

PZO 1

**KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)  
COIMBATORE – 641 029**

**Course Name: M.Sc., Zoology**

Curriculum and scheme of Examination under CBCS

**(Applicable to students Admitted from the Academic Year 2019-2020)**

| Semester    | Part | Subject<br><br>Code | Title of the Paper                             | Instruction<br>hours/cycle | Exam. Marks |     |       | Duration of<br>Exam (hours) | Credits |
|-------------|------|---------------------|------------------------------------------------|----------------------------|-------------|-----|-------|-----------------------------|---------|
|             |      |                     |                                                |                            | CIA         | ESE | TOTAL |                             |         |
| SEMESTER I  |      |                     |                                                |                            |             |     |       |                             |         |
| I           | I    | 18PZO101            | Core Paper 1 Animal physiology                 | 6                          | 25          | 75  | 100   | 3                           | 5       |
|             |      | 19PZO102            | Core Paper 2 Cell and Molecular biology        | 5                          | 25          | 75  | 100   | 3                           | 4       |
|             |      | 18PZO103            | Core Paper 3 Biotechnology                     | 6                          | 25          | 75  | 100   | 3                           | 5       |
|             |      | 18PZO104            | Core Paper.4 Aquaculture                       | 5                          | 25          | 75  | 100   | 3                           | 5       |
|             |      | 18PZO2CL            | Core Practical. 1                              | 4                          | -           | -   | -     | -                           | -       |
|             |      | 19PZO2CM            | Core Practical. 2                              | 4                          | -           | -   | -     | -                           | -       |
|             |      |                     | Total                                          | 30                         |             |     | 400   |                             | 19      |
| SEMESTER II |      |                     |                                                |                            |             |     |       |                             |         |
| II          | I    | 19PZO205            | Core Paper 5 Biostatistics and Bio informatics | 6                          | 25          | 75  | 100   | 3                           | 5       |
|             |      | 18PZO206            | Core Paper 6 Molecular Genetics                | 6                          | 25          | 75  | 100   | 3                           | 5       |
|             |      | 19PZO207            | Core Paper 7 Microbiology and Immunology       | 6                          | 25          | 75  | 100   | 3                           | 4       |
|             |      | 18PZO2CL            | Core Practical 1                               | 4                          | 40          | 60  | 100   | 4                           | 2       |

PZO 2

|                     |          |           |                                                 |            |    |     |             |   |           |
|---------------------|----------|-----------|-------------------------------------------------|------------|----|-----|-------------|---|-----------|
|                     |          | 19PZO2CM  | Core Practical 2                                | 4          | 40 | 60  | 100         | 4 | 2         |
|                     |          | 18PZO2N1  | Non Major Elective I                            | 4          | 25 | 75  | 100         | 3 | 5         |
|                     |          |           | <b>Total</b>                                    | <b>30</b>  |    |     | <b>600</b>  |   | <b>23</b> |
| <b>SEMESTER III</b> |          |           |                                                 |            |    |     |             |   |           |
| <b>III</b>          | <b>I</b> | 18 PZO308 | Core Paper 8 Entomology                         | 5          | 25 | 75  | 100         | 3 | 5         |
|                     |          | 19PZO309  | Core Paper 9 Bio physics and Bioinstrumentation | 4          | 25 | 75  | 100         | 3 | 4         |
|                     |          | 18 PZO310 | Core Paper 10 Developmental Biology             | 5          | 25 | 75  | 100         | 3 | 5         |
|                     |          | 18PZO4CN  | Core Practical .3                               | 4          | -  | -   | -           | - | -         |
|                     |          | 19PZO4CO  | Core Practical .4                               | 4          | -  | -   | -           | - | -         |
|                     |          | 18PZO3N2  | Non Major Elective. II                          | 4          | 25 | 75  | 100         | 3 | 5         |
|                     |          | 18PZO3E1  | Major Elective. I                               | 4          | 25 | 75  | 100         | 3 | 5         |
|                     |          |           | <b>Total</b>                                    | <b>30</b>  |    |     | <b>500</b>  |   | <b>24</b> |
| <b>SEMESTER IV</b>  |          |           |                                                 |            |    |     |             |   |           |
| <b>IV</b>           | <b>I</b> | 18 PZO411 | Core Paper 11 Biodiversity and Evolution        | 5          | 25 | 75  | 100         | 3 | 5         |
|                     |          | 18 PZO412 | Core Paper.12 Applied Entomology                | 6          | 25 | 75  | 100         | 3 | 5         |
|                     |          | 18PZO4CN  | Core Practical 3                                | 4          | 40 | 60  | 100         | 4 | 2         |
|                     |          | 19PZO4CO  | Core Practical .4                               | 4          | 40 | 60  | 100         | 4 | 2         |
|                     |          | 18PZO4E2  | Major Elective II                               | 6          | 25 | 75  | 100         | 3 | 5         |
|                     |          | 18PZO4Z1  | Project and Viva voce                           | 5          | 40 | 160 | 200         | - | 5         |
|                     |          |           | <b>Total</b>                                    | <b>30</b>  |    |     | <b>700</b>  |   | <b>24</b> |
|                     |          |           | <b>Grand Total</b>                              | <b>120</b> |    |     | <b>2200</b> |   | <b>90</b> |

|                       |                            |           |             |        |
|-----------------------|----------------------------|-----------|-------------|--------|
| Programme Code : 06   | M.Sc, Zoology              |           |             |        |
| Course code: 18PZO104 | Core Paper 4 – Aquaculture |           |             |        |
| Batch                 | Semester                   | Hour/Week | Total hours | Credit |
| 2018-2019             | 1                          | 5         | 75          | 5      |

### Course Objectives

1. To explore the aquatic resources of the edible and economically important organisms.
2. To make use of the inland waters and marine potential to substitute the protein requirements by the human population.
3. To provide self employment opportunities and knowledge for students.

### Course Outcomes

|    |     |                                                                                                                                                |
|----|-----|------------------------------------------------------------------------------------------------------------------------------------------------|
| K1 | CO1 | Get knowledge about the production of cultivable candidate fish species                                                                        |
| K2 | CO2 | Understand the global, national, traditional and modern techniques related to fishes for food security                                         |
| K3 | CO3 | Apply practical knowledge into the aquaculture field to enhance production level                                                               |
| K4 | CO4 | Analyze students theoretical and technical knowledge useful for teaching, research, extension and entrepreneurship in the field of Aquaculture |

## SYLLABUS

### UNIT I

(14Hrs)

#### Principle of Aquaculture

Principle of Aquaculture- The need for aquaculture, Over view of national and international Aquaculture. Systems of aqua culture –Extensive, Semi-intensive, intensive, and super intensive aqua culture. traditional aqua culture.

### UNIT II

(15Hrs)

## **Culture of Fishes**

Qualities of cultivable species of fishes, Types of culture - Monoculture, Polyculture,

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pond culture, pen culture, cage culture, running water culture, zero water exchange system, culture sewage fish culture, Paddy fish culture, brackish water culture marine fish culture, integrated fish farming.

### **UNIT III**

**(15Hrs)**

#### **Aquaculture Engineering**

Preliminary survey, site selection, topography, location, design and construction of hatcheries, race ways and farm complex. Tide fed and pump fed farms, creeks, estuarine and marine water source utilization. Design and construction of ponds and dykes. Water distribution system- main feeder channel, drainage channel. Types of inlet and outlet and their construction

### **UNIT IV**

**(16Hrs)**

#### **Feed Management**

Criteria for selection of candidate species for aquaculture. Live feed culture and its nutritional value. Proximate composition of live feed and Green algae, Blue green algae, Diatoms, Spirulina, *Artemia*, Rotifers, Copepods, feed for formulation, Manufacturing, Feed additives

### **UNIT V**

**(15Hrs)**

#### **Fish diseases and Management**

Significance of fish disease in relation to aquaculture\*. Host, pathogen and environment interaction. Pathogenicity and mechanism of bacterial, viral and fungal infections of candidate species. Conventional and rapid diagnostic technique. Health management in aquaculture- Drugs, chemicals, antibiotics and probiotics used in aquaculture and their mode of action. Quarantine and health certification in Aquaculture

**\*Self study (Questions may be asked from these topics also)**

#### **Teaching Methods:**

Over Head Projector, Power Point Presentation, Seminar, Smart class, Assignment, Discussion and Quiz.

#### **Text books**

1. Kamaheshwar Pandey and J.P. Shukla (2005). Fish and fisheries. Rastogi Publications, Meerut, India.

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2. Ahilan, B. and N.Felix. (2008). Text book of Aquaculture. Daya Publishing House New Delhi, India.
3. Jhingran, V.G. (1991). Fish and fisheries of India. Hindustan Publish Corporation, Delhi.

### **Reference books**

1. Bardach JE, Rhyther JH&Mc. Larney WO.(1972). Aquaculture Farming and Husbandry of Freshwater and marine Organism. Jhon Wiley & Sons. London. UK.
2. Boyd, C.E. and C.S. Tucker, (1992). Water Quality and Pond Soil Analyses for Aquaculture. Alabama Agricultural Experiment Station, Auburn University, Alabama, 183 pp.
3. Pillay TVR and Kutty MN (2005). Aquaculture: Principles and Practices. 2<sup>nd</sup> ED ISBN: 978-1-405-10532-3, Wiley-Blackwell, 640 pages, Blackwel, Publication.
4. Ayyappan, S. J. K. Jena, A. Gopalakrishnan, A. K. Pandey. (2011). Handbook of fisheries and aquaculture. Indian Council of Agricultural Research. Directorate of Information and Publications on Agriculture, Directorate of Information and Publications of Agriculture, Indian Council of Agricultural Research, New Delhi, India.
5. De Silva SS & Anderson TA. (1995). Fish Nutrition in Aquaculture. Published by Chapman and Hall, United Kingdom.
6. Andrews, C, Excell A and Carrington, N. (1988). The manual of fish health. Salamander Book Ltd. Londaon. pp.209.
7. Shankar, K.M. and C.V. Mohan. (2002). Fish and shellfish health management, UNESCO, New Delhi.

|                       |          |                                                          |             |         |
|-----------------------|----------|----------------------------------------------------------|-------------|---------|
| Programme Code: 06    |          | M.Sc., Zoology                                           |             |         |
| Course Code: 18PZO4CN |          | Core Practical III. Environmental Biology and Toxicology |             |         |
| Batch                 | Semester | Hours / Week                                             | Total Hours | Credits |
| 2018-2019             | III& IV  | 4                                                        | 120         | 2       |

**Course Objectives**

1. To observe the quality of the water and soil.
2. To understand the microbial activities and biological analysis of the water.
3. To know the toxicity testing methods and encourage the students to visit the field environment.

**Course Outcomes**

|    |     |                                                                                               |
|----|-----|-----------------------------------------------------------------------------------------------|
| K3 | CO1 | Apply knowledge in determining the physical characteristics of the water and soil.            |
| K4 | CO2 | Analyze the plankton population, microbial quality and the biological analysis of the water.  |
| K5 | CO3 | Evaluate the toxicity of pollutants on animals and to expose the students in the field study. |

**SYLLABUS****I. Analysis of water** – Pond / Pool water; /River water; Sewage / Effluent

1. pH
2. Total dissolved solids (TDS, TSS)
3. Dissolved carbondioxide
4. Dissolved oxygen
5. Hardness (Temporary – carbonates, bicarbonates, Permanent – calcium, magnesium, chlorides, sulphates, phosphates, nitrates and silicate.
6. BOD and COD (Demonstration only)

**II. Analysis of soil** – Clayey soil, Sandy soil, Garden soil and Red soil

1. Soil moisture
2. Soil texture
3. Chlorides

4. Sulphates
5. Nitrates
6. Phosphates
7. Silicates
8. Humus

### **III. Biological analysis**

1. Qualitative analysis of organisms (Pollution indicators) such as diatoms / algae, flagellates, ciliates, annelids, insects, mollusks and fish.
2. Biological analysis of sewage water and industrial effluent.
3. Estimation of chlorophyll content in the leaves as an indicator of pollution.
4. Microbiological study in water and soil.

### **IV. Toxicological Testing methods**

LC<sub>50</sub>, LD<sub>50</sub>

### **V. Lab and Field Study**

#### **1. Detailed study of Pond/Lake ecosystems**

##### **a. Physico-chemical parameters**

##### **b. Qualitative and quantitative analysis of plankton**

#### **2. Measurement of noise pollution**

#### **3. Estimation of Primary productivity in fresh water habitat**

### **VI. Field Trip**

1. Visit to – Drinking water treatment Plant; Sewage water treatment plant and District Environmental Laboratory.

### **VII. Submission of the following at the time Practical Examination without**

**which the students will not be permitted to write the examination.**

1. A minimum of 5 whole mounts of Plankton – 5 Marks
2. Bonafide Record – 10 Marks

**MAPPING**

| <b>PSO</b><br><b>CO</b> | <b>PSO1</b> | <b>PSO 2</b> | <b>PSO 3</b> | <b>PSO 4</b> | <b>PSO 5</b> |
|-------------------------|-------------|--------------|--------------|--------------|--------------|
| <b>CO1</b>              | M           | M            | H            | S            | S            |
| <b>CO2</b>              | M           | S            | M            | H            | H            |
| <b>CO3</b>              | S           | M            | M            | H            | M            |

S – Strong

H – High

M – Medium

L – Low

**MODEL QUESTION PATTERN FOR CORE PRACTICAL III****CIA Practical Examination**

|                               |                 |
|-------------------------------|-----------------|
| Model Practical Examination = | 25 Marks        |
| Observation Note =            | 10 Marks        |
| Attendance =                  | 5 Marks         |
| <b>Total</b> =                | <b>40 Marks</b> |

**END OF SEMESTER EXAMINATION****Time – 4 Hours****Max. Marks – 60**

|                                                     |   |          |
|-----------------------------------------------------|---|----------|
| Q I : Estimation of water sample (Major Experiment) | - | 15 marks |
| Q II : Estimation of soil sample (Minor Experiment) | - | 10 marks |
| Q III : Estimation of Chlorophyll                   | - | 10 marks |
| Q IV : Spotters (2)                                 | - | 10 marks |
| Q V : Submission of slide                           | - | 5 marks  |
| Q VI : Record                                       | - | 10 marks |

**Total - 60 marks**

|                    |                                                       |             |         |
|--------------------|-------------------------------------------------------|-------------|---------|
| Programme Code: 06 | M.Sc. Zoology                                         |             |         |
|                    | <b>Major Elective Paper 1 – Environmental Biology</b> |             |         |
| Batch              | Hours / Week                                          | Total Hours | Credits |
| 2018-2019          | 4                                                     | 60          | 5       |

### Course Objectives

1. To obtain knowledge about the biosphere and their characteristics.
2. To know the energy, natural resources and their conservations.
3. To get information about the space ecology.

### Course Outcomes

|    |     |                                                                                                  |
|----|-----|--------------------------------------------------------------------------------------------------|
| K1 | CO1 | Expertise knowledge about the biosphere.                                                         |
| K2 | CO2 | Understand the physical, chemical and biological characteristics of the biosphere.               |
| K3 | CO3 | Apply the knowledge in measuring the energy resources and the conservation of natural resources. |
| K4 | CO4 | Analyze the techniques of the remote sensing and space travel.                                   |

## SYLLABUS

### Unit I

(12 Hours)

#### Atmosphere

Composition and Structure, Climatic factors – Air, Light, Temperature, Atmospheric Pressure, Wind, Humidity and Rainfall.

**Unit II**

**(12 Hours)**

**Hydrosphere**

Water resources, hydrological cycle, physico-chemical and biological characteristics of ponds, lakes, rivers, estuaries, mangroves and sea.

**Unit III**

**(12 Hours)**

**Lithosphere**

Soil formation, components of soil, physico-chemical properties of soil, structure, texture and classification of soil, Soil organisms, Soil erosion (degradation).

**Unit IV**

**(12 Hours)**

**Energy and Environment**

Concept of energy, Sources of energy, Measurements of primary production, Energy flow in ecosystem. Conservation of Natural resources – Minerals, Forest, Agriculture, Afforestation, Wild life management\*, Freshwater fish culture.

**Unit V**

**(12 Hours)**

Radiation Ecology – Radiation environment – Remote sensing, Radio Telemetry as a tool for ecological research, Space ecology – Exobiology – Hazards of space travel – Regenerating system.

**\* denotes Self study**

**Teaching Methods:**

Over Head Projector, Power Point Presentation, Seminar, Smart class, Assignment, Discussion, Quiz.

**Text Books**

1. Sharma P.D.,(2012), Ecology and Environment – Rastogi Publications, India.
2. Biswarup Mukerjee,(1997), Environmental Biology – Tata McGraw Hill publishing company Ltd, New Delhi.
3. Odum E.P.(1971), Fundamentals of Ecology – 3<sup>rd</sup> edition, W.B.Saunders & Co, Philadelphia.

**Reference Books**

1. Joesph M. Moran, Michael, P.Morgan, James, H.Wiesma,(1991), Introduction to Environmental Science –Published by W.H. Freeman and Company, Sanfrancisco.
2. Agarwal K.C., (1989), Environmental Biology –Agro Botanical Publishers(India).
3. Charles R. Goldman, Alexander J. Horsno Mcgraw ,(1983), Limnology – Hill International book company, New Delhi.
4. Dilip Kumar,(2010), Introduction to Soil Science – DasKalyani Publishers, New Delhi.
5. Edward John Kormandy ,(1969), Concept of Ecology – Prentice Hall Publishers New Delhi.
6. Singh J.P., Singh S.P and S.R.Gupta, (2014), Ecology Environmental Science and Conservation – S.Chand Publishers, New Delhi.

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|                    |                                                               |             |         |
|--------------------|---------------------------------------------------------------|-------------|---------|
| Programme Code: 06 | M.Sc. Zoology                                                 |             |         |
|                    | Major Elective Paper 3 – Environmental Biology and Toxicology |             |         |
| Batch              | Hours / Week                                                  | Total Hours | Credits |
| 2018-2019          | 6                                                             | 90          | 5       |

### Course Objectives

1. To assess the environmental degradation of the biosphere.
2. To create awareness about the environmental quality and monitoring.
3. To obtain the information about toxicants and their impacts in the environment.

### Course Outcomes

|    |     |                                                                                                 |
|----|-----|-------------------------------------------------------------------------------------------------|
| K1 | CO1 | Obtain knowledge about the pollutants of the biosphere and their impacts on human beings.       |
| K2 | CO2 | Understand the effects and control measures of the pollutants.                                  |
| K3 | CO3 | Apply the knowledge in monitoring the quality of the environment and to promote bioremediation. |
| K4 | CO4 | Analyze and evaluate the toxicity of pollutants on living organisms.                            |

## SYLLABUS

### Unit I

(18 Hours)

#### Air Pollution

Air pollutants, sources of Air pollution, Effects on the environment – Acid rain, Green house effect and Ozone depletion, Effects on the living organisms including man, control methods of air pollution.

**Unit II****(18 Hours)****Water Pollution**

Water pollutants, sources of water pollution, Types of Pollution (Organic, Pesticidal, Heavy metal and Oil pollution), Effects on the living organisms including man, Control methods of water pollution.

**Unit III****(18 Hours)****Soil, Noise, Thermal and Radioactive Pollution**

**Soil pollution** – Sources and their effects on the environment and organisms including man, solid waste management.

**Noise pollution** – Sources of noise and their effects on the environment, organisms including man and Control of Noise pollution.

**Thermal and radioactive pollution** – Sources and their effects on the environment, organisms including man and Control of Thermal and Radioactive pollution.

**Unit IV****(18 Hours)****Environmental Quality, Awareness and Management**

Ecoindicators and the environment, Environmental education and Awareness, Environmental monitoring and Environmental Impact Assessment (EIA), Environmental management and Bioremediation.

**Unit V****(18 Hours)****Toxicology**

Scope and significance, Classification, Toxic substances, Absorption and Excretion of toxicants, Toxicity – Mode of action of toxicants, Toxicity – Acute and chronic toxicity. Impacts of toxicants\*, Toxicological testing methods – Evaluation of toxicity in organisms – LC<sub>50</sub> in sAquatic organisms, LD<sub>50</sub> in Terrestrial organisms.

**\* Denotes Self study**

**Teaching Methods:**

Over Head Projector, Power Point Presentation, Seminar, Smart class, Assignment, Discussion, Quiz.

**Text Books**

1. Sharma P.D., (2012), Environmental Biology and Toxicology –, Rastogi publications, India.
2. Biswarup Mukherjee, (1997), Environmental Biology –Tata McGraw Hill publishing company Ltd, New Delhi.
3. Subramaniam M.A., (2004), Toxicology principles and methods –M.J.Publishers Chennai.

**Reference Books**

1. Chattwal G.R., M.C.Mehra, J.Katyal, M.Satake, Mohan Katyal, T.Nagahiro, (1989), Environmental Air pollution and its control –Anmol Publications, New Delhi.
3. Goel P.K., (1997), Water pollution – Causes, effects and control –New Age International Pvt. Ltd. Publishers, New Delhi.
4. Voudouris, (2012), Water quality Monitoring and Assessment –Intech Publishers.
5. Jimmy Katayal and M.Satake, (2001), Environmental pollution – Anmol Publications Pvt. Ltd., New Delhi.
6. Purohit Agarwal . P. (2006), Environmental pollution – causes, effects and control – Agrobios publishes, India.

|                              |                               |                  |                    |               |
|------------------------------|-------------------------------|------------------|--------------------|---------------|
| <b>Programme Code : 06</b>   | <b>M. Sc, Zoology</b>         |                  |                    |               |
| <b>Course code: 19PZOOJ1</b> | <b>JOC – ANIMAL HUSBANDRY</b> |                  |                    |               |
| <b>Batch</b>                 | <b>Semester</b>               | <b>Hour/Week</b> | <b>Total hours</b> | <b>Credit</b> |
| <b>2019 - 2020</b>           | <b>2</b>                      | <b>3</b>         | <b>45</b>          | <b>2</b>      |

### COURSE OBJECTIVES

1. To give overview on the common breeds of Livestock and their breeding habits.
2. To develop idea about the various management practices and Veterinary Medicine.
3. To have a basic understanding of Veterinary and Dairy Science.

### COURSE OUTCOMES

|           |            |                                                                                                                           |
|-----------|------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>K1</b> | <b>CO1</b> | Get knowledge about the production of Livestock.                                                                          |
| <b>K2</b> | <b>CO2</b> | Understand the Livestock and rearing techniques to generate self employment.                                              |
| <b>K3</b> | <b>CO3</b> | Apply knowledge into the Livestock production, to avoid production risks and enhance the production level.                |
| <b>K4</b> | <b>CO4</b> | Analyze technical knowledge for consultancy, marketing and entrepreneurship development in the field of Animal husbandry. |

### SYLLABUS

#### UNIT – I

**(9 Hrs)**

**Basics of Animal Husbandry:** Scope and importance; Common breeds of cattle, buffalo, sheep, goat, pig, poultry and rabbits; Animal production systems; Principles of housing for farm animals and routine management practices for various categories of livestock and sick animals. Role of livestock in Indian economy and human health. Socioeconomic aspects of livestock enterprise with special reference to farming community and rural development.

**UNIT – II****(9 Hrs)**

**Basic Andrology and Artificial Insemination:** Cattle - Sexual behavior of males; Pheromones – Definition, role of pheromones; Study of male genitalia and gonads; Male infertility; Semen collection processing and storage; Artificial insemination; Handling of fresh and frozen semen; Semen evaluation; Diseases transmitted through semen. Systems and strategies for improvement of livestock for milk, meat, wool production and poultry for eggs and meat. Breeding of resistance varieties.

**UNIT – III****(9 Hrs)**

**Animal Nutrition:** Principles of animal nutrition; Role of natural and artificial dietary nutrition in animal health and production; Feeds and fodders; Scientific feeding of livestock; Feeding schedule for different categories of livestock; Feed additives; Silage making, Diet formulation for newborn, growing, pregnant, lactating and sick animals. Nutrition deficiencies and their management.

**UNIT – IV****(9 Hrs)**

**Veterinary Medicine:** Major contagious diseases affecting cattle, buffaloes, sheep and goats, pigs, poultry, rabbits. Etiology, symptoms, pathogenicity, diagnosis, treatment and control of major bacterial, viral, and parasitic infections.

Immunization and vaccination: Methods of immunization; Vaccines and their use in animals. Animal Ethics – Society for the prevention of Cruelty to Animals (SPCA)\*.

**UNIT – V****(9 Hrs)**

**Dairy Science:** Physico-chemical and nutritional properties of milk. Quality assessment of milk and milk products, Common tests and legal standards. Cleaning and sanitation of dairy equipment. Milk collections, chilling, transportation processing, packaging, storage and distribution. Manufacture of market milk, cream butter, cheese, ice-

cream, condensed and dried milk, by products and Indian Milk products – Economic importance; New Entrepreneur cum Enterprise Development – programmes, schemes, agencies in India.

**\*Denotes Self Study**

**Text Teaching Methods:**

Overhead Projector, Powerpoint Presentation, Seminar, Assignment, Discussion, Quiz, Field Visits.

**Text Books:**

1. Singh C.D.N. (2010), Advanced General Pathology of Animals (PB), IBDC.
2. M.K Shukla (2011), Applied veterinary Andrology and frozen semen technology, NIPA.
3. Banerjee G.C (2018), Principles of Animal Nutrition and Feeds Revised Edition (PB), Oxford & IBH.
4. Reddy (2018), Applied Nutrition: Livestock, Poultry, Rabbits and Laboratory Animals, 3 (edition) (PB), Oxford & IBH.

**Reference Books:**

1. Bansil P.C (2006), Livestock Economy of India, CBS.
2. Mohiuddin S. M (2007), Infectious Diseases of Domestic Animals, IBDC.
3. Legates (2014), Breeding & Improvement of Farm Animals, McGraw-Hill.
4. Hui Y.H (2014), Dairy Science and Technology Handbook: Principles and Properties, Vol. 1 (PB), John Wiley (WSE & Exclusive Indian Spl. Price Titles).
5. Spreer (2018), Milk and Dairy Product Technology (HB), Taylor & Francis.

MAPPING

| CO \ PSO                                   | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 4 |
|--------------------------------------------|-------|-------|-------|-------|-------|
| CO1                                        | S     | H     | H     | H     | S     |
| CO2                                        | H     | S     | H     | H     | H     |
| CO3                                        | H     | M     | H     | H     | H     |
| CO4                                        | H     | H     | S     | H     | H     |
| S-Strong      H- High    M-Medium    L-Low |       |       |       |       |       |