breeding

Credit 2 (Marks – 50) **Paper-IX** **3 Periods per week/Total Periods-45**

Unit – I **No. of periods 10**

- Principles of animal breeding
- Fertility, breeding efficiency, factors affecting breeding efficiency
- Sterility, causes of sterility

UNIT – II **10**

- Biotechniques in animal reproduction.
- Oestrus synchronization.
- E.T.T., cloning
- Super ovulation, super foetation
- Formation of breeding plans on the basis of genotypic and phenotypic parameters.
- Factors to be considered while preparing Breeding plans.

UNIT- III **13**

- System of animal breeding
- Inbreeding – Methods, effects on growth, production.
- Out breeding – Methods, effects on growth, production.
- Buffalo breeding in India
- Review of cattle crossbreeding policy in India

UNIT – IV **12**

- Selection
- Choosing traits for selection
- Heritability
- Selection methods
  - Performance method
  - Pedigree selection
  - Progeny testing
  - Tandam method
- Effects of selection.

Swami Ramanand Teerth Marathwada University Nanded
Choice Based Credit System (CBCS) Course Structure
B.Sc. Second Year (Semester -III)

Semester Pattern Effective from June-2017

Dairy Science

Practical Paper : CCDSP II(CCDS III & IV Section A)

Credits – 0 2 **Paper - X** **Marks : 50**

Annual Practical Based on CCDS III & IV Section A

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1. General precautions in Nutrition Laboratory
2. Collection of Feeds, fodders and Preparation of samples
3. Proximate principles of feeds
4. Determination of DM and moisture content
5. Determination of Ether Extract
6. Determination of Nitrogen and crude protein
7. Determination of Ash
8. Estimation of TDN Value
9. Classification of feeds and computation of ration
10. Study of Reproductive organs of cattle on charts / model specimens
11. Study of section slides – TS of Test, TS of ovary, spermatogenesis, Oogenesis, Maturation of sperm.
12. Preparation of heat expectancy chart
13. Microscopic evaluation of spermatozoa in cattle and buffalo
14. Microscopic examination of semen
15. Estimation of pH & semen
16. Determination of mobility of spermatozoa
17. Assembling and preparation of AV and collection of semen by AV method
18. Study of AI equipments and Insemination Technique
19. Pregnancy diagnosis
20. Excursion / Visits to – Cattle and Buffalo breeding farms
    - Slaughter house
    - AI centre
    - Semen collection and preservation centre

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B.Sc. Second Year (Semester -III)

Semester Pattern Effective from June-2017

Dairy Science

Practical Paper : CCDSP III (CCDS III & IV Section B)

Credits – 0 2 **Paper - XI** **Marks : 50**

Annual Practical Based on CCDS III & IV Section B

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1) Preparation of animal for milking
2) Equipments /Utensils used in milking
3) Milking methods – Hand milking
   - Machine milking – Milking machine components and working
4) Sampling of milk.
5) Organolestic tests, platform tests
6) Preparation of standardized milk
7) Study of detergents
8) Cleaning and sanitation of milk equipments
9) Milk packaging materials
10) Estimation of gene frequency
11) Estimation of genotype frequency
12) Estimation of Most Probable Producing Ability (MPPA) in cow
13) Judging of dairy cattle
14) Estimation of sire Index
15) Estimation of Breeding efficiency of cow
16) Excursion / visits to
    - ❖ Cattle and buffalo breeding farm
    - ❖ Agricultural/Veterinary Colleges
    - ❖ Semen collection & preservation centers

Swami Ramanand Teerth Marathwada University Nanded
Choice Based Credit System (CBCS) Course Structure
B.Sc. Second Year (Semester -III)
Semester Pattern Effective from June-2017
Dairy Science

Credits – 0 2 /Marks 50 **3 Lectures per Week/ Total Periods 45**

Skill Enhancement Course SEDS-I (A)
Feed processing and preparation

1. Classification of feeds 10
2. Feeding stuff and their nutritive value
3. Comparative Study of
    - Roughages and Concentrates
    - Succulent and non succulent fodders
    - Cereal and Leguminous roughages
    - Conventional and Non conventional feeds
4. Ration - 10
    - Types
    - Principles of rationing
    - Computation of ration
5. Feed Processing – 10
    - Importance and significance
    - Physical Treatment
    - Chemical Treatment
    - Microbiological Treatment
6. Preparation of Feeds – 10
    - Concentrate mixture
    - Calf starter
    - Milk replacer
    - Feed supplements, feed additives
    - Non conventional feeds
    - Feed mixtures with non conventional Agro industrial by products
7. Visit to Feed Processing Plants. 05

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Choice Based Credit System (CBCS) Course Structure
B.Sc. Second Year (Semester -III)
Semester Pattern Effective from June-2017
Dairy Science

Credits – 0 2 /Marks 50 **OR** **3 Lectures per Week/ Total Periods 45**

Skill Enhancement Course SEDS-I (B)
Conservation of Greens

1. Principles of conservation — 10
2. Significance
3. Suitable crops for conservation and stage of harvesting
4. Silage making - — 15
    - Definition, Standards of Silage
    - Types of silo pits and their dimensions
    - Ensiling, care during and after ensiling
    - Chemical changes during ensiling
5. Hay Making – — 10
    - Definition
    - Characteristics of good quality hay
    - Curing of hay (Hay making process)
    - Factors affecting quality of hay
6. Visit to silage and hay unit — 10

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Choice Based Credit System (CBCS) Course Structure
B.Sc. Second Year (Semester -III)
Semester Pattern Effective from June-2017
Dairy Science

Credits – 0 2 /Marks 50 **3 Lectures per Week/ Total Periods 45**

Skill Enhancement Course SEDS-II (A)

Organoleptic and platform Tests

1.	Study of Milk and its constituents	05
2.	Physico- chemical properties of milk	05
3.	Receiving of milk at RMRD and Collection centre	05
4.	Organoleptic Tests – Sensory evaluation Hedonic scales	10
5.	Platform Tests	10
6.	Visits to Dairy Plant and collection centre, chilling centre	10

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Choice Based Credit System (CBCS) Course Structure
B.Sc. Second Year (Semester -III)
Semester Pattern Effective from June-2017
Dairy Science

Credits – 0 2 /Marks 50 **OR** **3 Lectures per Week/ Total Periods 45**

Skill Enhancement Course SEDS-II (B)

Artificial Insemination

1.	Study of male and female reproductive system	05
2.	Garnetogenesis, oestrus cycle	05
3.	Semen Definition Collection by AV method Collection technique Evaluation Freezing, Handling & Storage	10
4.	Heat detection	03
5.	Study of AI Equipments	05
6.	Time and Technique of AI	02
7.	Pregnancy diagnosis	05
8.	Visits to VET Hospitals and AI centre	10

Reference Books

1. Reproduction in farm animals- C. N. Sane & others
2. Animal nutrition & feeding practices in India – S. K. Ranjhan
3. Hand book of Indian dairy farmers – Patrick John.
4. A Textbook of genetics – Dalela R. C. & S. R. Verma
5. A Textbook of animal husbandry – G. E. Banergee
6. Feeds and Feeding – G. B. Morrison
7. Live stock production and management – NSR Sastri & Thomas
8. A Textbook of animal nutrition – G. C. Banergee
9. Genetics and Breeding in farm animals – Banergee and Mukhargee
10. Reproduction in farm animals – Hafeez
11. Animal nutrition – Maynord & Loosli
12. Handbook & physiology of farm animals – R. D. Frandson
13. Anatomy & physiology of farm animals – R. D. Frandson
14. Principles and practices of dairy farm management – Jagdish Prasad
15. Modern dairy cattle management – Wiltam N. Etgas
16. A Textbook of animal Husbandry & Dairy Science – Jagdish Prasad
17. Dairy Cattle feeding and management – Wiltam N. Etgas
18. Handbook of Animal Husbandry Sciences – Amlendy Chakrabarti
19. Live stock feeding & management – Sing & Moor
20. Laboratory manual for nutrition research – S. K. Rajan & Gopal Krishna
21. The science of animal Husbandry – Balkey & Bade
22. Principles of Dairy Science – G. H. Schmidt, L. D. Vleck
23. Dairy Cattle : Principles, Practices, Problems & Profits – Donald L. Bata, Frank
24. Milk Production in Tropics – A. Chemberlin
25. Analytical Techniques in animal nutrition research – N. N. Pathak, D. N. Kansra, R. C. Jakhmola
26. Analytical Techniques in animal nutrition – P. C. Gupta, V. A. Sharma, A. B. Maudar
27. Animal Nutrition – Cramptom and Harris
28. Applied Nutrition – D. V. Reddy
29. Nutritional Microbiology of Farm Animals – D. N. Karma, N. N. Pathak
30. Genes and Evolution – JHA
31. Cattle Embrayo Transfer Procedure- Curtis

32. Genetics of Livestock Improvement – John F. Lasley
33. An Introduction to Genetics – B. K. Jain
34. A Test Book of Animal Nutrition – D. N. Verma
35. Outlines of Dairy Technology – Sukumar De
36. Dairy Processing – James Warner
37. Engineering for Food and Dairy Processing – E. M. Farell
38. Technology of Milk Processing – C. P. Anantkrishnan, A.Khan and P.N. Padmanabhan.
39. Dairy Plant Management and Engineering – Tufail Ahemad
40. Animal Genetics and Breeding – Dr. Satish Kulkarni, Dr Pandurang Gangasagar,

Dr. K. G. Dande

Dr. S. A. Kulkarni

Swami Ramanand Teerth Marathwada University Nanded
Choice Based Credit System (CBCS) Course Structure
B.Sc. Second Year (Semester -III)
Semester Pattern Effective from June-2017
Dairy Science
Practical Question Paper Proforma-X

Time – 4 Hrs. **Marks 50**

Q.1) Computation of ration 10

Q.2) Spotting – 10 spots 10

(Nutrition lab equipments / Reproductive Organs of Cattle/ Section Slides reproductive system/Digestive system)

Q.3) Proximate analysis 10

DM/CP/EE/NFE/Ash/ Estimation of DCP/TDN/ SE Value

OR

Evaluation of Semen-Macroscopic evaluation of semen/ Total sperm count/Sperm motility/ pH of semen/Assembling of AV

Q.4) A I Technique / Pregnancy Diagnosis / Heat Detection 10

Internal / C. A. - Record book and Viva-voce 05

- Excursion Report/ Visit Report/Submission collection of feeds and fodder 05

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Choice Based Credit System (CBCS) Course Structure
B.Sc. Second Year (Semester -III)
Semester Pattern Effective from June-2017
Dairy Science
Practical Question Paper Proforma-XI

Time – 4 Hrs.		**Marks 50**
Q.1) Milking methods / Estimation of Sire Index/ Estimation of Breeding Efficiency		05
Q.2) Sampling / platform tests of milk		10
Q.3) Preparation of Standardized milk/packaging materials		10
Q.4) Estimation of gene frequency/Genotype frequency/ Most Probable Producing Ability (MPPA) of cow		15
Internal / C. A.	- Record book and Viva-voce	05
	- Excursion Report/ Visit Report	05

Swami Ramanand Teerth Marathwada University Nanded
Semester Pattern Curriculum Under
Choice Based Credit System (CBCS) Pattern For
Faculty of Science
Under Graduate (U.G.) Programmes
Subject : Dairy Science

CLASS: B. Sc. Second year
Annual Pattern
Skill Enhancement Course Dairy Science (SECDS) I & II
End of Semester Examination (ESE)

Maximum Marks 25

SEAT NO.

MARK SHEET

Sr. No.	End of Semester Examination (CA) (ESE)	Maximum Marks	Obtained Marks
1.	Skill Work report	10	
2.	Skill Work Presentation	10	
3.	Submission, Viva voce & others if any	05	
4.	Total Marks	25	

Name & Signature of

Examiner 1:

Examiner 1:

Continues Assessment (CA)

Maximum Marks 25

SEAT NO.

MARK SHEET

Sr. No.	End of Semester Examination (CA) (ESE)	Maximum Marks	Obtained Marks
1.	Skill work report seminar	15	
2.	Practical Skill Test	10	
3.	Total Marks	25	